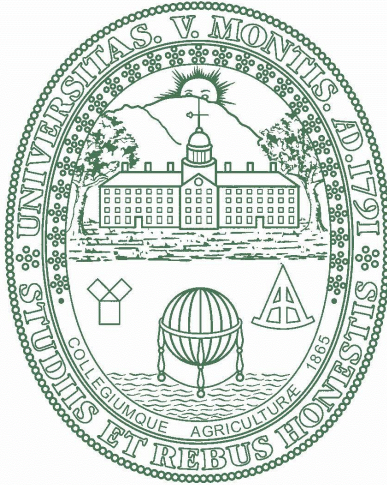


This PDF is a static document and reflects catalogue content as of April 18, 2022.

# The University of Vermont



## Graduate Catalogue 2022-2023

Students at the University of Vermont are responsible for knowing and complying with all requirements for their respective degrees as stated in the catalogue.

The University of Vermont reserves the right to make changes in the course offerings, mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

Mode and method of instruction for any given course, including, but not limited to, in-person vs. remote instruction (synchronous or asynchronous), use of mixed formats, and alternative scheduling, is at the discretion of the University.

The following programs are currently inactive and thus do not have a listing in the catalogue: Certificate of Graduate Study in Ecological Design, the Master of Arts in French, the Master of Science in Engineering Management, the Master of Science in Athletic Training, the Master of Science in Plant Biology, and the Post-Professional Occupational Therapy Doctorate.

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## GRADUATE CATALOGUE

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## COURSES

### TO VIEW THE COURSE LIST, SELECT "MENU" AND THEN "COURSE LIST"

The University reserves the right to change course offerings at any time.

A student who lacks the stated prerequisites for a course may be permitted to enroll by the Instructor. Such students must inform the instructor that they lack the prerequisites, and the instructor will make appropriate efforts to ascertain that they are properly qualified. Students enrolled who do not meet the prerequisites of a course may be disenrolled from that course. The instructor will notify the Office of the Registrar of this action.

### ABOUT UVM COURSES - INFORMATION FOR GRADUATE STUDENTS

Courses numbered from 001 to 099 are introductory courses. Under no circumstance will graduate credit be allowed for a course numbered below 100.

Courses numbered 100 to 199 are intermediate courses, and may not be taken for graduate credit except upon the recommendation of a student's Studies Committee and with the authorization of the Dean of the Graduate College prior to enrollment. Graduate programs designed for the Master of Science for Teachers degree (MST) are exempted from this rule. Non-degree students are not permitted to receive graduate credit for courses numbered 100 to 199.

Courses numbered 200 to 299 are advanced courses. An advanced course presents concepts, results, or arguments which are only accessible to students who have taken courses in the discipline (or, occasionally, in a related discipline) at the introductory and

intermediate levels. Prior acquaintance with the basic concepts of the subject and with some special areas of the subject will be assumed. An advanced course will always have a minimum prerequisite of three hours of prior study at the intermediate level in the discipline, or in a related discipline, or some specified equivalent preparation. Not all 200-level courses are eligible for graduate credit. Courses numbered 200 to 299 that are not approved for graduate credit may not be taken for graduate credit except upon the recommendation of a student's Studies Committee and with the authorization of the Dean of the Graduate College prior to enrollment.

Authorization to enroll in courses numbered 100 to 199, or courses numbered 200 to 299 that are not eligible for graduate credit, will be limited to one appropriate course (three credit hours) for a master's program and two appropriate courses (six credit hours) for a doctoral program. Graduate students may take additional 100-level or 200-level courses beyond those values, but graduate credit will not be allowed for such courses.

The 200-level courses that are eligible for graduate credit are included in the Graduate Catalogue course list. Graduate students enrolled in a 200-level course approved for graduate credit must take the course for graduate credit. To obtain graduate credit, the graduate student generally is expected to meet higher qualitative and/or quantitative expectations than the undergraduate student.

Courses numbered 300 to 399 are generally limited to graduate students unless permission to enroll is given by the appropriate instructor, department or program.

Courses numbered 400 or above are limited to candidates for doctoral degrees.

### SPECIAL TOPICS COURSE POLICY - INFORMATION FOR FACULTY MEMBERS

A course offered under the Special Topics course rubric (i.e., X095/X096) may be presented up to three times within a ten-year period before it must be submitted for review as a permanent course offering listed under a unique course number in the Catalogue.

## COURSE LIST

### ANATOMY & NEUROBIOLOGY (ANNB)

#### Courses

#### **ANNB 300. Human Gross Anatomy. 6 Credits.**

Lectures and detailed regional cadaver dissections emphasize functional anatomy of major systems (e.g. musculoskeletal, cardiovascular, nervous). Physical Therapy students or Instructor permission.

#### **ANNB 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ANNB 391. Master's Thesis Research. 1-18 Credits.**  
Credit as arranged.

**ANNB 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ANNB 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ANNB 396. Special Topics in Neurobiology. 1-3 Credits.**

Prerequisite: Permission of the Instructor.

**ANNB 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ANNB 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ANNB 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ANNB 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ANIMAL BIOSCIENCES (ABIO)****Courses****ABIO 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ABIO 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ABIO 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ABIO 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**ABIO 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ABIO 491. Doctoral Dissertation Research. 1-18 Credits.****ABIO 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ABIO 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ABIO 497. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**ANIMAL SCIENCES (ASCI)****Courses****ASCI 215. Physiology of Reproduction. 3 Credits.**

Fundamental principles of the physiology of reproduction with emphasis on, but not limited to, farm animals. Prerequisite: ASCI 111 and ASCI 120; or ASCI 141; or Instructor permission.

**ASCI 216. Endocrinology. 3 Credits.**

Physiology of endocrine and autocrine/paracrine systems and growth factors. Prerequisites: BIOL 001, BCOR 011, or BCOR 021; ASCI 120, ASCI 141, or Instructor permission.

**ASCI 220. Lactation Physiology. 3 Credits.**

Physiological mechanisms that control and affect lactation in domestic and laboratory animals with emphasis on dairy cattle. Includes mammary anatomy, development and health, and milk synthesis. Prerequisite: CHEM 023 or CHEM 031; and ASCI 141 or both ASCI 111 and ASCI 120.

**ASCI 263. Clin Top: Companion Animal Med. 3 Credits.**

Case studies in companion animal medicine are used to develop clinical, analytical, and diagnostic skills based on a knowledge of anatomy and physiology. This course also explores problem-based learning in medicine. Prerequisites: ASCI 118; and ASCI 141 or both ASCI 111 and ASCI 120; minimum Junior standing.

**ASCI 272. Adv Top: Zoo, Exotic, Endang Spec. 3 Credits.**

An exploration of modern zoo philosophy and ethics and the extent of human intervention necessary for the preservation of endangered species. Prerequisites: ASCI 171 and Instructor permission.

**ASCI 278. Molecular Epidemiol Infect Dis. 3 Credits.**

Provides a foundation of knowledge on the use of molecular biology tools to study infectious disease problems; explores how biologists and health scientists link epidemiological methods and molecular biology techniques to address global health issues. Prerequisites: Minimum Junior standing, one 100-level course in BioCore, Biology, Health, Health Sciences, or Microbiology and Molecular Genetics or ASCI 118 or ASCI 177 or Graduate student standing or Instructor permission.



**ASCI 279. One Health: Antimicrob Resist. 3 Credits.**

Provides a foundation of knowledge on the problem of antimicrobial resistance and factors that contribute to the emergence and spread of resistant micro-organisms. Considers antimicrobial resistance from a One Health perspective, integrating animal, environmental and human health. Prerequisites: Minimum Junior standing, one 100-level course in BioCore, Biology, Health, Health Sciences, or Microbiology and Molecular Genetics or ASCI 118 or ASCI 177 or Graduate student standing or Instructor permission.

**ASCI 301. ASCI Graduate Journal Club. 1 Credit.**

Students learn to critically read and discuss current scientific literature in terms of scientific method and merit. Pre/corequisite: Graduate standing.

**ASCI 302. ASCI Graduate Seminar. 1 Credit.**

Topics of current faculty and graduate student interest presented in a seminar-discussion format. Pre/corequisite: Graduate standing.

**ASCI 303. Research Proposal Writing. 2 Credits.**

Students discuss and practice the grant/proposal writing process by developing and writing a research proposal in response to a specific request for proposals. Students practice grant writing and review, and they share their work and review the work of others. Pre/Co-requisites: Graduate standing; recommended be taken prior to/during the semester of student's first committee meeting.

**ASCI 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ASCI 391. Master's Thesis Research. 1-10 Credits.****ASCI 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ASCI 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ASCI 395. Special Topics. 1-6 Credits.****ASCI 396. Advanced Special Topics. 1-6 Credits.****ASCI 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ASCI 491. Doctoral Dissertation Research. 1-12 Credits.****ASCI 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ASCI 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ASCI 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ANTHROPOLOGY (ANTH)****Courses****ANTH 210. Archaeological Theory. 3 Credits.**

Development of archaeology from the 19th century to the present including concepts of form, space and time, intellectual attitudes, current systems theory, and research strategies. Prerequisites: ANTH 024 and one 100-level Anthropology course, or HST 121, HST 122, or HST 149, or HP 201, or graduate standing in Historic Preservation Program.

**ANTH 290. Ethnographic Field Methods. 3 Credits.**

Examination of theoretical and ethical premises of field work methodology with practical experience in research design, proposal writing, participant observation, interviewing, and qualitative data analysis. Prerequisite: ANTH 021, one course at the 100-level in cultural anthropology.

**ART HISTORY (ARTH)****Courses****ARTH 282. Seminar in Western Art. 3 Credits.**

Selected topics in Western Art. See Schedule of Courses for specific offerings each semester. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Six hours of 100-level Art History, including three hours in the area of the seminar; Minimum Junior standing.

**BIOCHEMISTRY (BIOC)****Courses****BIOC 201. Fundamentals of Biochemistry. 3 Credits.**

Provides a broad introduction to the field of biochemistry. Students will explore the molecular basis and chemical principles of biochemistry pertinent to living systems. This course is taught by LCOM faculty and emphasizes the relevance of biochemistry to health, disease, physiology and medicine. Prerequisites: CHEM 026, CHEM 042, CHEM 048, CHEM 142, or equivalent; BIOL 002, BCOR 012, BCOR 103, or equivalent.

**BIOC 205. Biochemistry I. 3 Credits.**

Introduction to chemistry and structure of biological macromolecules; examination of mechanisms of chemical processes in biological systems including enzyme catalysis, biosynthesis, regulation, and information transfer. Prerequisite: CHEM 048 or CHEM 142 or CHEM 144. Cross-listed with: CHEM 205 and MMG 205.

**BIOC 206. Biochemistry II. 3 Credits.**

Continuation of Biochemistry I. Biochemistry of nucleic acids; nucleic acid based processes, such as replication and transcription; cellular information transfer, genomics, and proteomics. Prerequisite: BIOC 205, CHEM 205, or MMG 205. Cross-listed with: CHEM 206, MMG 206.

**BIOC 207. Biochemistry Lab. 3 Credits.**

Introduction to biochemical tools, including spectrometry, chromatography, and electrophoresis; natural and recombinant enzyme isolation; assays of DNA-modifying enzymes; computer-based structure/function exercises. Prerequisite: BIOC 205, CHEM 205, or MMG 205. Cross-listed with: CHEM 207, MMG 207.

**BIOC 275. Adv Biochem of Human Disease. 3 Credits.**

The course takes a deep dive into five distinct areas of biochemistry related to a disease or group of diseases primarily through group learning. Key biochemical principles are reviewed and extended. Additionally students will read and discuss a primary literature article with each area. Prerequisites: NSF 183, BIOC 201, or BIOC 205.

**BIOC 301. General Biochemistry. 3 Credits.**

Survey for science majors. Chemistry, structure, metabolism, and function of proteins, carbohydrates, lipids; enzymes, bioenergetics and respiratory processes. Prerequisite: CHEM 142 or CHEM 144, or Instructor permission.

**BIOC 302. General Biochemistry. 3 Credits.**

Survey for science majors. Amino acids, nucleic acids, protein synthesis, cellular and physiological control mechanisms. Prerequisite: BIOC 301, or Instructor permission.

**BIOC 351. Proteins I: Structure&Function. 3 Credits.**

Special Topics: Introduction to concepts in protein structure and chemistry as well as exploration of ideas in a "hands on" fashion using computational resources. Prerequisite: BIOC 301, or Department permission. Alternate years.

**BIOC 372. Cancer Biology. 3 Credits.**

Overview of cancer biology for health science students. Foundation for cancer research. Lecture format; interdisciplinary viewpoint; outside lectures. Prerequisite: BIOC 301, or Department permission.

**BIOC 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOC 391. Master's Thesis Research. 1-12 Credits.**

Credit as arranged.

**BIOC 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOC 395. Special Topics. 1-12 Credits.****BIOC 396. Advanced Special Topics. 1-12 Credits.****BIOC 397. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOC 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOC 491. Doctoral Dissertation Research. 1-12 Credits.**

Credit as arranged.

**BIOC 492. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOC 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## BIOENGINEERING (BIOE)

### Courses

**BIOE 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOE 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOE 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOE 491. Doctoral Dissertation Research. 1-18 Credits.****BIOE 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOE 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOE 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BIOLOGY (BIOL)****Courses****BIOL 204. Adv Genetics Laboratory. 4 Credits.**

Laboratory experiments to provide experience with modern genetic techniques. Bench work and data analysis emphasized. Prerequisite: BCOR 101.

**BIOL 205. Adv Genetics & Proteomics Lab. 4 Credits.**

Laboratory experiments to provide experience with modern genetic and proteomics techniques. Bench work and data analysis are emphasized. Prerequisites: BCOR 101, BCOR 103.

**BIOL 209. Field Zoology of Arthropods. 0 or 4 Credits.**

Collection, identification, and ecology of arthropods. Substantial field collecting. Prerequisite: BCOR 102.

**BIOL 217. Mammalogy. 0 or 4 Credits.**

Classification, identification, morphology, evolution, and distribution of mammals. Prerequisite: BCOR 102.

**BIOL 219. Compar/Func Vertebrate Anatomy. 4 Credits.**

Structure, function, and phylogeny, with evolutionary and functional trends of all chordate groups. Prerequisite: Two courses from BCOR 101, BCOR 102, BCOR 103.

**BIOL 223. Developmental Biology. 3 Credits.**

An analysis of the cellular, subcellular, molecular, and genetic mechanisms that operate during oogenesis and embryogenesis in invertebrate and vertebrate organisms. Prerequisites: BCOR 101, BCOR 103.

**BIOL 254. Population Genetics. 0-4 Credits.**

Methods of detecting and investigating genetic variation, as well as its causes and consequences. Applications from medicine, forensics, and environmental biology are emphasized. Prerequisite: BCOR 101 or BCOR 102.

**BIOL 255. Comparative Physiology. 0 or 4 Credits.**

Physiology at the organ, systems, and organismal levels. Capstone course to consolidate biological concepts. Pre/co-requisites: BCOR 101, BCOR 102, BCOR 103.

**BIOL 261. Neurobiology. 3 Credits.**

Focus on molecular and cellular aspects of the nervous system. Electrical signaling, synaptic transmission, signal transduction, neural development, plasticity, and disease. Credit not awarded for both BIOL 261 and NSC1 261. Prerequisite: BCOR 103.

**BIOL 264. Community Ecology. 3 Credits.**

Theoretical and empirical analyses of community structure. Topics include population growth, metapopulation dynamics, competition, predation, species diversity, niches, disturbance succession, island biogeography, and conservation biology. Prerequisite: BCOR 102; at least Junior standing.

**BIOL 266. Neurodevelopment. 3 Credits.**

Current topics in developmental neurobiology through lectures and discussions of primary literature. The course is designed for advanced undergraduate life science majors and graduate students in the biological sciences. Pre/co-requisites: BCOR 101 and BCOR 103.

**BIOL 269. Plant-Animal Interactions. 3 Credits.**

Ecological and evolutionary interactions among plants and animals. Topics include herbivory, pollination, seed predation, ant-plant interactions, biological control, and anthropogenic effects on plant-animal interactions including the effects of GMOs and global climate change. Prerequisites: BCOR 102.

**BIOL 270. Speciation and Phylogeny. 0 or 4 Credits.**

Contribution of modern research in such fields as genetics, systematics, distribution, and serology to problems of evolutionary change. Prerequisite: BCOR 102.

**BIOL 271. Evolution. 3 Credits.**

Basic concepts in evolution will be covered, including the causes of evolutionary change, speciation, phylogenetics, and the history of life. Pre/co-requisites: BCOR 102 or permission of the Instructor.

**BIOL 276. Behavioral Ecology. 3 Credits.**

Adaptive significance of behavior in natural environments. Evolutionary theory applied to behavior and tested with field data. Prerequisite: BCOR 102 or Instructor permission.

**BIOL 277. Sociobiology. 3 Credits.**

The evolutionary biology of social behavior in animals. Topics include the evolution of sociality, social interactions, and the functional organization of social groups. Prerequisite: BCOR 102.

**BIOL 371. Graduate Colloquium. 1 Credit.**

Topics of current faculty and graduate student interest presented in a seminar-discussion format. Specific titles for colloquia will be listed in the course schedule.

**BIOL 372. Cutting Edge Topics. 2 Credits.**

Graduate students will explore cutting edge topics in depth. Students will cross disciplinary lines and learn collaboratively to solve problems. Students will present the outcomes in a talk appropriate for a lay audience. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Graduate standing.

**BIOL 380. Ecological Genomics. 4 Credits.**

An exploration of the merger of ecology and genomics to address the genetic basis of adaptive variation in natural populations. Emphasis on integrating quantitative approaches and hands-on analysis of large genomic and ecological data sets. Pre/Co-requisites: BCOR 101, BCOR 102, STAT 141 or STAT 211; basic knowledge of statistics, probability, genetics, and evolution required; familiarity with programming in R or bash is recommended. Cross-listed with: PBIO 380.

**BIOL 381. Special Topics. 0-4 Credits.**

Readings with conferences, small seminar groups, or laboratories intended to contribute to the programs of graduate students in biology or related disciplines for which formal courses are not available. Prerequisite: An undergraduate major in life science.

**BIOL 385. Biology Seminar. 0-1 Credits.**

Review and discussion of current biological research. Attendance required of Biology graduate students. Pre/co-requisite: Graduate standing and Instructor permission.

**BIOL 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOL 391. Master's Thesis Research. 1-10 Credits.**

Credit as arranged.

**BIOL 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOL 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOL 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOL 491. Doctoral Dissertation Research. 1-10 Credits.****BIOL 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOL 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BIOMEDICAL ENGINEERING (BME)****Courses****BME 201. Biomaterials Engineering. 3 Credits.**

A materials science and engineering approach is used to explore the structure-function relationships of natural and bio-inspired materials for various engineering applications. The emphasis is on mechanical design and function. The medical applications of biomaterials will be discussed. Prerequisites: ME 101 or BME 112. Cross-listed with: ME 201.

**BME 204. Biothermodynamics. 3 Credits.**

Inter-disciplinary; guides the student through the thermodynamics of living organisms, comprised of the study of energy transformation in the life sciences. Designed for students from the STEM disciplines. Covers Gibbs free energy, statistical thermodynamics, binding equilibria, and reaction kinetics. Prerequisites: ME 123, ME 124, or BME 112. Cross-listed with: ME 204.

**BME 206. Biomechanics of Human Motion. 3 Credits.**

Biomechanics of Human Motion will describe the typical processes-from small scale protein interactions to large scale joint torques-that result in human locomotion. Clinical problems and athletic performance will be discussed. Students will learn about musculoskeletal tissues related to force generation/transmission and will perform kinematic/kinetic analyses. Prerequisite: BME 011 or ME 012. Pre/Co-requisites: ME 101, ME 111, or BME 111. Cross-listed with: ME 206.

**BME 208. Biomechanics: Tissue Engr. 3 Credits.**

Solid biomechanics including structure, function and mechanical properties of biological tissues. Tissue engineering involving cell mechanics, scaffold materials, and signaling. Current literature topics are covered. Prerequisites: ME 101 or BME 112. Cross-listed with: ME 208.

**BME 227. Biomedical Instrumentation. 3 Credits.**

Measurement techniques for biomedical engineering research and industry, and health care institutions. Integrated biomedical monitoring, diagnostic, and therapeutic instrumentation. Prerequisite: EE 100 or EE 004 or EE 075 or EE 021. Co-requisite: EE 120, ANPS 020, or Instructor permission. Cross-listed with: EE 227.

**BME 229. Biosignal Decoding. 3 Credits.**

Overview of biomedical measurement techniques; development of Python software to visualize, denoise, and decode biomedical signals. Prerequisites: CS 021; (BME 111 or EE 171) or (ME 111 and EE 101) or Instructor permission. Pre/Co-requisites: Beginner knowledge of Python programming is strongly suggested. Cross-listed with: EE 229.

**BME 240. Wearable Sensing. 3 Credits.**

Covers current state-of-the-art in wearable sensors and the biomechanical and physiological phenomena they are being used to measure. Emphasis will be given to applications related to human health and medicine. Prerequisite: ME 111 or EE 171 or equivalent with Instructor permission.

**BME 241. Biomedical Signal Processing. 3 Credits.**

Covers several important physiological signals often monitored in biomedical contexts (e.g. EMG, ECG, PPG). Content will include the physiology that generates the signals as well as the signal processing techniques (e.g., LTI filters, empirical mode and wavelet decomposition) and algorithms used for analysis. Prerequisite: ME 111 or EE 171 or equivalent with Instructor permission.

**BME 250. Nanobiomaterials. 3 Credits.**

Covers the classes of nanomaterials used biomedically, the biological response, and material testing. Content includes applications of nanomaterials in drug delivery, nano-topography of surfaces, sensors, and imaging as well as the topic of nanotoxicity. Pre/Co-requisites: ME 101, BME 111, or equivalent with Instructor permission.

**BME 391. Master's Thesis Research. 1-18 Credits.**

Credit as arranged.

**BME 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BME 393. Graduate Seminar. 1 Credit.**

Presentation and discussion of advanced problems, research, and current topics in Electrical Engineering by faculty, graduate students, and outside guest speakers. Prerequisite: Graduate Student standing.

**BME 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BME 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BME 491. Dissertation Research. 1-18 Credits.****BME 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BME 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BME 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## BIOMEDICAL & HEALTH SCIENCES (BHSC)

### Courses

**BHSC 242. Immunology. 3 Credits.**

Deals with cells, organs, development, interactions and the functioning (infectious process, immunodeficiency, hypersensitivity reactions, transplantation and tumor immunology) of the innate and the adaptive immune system. Prerequisites: One semester of biochemistry, one semester of organic chemistry.

**BHSC 244. Immunology Lab. 1 Credit.**

Laboratory experience dealing with cellular and humoral immunity, B cells and T cells, autoimmunity, immunodeficiency. Laboratory covers immunological techniques and applications. Prerequisites: One semester of biochemistry, one semester of organic chemistry. Co-requisites: BHSC 242 or MMG 223.

**BHSC 281. Applied Molecular Biology. 3 Credits.**

Introduces students to the nucleic acid and protein-based molecular diagnostics technology through class presentation, reading, and discussions. Focuses on diagnostic applications for understanding molecular mechanisms of disease. Prerequisite: CHEM 042 or CHEM 141.

**BHSC 282. Applied Molecular Biology Lab. 1 Credit.**

Laboratory experiences include practical concepts of molecular applications. Introduces basic methods used in DNA and Protein technology including plasmid isolation, polymerase chain reaction, restriction enzyme use, and related assays. Prerequisite: CHEM 042 or CHEM 141. Co-requisite: BHSC 281.

**BHSC 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BHSC 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BHSC 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BHSC 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**BHSC 398. Graduate Research. 1-18 Credits.**

Student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

## BIostatistics (BIOS)

### Courses

**BIOS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BIOS 391. Master's Thesis Research. 1-12 Credits.**

Credit as arranged.

**BIOS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BIOS 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## BUCKHAM OVERSEAS PROGRAM (BUCK)

### Courses

**BUCK 995. Buckham Program. 12 Credits.**

## BUSINESS ADMINISTRATION (BSAD)

### Courses

**BSAD 222. Human Resource Management. 3 Credits.**

Critical examination of contemporary problems in human resource management; including job analysis, recruitment, training and employee development, health and safety, compensation, performance appraisal, and related topics. Prerequisites: BSAD 120; Business Administration major or minor; Master of Accountancy Graduate students; minimum Junior standing.

**BSAD 230. Tech, Entr & Commercialization. 3 Credits.**

Provides future business and technology professionals with insights into the processes of transferring research from the university to the marketplace, and transforming new technologies into sustainable products or services that create new economic, social and environmental value. Prerequisites: BSAD 150 or EMGT 201; Business Administration major or minor; Computer Science and Information Systems major; Engineering Management major; others by permission; minimum Junior standing.

**BSAD 235. Entrepreneurial Family Firms. 3 Credits.**

Students will learn to work effectively in and with family enterprises - the predominant organizational form in the world. By understanding their unique advantages and challenges, students will learn to develop strategic solutions to improve the family and business performance. Prerequisites: BSAD 120; Business Administration, Engineering Management major; Business Administration minor; minimum Junior standing.

**BSAD 246. Taxation of Social Enterprises. 3 Credits.**

Explores the balance that organizations try to achieve between the for-profit (business) and nonprofit (charitable) separation of the tax world. Prerequisites: BSAD 161 or BSAD 180; Business Administration majors, Business Administration or Accounting minors, Master of Accountancy Graduate Students; Senior standing.

**BSAD 251. Marketing Research. 3 Credits.**

The role of research in a marketing information framework. Emphasis on survey research, data collection, and analysis. Experimental designs also examined. Prerequisites: BSAD 150; Business Administration major or minor; Senior or Graduate standing.

**BSAD 252. Marketing Research Practicum. 3 Credits.**

Market research field project. Students design survey instruments, collect and analyze data, and present results to clients in a business environment. Prerequisites: BSAD Prerequisites: BSAD 251; Business Administration major or minor; Instructor permission; Minimum Junior standing.

**BSAD 256. Retail Management. 3 Credits.**

Provides an overview of retail management. Key perspectives that shape the field including strategic planning, merchandising, and competitive advantage are emphasized. Prerequisites: BSAD 150; Business Administration major or minor; Master of Accountancy Graduate Students; minimum Junior standing.

**BSAD 258. D2: Intn'l Market Analysis. 3 Credits.**

Examines the cultural, economic, historic, and political factors that affect the analysis of foreign markets. Specific attention is given to the processes by which market entry decisions are developed and implemented. Prerequisites: BSAD 150, Business Administration major or minor; Minimum Junior standing.

**BSAD 260. Financial Statement Analysis. 3 Credits.**

Study of the concepts and techniques underlying corporate financial statement analysis, with an emphasis on equity valuation models. Prerequisites: BSAD 180; Business Administration major or minor; Senior standing.

**BSAD 263. SU: Environmntl & Social Rprtnng. 3 Credits.**

An examination of voluntary and mandatory reporting of issues related to corporate social responsibility including environmental, social and governance. Knowledge is gained through readings, written assignments and discussion. Coverage includes GRI, SASB and integrated reporting guidelines and standards. Prerequisites: BSAD 161 or BSAD 180; Senior or Graduate student standing or Instructor permission.

**BSAD 264. Corporation Taxation. 3 Credits.**

A survey of the tax consequences for C corporations and their shareholders of womb-to-tomb transactions, which might include formations, acquisitions, divisions, consolidations, and international operations as well as the reporting of book/tax differences. Prerequisites: BSAD 161; Senior standing; Business Administration major, Master of Accountancy student, Business Administration minor, Accounting minor.

**BSAD 265. Accounting Information Systems. 3 Credits.**

Examination of how accounting information is collected, stored and made available to decision makers with an emphasis on internal control implementation. Prerequisites: BSAD 161; Senior standing; Business Administration major, Master of Accountancy student, Business Administration minor, Accounting minor.

**BSAD 266. Advanced Accounting. 3 Credits.**

Focuses on accounting for business combinations and developing consolidated financial statements. Includes accounting for foreign currency transactions, and foreign subsidiaries. Prerequisites: BSAD 162.

**BSAD 267. Auditing. 3 Credits.**

Examination of auditing theory and practice. Topics include standards, ethics and legal responsibilities of the profession, audit planning, internal control, audit evidence, and auditor communications. Prerequisites: BSAD 162, BSAD 265; Senior standing; Business Administration major, Master of Accountancy student, Business Administration minor, Accounting minor.

**BSAD 268. Adv Topics in Management Acctg. 3 Credits.**

Emphasizes use of internal and external information in management decision making; includes cost of inventory, business activities, strategic use of information, long-range planning. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: BSAD 161 or BSAD 180; Senior standing; Business Administration major, Master of Accountancy student, Business Administration minor, Accounting minor.

**BSAD 269. Gov't and NFP Accounting. 3 Credits.**

Provides a study of the theory and practical application of accounting principles and auditing standards to governmental entities and not-for-profit organizations. Prerequisites: BSAD 161; Business Administration major or minor, Accounting minor, Master of Accountancy Graduate student; minimum Junior standing.

**BSAD 270. Quant Anyl for Managerial Dec. 3 Credits.**

Application of management science methods to managerial decision making, emphasizing modeling and use of solution results. Topics include mathematical programming, waiting-line analysis, and computer simulation. Prerequisites: BSAD 030, BSAD 173; Business Administration major or minor; Engineering Management major, Master of Accountancy Graduate students; other majors or minors by Instructor permission; minimum Junior standing.

**BSAD 271. Current Topics Fin Reporting. 3 Credits.**

Focuses on the development and use of two sets of financial reporting standards: International Financial Reporting Standards (IFRS) and US generally accepted accounting principles (GAAP). Prerequisites: BSAD 161, BSAD 162; Business Administration majors and minors, Accounting minors, Master of Accountancy Graduate students; Senior standing.

**BSAD 273. Supply Chain Management. 3 Credits.**

Explores how firms can organize supply chains to more effectively align supply with the demand for products. Prerequisites: BSAD 173; Business Administration major or minor; Engineering Management major, or Graduate Master of Accountancy student; minimum Junior standing or graduate standing; other majors or minors by Instructor permission.

**BSAD 281. Fixed Income Security Analysis. 3 Credits.**

Focuses on the valuation and analysis of fixed income securities and the management of fixed income investment portfolios. Prerequisites: BSAD 180; Business Administration major or minor, Master of Accountancy Graduate student; minimum Junior standing.

**BSAD 282. Security Val & Portfolio Mgmt. 3 Credits.**

Examination of theories and evidence on the investment decision process including operations of equity securities markets, market efficiency, financial asset prices, and portfolio management. Prerequisites: BSAD 180; Business Administration major or minor; Minimum Junior standing. Co-requisite: BSAD 280.

**BSAD 285. Options and Futures. 3 Credits.**

Financial derivatives - options, futures, and swaps. Topics include: structures of the markets for exchange traded and over-the counter derivatives, identification and exploitation of arbitrage opportunities, use and misuse of derivatives to hedge risk in both financial and product markets. Prerequisites: BSAD 180; Minimum Junior standing; Business Administration major or minor.

**BSAD 288. Wall Street Seminar. 3 Credits.**

Application of financial theory to stock/bond valuation, credit analysis, security underwriting, or risk management. Students will complete projects assigned by major financial service firms. May be repeated; only counts once toward Business Administration major or minor. Prerequisites: BSAD 181; Business Administration major or minor and Instructor permission; minimum Junior standing.

**BSAD 289. Real Estate Finance. 3 Credits.**

This course is an introduction of real estate finance and investments. Topics include urban economics, appraisal, investment value analysis, financing, and development. Prerequisites: BSAD 180; Business Administration major or minor; minimum Junior standing.

**BSAD 305. Sustainable Marketing. 3 Credits.**

Accelerated course on sustainable marketing principles and theory which focuses on how enterprises respond to the twin global challenges of global poverty and environmental sustainability. Prerequisite: Graduate student standing.

**BSAD 306. Fundamentals of Accounting. 3 Credits.**

Introduction to basic concepts for developing and interpreting financial statements. Introduction to use of accounting information for planning, cost behavior, control, and decision making. Prerequisite: Graduate Business Administration student.

**BSAD 310. Professional Communications. 3 Credits.**

Addresses different components of professional communications key to accounting career success. Clear business writing, strong interpersonal skills, effective presentations and group meeting communications are emphasized and illustrated through a variety of assignments. Prerequisite: Master of Accountancy Graduate standing or Instructor permission.

**BSAD 335. Sustainable Family Enter I. 3 Credits.**

Long-lived family firms that sustain over generations of leaders, economic and industry life cycles, embrace transgenerational entrepreneurship and innovation as part of their culture. This course focuses on the unique dynamics and dilemmas of these family businesses. Prerequisite: Graduate student standing.

**BSAD 336. Sustainable Family Enter II. 3 Credits.**

Goes beyond the documented best practices of family enterprises embedding sustainable development goals into their core operations to innovative next practices being tried while still continuing to generate positive economic returns to sustain their enterprise. Case examples, experiential exercises, virtual learning, lectures, and discussions are used to bring concepts to life. Prerequisites: BSAD 335.

**BSAD 338. Int Sustain New Business Model. 3 Credits.**

Entrepreneurial activities have a significant impact on individual lives and careers as they enable the growth and sustainability of organizations. This course focuses on developing an environmentally and socially responsible business model to assess the viability of an innovative idea. Prerequisite: Graduate student standing.

**BSAD 340. Green Oper. and Supply Chains. 3 Credits.**

Study of the foundational concepts in supply chain and operations management in sustainable enterprises. Design, planning, and control are examined, with emphasis on managerial analysis and decision making that will help the enterprise succeed responsibly and sustainably. Prerequisite: Graduate student standing.

**BSAD 361. Accounting Rsch, Reg & Ethics. 3 Credits.**

Students will research current financial reporting issues and regulatory requirements. Cases will emphasize the ethical responsibilities of professional accountants. Prerequisite: Master of Accountancy student.

**BSAD 362. CPA Law. 3 Credits.**

Provides Masters of Accountancy students with exposure to the major areas of U.S. law emphasized on the uniform CPA exam. MBA students will also benefit from the course. Prerequisite: Master of Accountancy student.

**BSAD 363. Accounting & Reporting for ESG. 3 Credits.**

Combines an introduction to financial and managerial accounting and reporting with the most recent standards used by entities worldwide to report on their environmental, social and governance (ESG) activities. Prerequisite: Graduate student standing.

**BSAD 365. Managerial Accounting. 3 Credits.**

Study of use of company information in internal strategic and operational decision making. Topics include product costing, incentive compensation, and performance measurement. Prerequisite: Master of Accountancy student.

**BSAD 366. Adv Topics in Corp Acct.&Rept. 3 Credits.**

Advanced topics in corporate accounting and reporting; focuses on accounting for business combinations and developing consolidated financial statements. Includes accounting for foreign currency transactions, foreign subsidiaries, segment, interim, and SEC reporting. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Master of Accountancy major.

**BSAD 368. Pass-Through Entities. 3 Credits.**

A study of the tax consequences of using partnerships, S corporations, and limited liability companies for business operations, with an examination of the tax aspects of choice-of-entity, operational, and divestment decisions for small and family-owned businesses. Prerequisite: Master of Business Administration, Master of Accountancy, or other Graduate standing.

**BSAD 369. Fraud Examination. 3 Credits.**

Covers all of the major methods employees use to commit occupational fraud. Students will learn how and why occupational fraud is committed, how fraudulent conduct can be deterred, and how allegations of fraud should be investigated. Prerequisite: BSAD 162.

**BSAD 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**BSAD 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BSAD 395. Advanced Special Topics. 1-18 Credits.**

Topics and material that may develop later into a regular course offering; in addition, it may include topics and material offered only once. Prerequisite: Graduate Business Administration student.

**CELL BIOLOGY (CLBI)****Courses****CLBI 301. Cell Biology. 3 Credits.**

Advanced survey of cell organelles, their composition, origin, and the relationship between their structure and function. Emphasis on recent literature and current controversies. Prerequisite: CHEM 142; Graduate standing in Biology or Instructor permission.

**CLBI 381. Seminar. 1 Credit.**

One hour.

**CLBI 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CLBI 391. Master's Thesis Research. 1-12 Credits.**

Credit as arranged.

**CLBI 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CLBI 393. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CLBI 394. Science Communication. 3 Credits.**

Develop effective oral and written communication skills for a range of audiences from academia to industry, organizations, news, policymakers, and the general public.

**CLBI 395. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Credit as arranged.

**CLBI 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Credit as arranged.

**CLBI 401. Critical Reading & Analysis. 2 Credits.**

Runs concurrently with CLBI 301 and utilizes primary literature and an active, discussion-based approach to provide intensive study in the logic, critical thinking, and experimental design & interpretation. Co-requisite: CLBI 301.



**CLBI 402. Biomedical Data Analysis. 2 Credits.**

Introduction to qualitative, quantitative and statistical analysis for cell, molecular, and biomedical sciences. The practical philosophy underlying data presentation and interpretation will be emphasized via problem solving in and outside of class time. Prerequisite: Doctoral student or Instructor permission.

**CLBI 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CLBI 491. Doctoral Dissertation Research. 1-12 Credits.**

Credit as arranged.

**CLBI 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CLBI 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## CHEMISTRY (CHEM)

### Courses

**CHEM 205. Biochemistry I. 3 Credits.**

Introduction to chemistry and structure of biological macromolecules; examination of mechanisms of chemical processes in biological systems including enzyme catalysis, biosynthesis, regulation, and information transfer. Prerequisite: CHEM 048 or CHEM 142 or CHEM 144. Cross-listed with: BIOC 205 and MMG 205.

**CHEM 206. Biochemistry II. 3 Credits.**

Continuation of Biochemistry I. Biochemistry of nucleic acids; nucleic acid based processes, such as replication and transcription; cellular information transfer, genomics, and proteomics. Prerequisite: BIOC 205, CHEM 205, or MMG 205. Cross-listed with: BIOC 206 and MMG 206.

**CHEM 207. Biochemistry Lab. 3 Credits.**

Introduction to biochemical tools, including spectrometry, chromatography, and electrophoresis; natural and recombinant enzyme isolation; assays of DNA-modifying enzymes; computer-based structure/function exercises. Prerequisite: BIOC 205, CHEM 205, or MMG 205. Cross-listed with: BIOC 207 and MMG 207.

**CHEM 214. Polymer Chemistry. 3 Credits.**

Polymer synthesis and characterization. Kinetic models for polymerization and copolymerization. Physical properties, characterization of polymers in the solid state and in solution. Prerequisite: CHEM 048 or CHEM 142 or CHEM 144, and CHEM 165.

**CHEM 221. Instrumental Analysis. 3 Credits.**

Systematic survey of modern methods of chemical analysis. Fundamental principles and applications of spectroscopy, electrochemistry, and separation techniques. Prerequisite: CHEM 121. Credit for or concurrent enrollment in CHEM 165 strongly recommended.

**CHEM 226. Analytical Spectroscopy. 3 Credits.**

Principles of optical spectroscopic methods of analysis. Emphasis on theory and practice of atomic spectroscopy and new molecular spectroscopic methods. Prerequisite: CHEM 221. Alternate years.

**CHEM 231. Advanced Inorganic Chemistry. 3 Credits.**

Molecular symmetry and group theory with an emphasis on applications (vibrational and electronic spectra, bonding and reactivity); introduction to transition metal processes; bioinorganic chemistry. Prerequisite: CHEM 165; CHEM 047, CHEM 141, or CHEM 143.

**CHEM 234. Organometallic Chemistry. 3 Credits.**

Synthesis, structure, bonding, properties, reactions, and applications of organometallic systems; mechanisms of organometallic reactions including oxidative addition and insertion reactions with applications in catalysis. Prerequisite: CHEM 131 or CHEM 231.

**CHEM 236. Physical Inorganic Chemistry. 3 Credits.**

Determination of molecular and electronic structure of inorganic complexes using spectroscopic techniques. Introduction to magnetism. Interpretation of spectroscopic data within the frameworks of group theory and electronic structure calculations. Prerequisites: CHEM 131 and CHEM 165; or CHEM 231.

**CHEM 241. Advanced Organic Chemistry 1. 3 Credits.**

Stereochemistry, conformational analysis, stereoelectronic effects, transition state theory, molecular orbital theory, and reactivity criteria are discussed in regards to reaction mechanisms and functional group manipulations. Prerequisite: CHEM 142 or CHEM 144.

**CHEM 242. Advanced Organic Chemistry 2. 3 Credits.**

Modern synthetic organic methods and approaches to multi-step synthesis are discussed. Selected total syntheses are reviewed to highlight important concepts including diastereoselective and enantioselective processes. Prerequisite: CHEM 241.

**CHEM 260. Advanced Physical Chemistry. 3 Credits.**

Builds on the concepts from Introductory Physical Chemistry (CHEM 165). The three major areas of quantum chemistry, thermodynamics, and kinetics are extended in greater depth, and at a higher level of mathematical rigor. Prerequisite: CHEM 165. Co-requisites: CHEM 167 or MATH 121.

**CHEM 267. Topics in Physical Chemistry. 1-3 Credits.**

Selected topics of current interest in physical chemistry. See Schedule of Courses for specific titles. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: CHEM 260.

**CHEM 274. Solid State Chemistry. 3 Credits.**

Explores the rich field of solid-state chemistry. Solid-state materials represent some of the most promising advanced materials in development, with applications ranging from pharmaceuticals to flexible electronics. Introduces the chemical physics surrounding solids. Topics include (but are not limited to) crystals and their properties, nanomaterials, semiconductors, and characterization methods. Prerequisite: CHEM 165.

**CHEM 275. Computational Chemistry. 3 Credits.**

Explores the techniques and applications of computational chemistry to model organic, inorganic, and biological molecules. Introduces basic level of classical and quantum modeling, cheminformatics and big chemical data, as well as computer-aided design of new materials and medicines. Prerequisite: CHEM 260.

**CHEM 318. Current Topics in Chemistry. 0 or 1 Credits.**

Survey of current topics in the chemistry literature. May be repeated for credit with different content. Prerequisite: Graduate Chemistry students only.

**CHEM 379. Intro to Graduate Research. 1 Credit.**

Introduction to graduate research in chemistry. Overview of faculty research areas and department/university research resources. Prerequisites: Chemistry graduate students only.

**CHEM 380. Chemical Investigations. 1 Credit.**

Current problems and literature.

**CHEM 381. Grad Seminar. 1 Credit.**

Current problems and literature.

**CHEM 384. Advanced Topics in Chemistry. 2 Credits.**

Comprehensive independent study in chemistry.

**CHEM 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CHEM 391. Master's Thesis Research. 1-18 Credits.****CHEM 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CHEM 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CHEM 395. Independent Lit Rsch Project. 1-12 Credits.**

Reading and literature research culminating in the preparation of a comprehensive and critical review of a topic of current interest in chemistry.

**CHEM 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**CHEM 484. Advanced Topics in Chemistry. 2 Credits.**

Comprehensive independent study in chemistry.

**CHEM 487. Research Problem Conception. 1 Credit.**

Identification of a current research problem to be addressed by original, independent research. Prerequisite: CHEM 484.

**CHEM 488. Research Problem Solution. 1 Credit.**

Solution to a current research problem to be addressed by original, independent research. Prerequisite: CHEM 487.

**CHEM 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CHEM 491. Doctoral Dissertation Research. 1-18 Credits.****CHEM 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CHEM 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## CIVIL & ENVIRONMENTAL ENGR (CE)

### Courses

**CE 201. Sustainable Eng Materials. 3 Credits.**

Introduces the fundamentals of materials with a focus on sustainable engineering, including structure and bond, interatomic potential, metals, fracture, strength testing, cement chemistry, aggregates, composites, reinforced concrete, asphalt, bamboo and wood. Prerequisite: CE 100, ME 014, or Instructor permission.

**CE 218. Numerical Methods for Engineer. 3 Credits.**

Foundational concepts of numerical integration, numerical differentiation, and numerical approximation and solution of differential and partial differential equations of the type encountered in the analysis of engineering problems and data processing; project-based. Prerequisites: MATH 271, CS 020; MATH 122 or MATH 124. Cross-listed with: ME 218.

**CE 241. Traffic Operations & Design. 3 Credits.**

Advanced concepts of traffic engineering and safety; human, vehicle and environment factors; simulation and statistical analysis software; transportation design manuals; project-based. Prerequisite: CE 133.

**CE 243. Transportation Demand Models. 3 Credits.**

Study of specific methods used to analyze travel demand, travel behavior and network flows; process of travel demand modeling; collection, analysis and expansion of survey data and travel data; mathematical methods common to travel modeling. Prerequisite: CE 133.

**CE 247. Sustain Resource Recovery Dsgn. 3 Credits.**

Environmental engineering strategies to create circular economies emphasizing the role of wastes as resources. Course topics include life cycle assessment, carbon and nutrient management, materials recycling, and waste-to-energy processes. Project-based. Prerequisite: CE 151.

**CE 253. Transportation & Air Quality. 3 Credits.**

Air pollution sources, measurement methods, legislation, vehicle emissions formation, control and transport processes. Emphasis on emission factor and dispersion multi-scale modeling using latest modeling tools. Project-based. Prerequisites: CE 132, CE 133.

**CE 254. Environmental Quantitative Anyl. 0 or 4 Credits.**

Focuses on chemical, biochemical and physical processes; diffusion, equilibria, reaction kinetics, acids/bases, colloids, air/water exchange; laboratories demonstrate standard environmental engineering techniques; project-based. Prerequisites: CHEM 032, CE 132, STAT 141 or STAT 143. C- or better in CE 132.

**CE 255. Phys/Chem Proc Water/Wstwater. 0 or 3 Credits.**

Theory of physical/chemical processes for treating waters and wastewaters; reactor dynamics, mass transfer, adsorption, ion exchange, precipitation; project-based. Prerequisite: CE 151.

**CE 256. Biol Proc Water/Wastewater Tr. 0 or 3 Credits.**

Theory and application of biological processes for treating industrial and domestic wastewaters and contaminated ground water; microbiological considerations; aerobic and anaerobic processes; reactor design, in-situ bioremediation; bench-scale and pilot-scale experimentation. Prerequisite: CE 151.

**CE 260. Hydrology. 3 Credits.**

Theory of precipitation, run-off, infiltration, and ground water; precipitation and run-off data; and application of data for use in development of water resources. Pre/Co-requisite: CE 160.

**CE 262. Advanced Hydrology. 3 Credits.**

Introduces computer modeling of hydrological systems. Project-based. Simple overland flow, flood routing, water quality, and groundwater models are developed using finite difference techniques. Stochastic hydrology and hydrologic time series analysis are also introduced. Prerequisite: CE 260.

**CE 265. Ground Water Hydrology. 3 Credits.**

Principles of ground water hydraulics, well characteristics, aquifers, and use of numerical methods to solve ground water flow problems. Project-based. Prerequisite: CE 160.

**CE 266. Climate Change Impacts. 3 Credits.**

Introduces the physical basis of climate change and explores a number of climate change impacts, particularly those that affect the built environment; primary focus on hydro-climate impacts, specifically flood risk, water resources, coastal flooding, and stormwater infrastructure; various modeling techniques are introduced and applied to engineering problems. Prerequisites: CS 020 or CS 021; CE 260.

**CE 271. Advanced Structural Analysis. 3 Credits.**

Virtual work, energy theorems, analysis of structures by the displacement method and the finite element method, non-linear structural analysis. Project-based. Prerequisite: CE 170.

**CE 272. Structural Dynamics. 3 Credits.**

Vibrations, matrices, earthquake engineering, stability and wave propagation. Project-based. Prerequisites: Senior standing in Engineering or Physical Sciences or Instructor permission. Cross-listed with: ME 270.

**CE 273. Structural Design - Wood. 3 Credits.**

Analysis and design of solid and glue laminated timber members and structural systems including tension members, beams, columns, beam-columns, diaphragms, shear walls, and connections; LRFD and ASD design methods; application of IBC for timber systems; current developments in wood design/construction; project-based. Prerequisite: CE 170.

**CE 281. Geotechnical Design. 3 Credits.**

Bearing capacity, lateral earth pressures, slope stability; analysis and design of shallow and deep foundations, retaining structures, and slopes; project-based. Prerequisite: CE 180.

**CE 285. Geo-energy Systems. 3 Credits.**

An introduction to Geoenery technologies for subsurface energy extraction (shallow and deep geothermal systems, enhanced oil recovery, shale gas extraction) and secure storage of byproducts of energy production (carbon dioxide and nuclear wastes); project-based. Prerequisite: CE 180.

**CE 286. Foundation Design. 3 Credits.**

Subsurface explorations; geotechnical analysis, design, construction, preservation, remediation, and monitoring aspects of shallow and deep foundations. Prerequisite: CE 180.

**CE 359. Appld Artificial Neural Ntwrks. 1-3 Credits.**

Introduction to artificial neural networks. A broad range of example algorithms are implemented in MATLAB. Research applications to real data are emphasized. Prerequisites: CS 021, STAT 223 or equivalent. Cross-listed with: CSYS 359.

**CE 369. Applied Geostatistics. 3 Credits.**

Introduction to the theory of regionalized variables, geostatistics (kriging techniques): special topics in multivariate analysis; Applications to real data subject to spatial variation are emphasized. Prerequisites: STAT 223; CS 020 or CS 021; or Instructor permission. Cross-listed with: CSYS 369, STAT 369.

**CE 370. Uncertainty & Risk in Eng Sys. 3 Credits.**

Modeling uncertainty and risk, random variables, modeling and simulation of functions of random variables and random processes, propagation of uncertainties in computational models, analytical and computational methods for computing failure probability of engineering systems, Bayesian updating of risk measures, communicating uncertainty and risk. Prerequisite: STAT 151 or equivalent.

**CE 391. Master's Thesis Research. 1-12 Credits.****CE 392. Master's Project. 1-6 Credits.**

Independent project related to civil and environmental engineering under the supervision of a Civil & Environmental Engineering faculty member, concluding with a written technical report and an oral presentation to a committee of two Civil & Environmental Engineering faculty members. Prerequisite: Permission of Civil & Environmental Engineering Graduate Coordinator or Civil & Environmental Engineering Department Chair.

**CE 393. CEE Graduate Seminar. 0 Credits.**

Presentation and discussion of advanced problems, research, and current topics in Civil & Environmental Engineering by faculty, graduate students, and outside guest speakers. Prerequisite: Graduate student in Civil & Environmental Engineering.

**CE 394. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CE 395. Advanced Special Topics. 1-18 Credits.**

Advanced topics in recently developed technical areas. Hours and credits as arranged.

**CE 398. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CE 399. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CE 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CE 491. Doctoral Dissertation Research. 1-18 Credits.****CE 493. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CE 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## CLINICAL&TRANSLATIONAL SCIENCE (CTS)

### Courses

**CTS 301. Design Clin&Translational Res. 3 Credits.**

Seminar emphasizing the skills for designing and executing clinical and translational research. Prerequisite: Graduate standing, or Instructor permission.

**CTS 302. Quality in Healthcare. 3 Credits.**

Introduces students to the principles and practices of health care quality and quality improvement. Principles in the design and management of continual improvement activities will be presented and applied. Prerequisite: Graduate standing. Cross-listed with: GRNS 328.

**CTS 307. Cell to Society. 3 Credits.**

A seminar that addresses a medical issue from molecule to market. By the end of the seminar, students will understand and appreciate the full range of translational science. A theme is selected and announced each year. Prerequisite: Graduate standing or Instructor permission.

**CTS 310. Conduct Clin&Translational Res. 3 Credits.**

Seminar emphasizing the ethics and mechanics of clinical and translational research. Pre/co-requisite: Prerequisite: Graduate standing, or Instructor permission.

**CTS 315. Report Clin&Translational Res. 3 Credits.**

Seminar emphasizing communication skills for writing, editing and presenting science. Pre/co-requisite: Prerequisite: Graduate standing, or Instructor permission.

**CTS 320. Analyze Clin&Translational Res. 3 Credits.**

Seminar emphasizing basic and analytical skills for clinical and translational research. Pre/co-requisites: Prerequisite: Graduate standing, CTS 320, or Instructor permission.

**CTS 325. Multi Analysis Clin&Trans Res. 3 Credits.**

Introduction to multivariate regression; models that account for effects of multiple predictors on a single outcome, including linear and logistic regression and survival analysis. Prerequisite: Graduate standing, CTS 320, or Instructor permission.

**CTS 385. Independent Study in CTS. 1-6 Credits.**

Individual work on a topic selected by student in consultation with Faculty member. The independent study may involve original research, project, and readings with conferences and will provide specialized knowledge relating to an area in which an appropriate course is not offered. Prerequisite: Approval from Program Advisor.

**CTS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CTS 391. Master's Thesis Research. 1-18 Credits.**

Master's Thesis Research.

**CTS 392. Master's Research Internship. 1-6 Credits.**

Requirement for the Master's in Clinical and Translational Science Research Management; includes experiential education in a research laboratory under the direction of a Research Mentor.

**CTS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CTS 395. Advanced Special Topics. 1-18 Credits.**

Special topics in Clinical and Translational Research. Prerequisite: Graduate standing, or Instructor permission.

**CTS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CTS 491. Doctoral Dissertation Research. 1-18 Credits.**

Doctoral Dissertation Research.

**CTS 493. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CTS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CTS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**COMM SCIENCES & DISORDERS (CSD)****Courses****CSD 208. Cognition & Language. 3 Credits.**

Study of cognition and language in terms of mental representation models; contemporary models of memory, as well as capacity theories of language comprehension and production. Prerequisite: CSD 101.

**CSD 262. Measurement of Comm Processes. 4 Credits.**

This course will acquaint students with the principles, methods, and problems of psychometrics as applied to the screening and diagnosis of communication processes. Students will describe, critique, and create assessments for reliable and valid measurements of communicative skills. Prerequisites: CSD 199 or Instructor permission. Pre/Co-requisites: CSD 199.

**CSD 271. Introduction to Audiology. 3 Credits.**

Survey of hearing and the nature and causes of hearing impairment. Includes an orientation to assessment procedures and rationales, hearing screening and counseling considerations. Prerequisites: CSD 101, CSD 199.

**CSD 272. Hearing Rehabilitation. 3 Credits.**

Examination of the impact of hearing loss on development and its overall effects on communication. Survey of management considerations, sensory devices, speech reading, and auditory training. Prerequisite: CSD 271.

**CSD 274. D2: Culture of Disability. 3 Credits.**

Focus on theoretical questions of how societies understand disability and its consequences for social justice, by examining the multiple determinants of the societal construction of disability. Prerequisite: One of the following: EDSP 117, CSD 101, ASL 195, Graduate standing, or by Instructor permission. Cross-listed with: EDSP 274.

**CSD 299. Autism Spect Dis:Assess&Interv. 3 Credits.**

Discusses knowledge/research regarding assessment of and interventions for individuals with ASD related to and use of evaluation tools, and implementation of communication, social interaction and play skills. Prerequisite: Minimum Junior standing.

**CSD 311. Intrdsc Sem Neurodev Disabil I. 3 Credits.**

Seminar with focus on cultural competence and family-centered care, interdisciplinary collaborative teaming, policy and health disparities related to children and families affected by neurodevelopmental and related disabilities, including ASD. Prerequisite: Instructor permission.

**CSD 312. Intrdsc Sem Neurodev Disabil 2. 3 Credits.**

Seminar exploring interdisciplinary process, collaborative teaming, teaching, cultural competence and family-centered care as they relate to children and families affected by neurodevelopmental and related disabilities, including ASD. Prerequisite: Instructor permission.

**CSD 313. Augmentative Communication. 3 Credits.**

An introduction to development and selection of augmentative/alternative communication strategies and systems for persons with severe communication challenges. Prerequisite: Graduate standing in Communication Sciences & Disorders or Instructor permission.

**CSD 320. Clinic Preparation&Management. 3 Credits.**

Principles of behavioral observation, analysis and modification as they apply to the assessment and remediation of communication disorders. Prerequisite: Graduate standing.

**CSD 321. Clinic Practicum Study 1. 1 Credit.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/Co-requisites: CSD 320 or concurrent enrollment; Graduate standing in Communication Sciences & Disorders.

**CSD 322. Clinic Practicum Study 2. 2 Credits.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Prerequisites: CSD 320; Graduate standing in Communication Sciences & Disorders.

**CSD 323. Clinic Practicum Study 3. 3 Credits.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 324. Clinic Practicum Study 4. 2 Credits.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 325. Clinic Practicum Study 5. 3 Credits.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 326. Clinic Practicum Study Winter 6. 1 Credit.**

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Prerequisites: CSD 320, CSD 321; Graduate standing in Communication Sciences & Disorders.

**CSD 327. School Based Issues for SLPs. 1 Credit.**

An overview of topics necessary for employment as a school based SLP. Specific topics will be covered related to federal and state special education regulations. Prerequisites: CSD 320; Graduate standing. Co-requisite: CSD 322.

**CSD 332. Assmt & Treatmt of Stuttering. 3 Credits.**

Study of adult and child fluency disorders with focus on symptomatology, etiology, diagnosis, and rehabilitation of people with stuttering disorders including cluttering and neurogenetic populations. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 340. Spch Snd Disorders in Children. 3 Credits.**

Etiology, diagnosis, pathology, and habilitation and rehabilitation of articulation of speech. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 341. Language Disorders. 3 Credits.**

Identification, evaluation, and rehabilitation procedures for children with language disabilities. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 342. Seminar Lang/Lrng Disabilities. 3 Credits.**

LLD assessment and intervention; oral language-literacy connections. Reading and written language disorders; related challenges. Role of the SLP; evidence-based approaches. Prerequisite: Graduate Student standing in Communication Sciences and Disorders or Instructor permission.

**CSD 350. Swallowing Disorders. 3 Credits.**

Introduction to normal and disordered swallowing function across the life span including etiologies, signs/symptoms of dysphagia, diagnostic procedures and treatment within an interdisciplinary model. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 351. Neurogenic Comm. Disorders 1. 3 Credits.**

The study of linguistic and cognitive-communication impairments associated with stroke and other acquired neurogenic communication disorders. Aphasia, Right Hemisphere Communication Disorders (RHD) and communication disorders associated with dementia are explored. Emphasis on the principles and procedures of assessment and intervention are emphasized. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 352. Voice Disorders. 3 Credits.**

Study of normal and abnormal laryngeal anatomy and physiology as they relate to diagnoses and treatment of a wide variety of vocal pathologies. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 353. Neurogenic Comm. Disorders 2. 3 Credits.**

Covers the study of motor speech disorders associated with damage to the central or peripheral nervous system. Cognitive-communication impairments associated with Traumatic Brain Injury (TBI) and related disorders are also explored. Principles and procedures of assessment and intervention are emphasized. Prerequisite: Graduate standing in Communication Sciences & Disorders.

**CSD 361. Research Methods II. 1 Credit.**

Students will critically review the professional literature in preparation for carrying out a systemic review. Prerequisite: Graduate standing or Instructor permission.

**CSD 362. Master's Thesis Research. 1-6 Credits.****CSD 363. Non-thesis Research. 1-6 Credits.**

Students complete a systematic review or research project under the direction of faculty. Prerequisite: Graduate standing or Instructor permission.

**CSD 390. Practicum. 1-18 Credits.**

A required component of a curriculum that is an on-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded.

**CSD 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CSD 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CSD 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## COMMUNITY DEVELOPMENT & APPLIED ECONOMICS (CDAE)

### Courses

**CDAE 205. Rural Comm in Modern Society. 3 Credits.**

The changing structure and dynamics of rural social organization in context of modernization and urbanization. Emphasis on rural communities in the U.S. Prerequisite: Six hours of Sociology.

**CDAE 207. The Real Cost of Food. 3 Credits.**

Learn how producers, processors, wholesalers, cooperatives, retailers, consumers, and governments affect the movement of food and fiber products through the production-marketing chain. Prerequisite: CDAE 061 or equivalent.

**CDAE 208. Agricultural Policy and Ethics. 3 Credits.**

An examination of American agriculture and policies from various perspectives - historical, political, ecological, technological, social, economic, and ethical. Emphasis on contemporary issues, policy options, and future development. Prerequisites: CDAE 102 or PSS 212 or equivalent. Cross-listed with: PSS 218.

**CDAE 218. Community Org & Development. 3 Credits.**

The roles of forms of community capital, civic engagement, leadership, social and political institutions, and communities of place and interest in a community development context. Pre/co-requisites: Junior standing; CDAE 102 or Instructor permission.

**CDAE 237. Economics of Sustainability. 3 Credits.**

Economic analysis that integrates natural resource and community planning for sustainable development at local, national, and international levels. Examples include land use, sustainable agriculture, and green business. Prerequisites: CDAE 102 or Instructor permission.

**CDAE 253. Macroeconomics for Appl Econ. 3 Credits.**

Explore macroeconomic principles and concepts as they affect individuals and businesses in local, regional, national, and global economics. Prerequisites: CDAE 102 or equivalent.

**CDAE 254. Microeconomics for Appl Econ. 3 Credits.**

The study of economic choices of individuals and firms, and the analysis of competitive and noncompetitive markets. Emphasis on application of intermediate microeconomic theory. Prerequisites: CDAE 102 or equivalent.

**CDAE 260. Smart Resilient Communities. 3 Credits.**

Focus on social ecological systems integration framework to determine community resilience, enable smart design processes at the nexus of food, energy and water systems and learn practical skills, such as early warning systems, ubiquitous computing and interactive scenario planning techniques. Prerequisite: CDAE 102 or Graduate standing. Cross-listed with: PA 260.

**CDAE 266. Dec Making:Comm Entrepreneurs. 3 Credits.**

Quantitative decision-making methods and applications for community entrepreneurs. Major topics include linear programming, risk and uncertainty, inventory decisions, and e-commerce. Prerequisites: CDAE 166, MATH 019, and CALS 085 or CALS 002.

**CDAE 267. Strat Plan:Comm Entrepreneurs. 4 Credits.**

Applications of marketing, finance, and management strategies. Drafting a real working business plan for community entrepreneurs and economic development. Prerequisites: One of the following: CDAE 166, CDAE 167, CDAE 168, or equivalent course; Senior standing only.

**CDAE 272. Int'l Economic Development. 3 Credits.**

International trade, finance, investment, and development theories and policies for community development. Prerequisite: CDAE 102 or EC 100-172.

**CDAE 273. Project Development & Planning. 3 Credits.**

National, community, and private sector project development. Focus on planning methods and policy instruments, sectoral linkages, and contributions to the economy as a whole. Pre/co-requisites: CDAE 102 or Instructor permission.

**CDAE 276. Community Design Studio. 3 Credits.**

Problem-based community design studio course with research on existing conditions, needs assessment, sense of place, and development of sustainable and integrative design solutions and processes. Prerequisites: CDAE 015, CDAE 001, or equivalent.

**CDAE 286. Adv Sust Dev Sm Island States. 4 Credits.**

This course is an advanced course in problems of sustainable development on small island developing states utilizing a case study of St. Lucia, West Indies. Prerequisites: CDAE 186 and Instructor permission required.

**CDAE 321. Econ of Sustainable Food Syst. 3 Credits.**

Utilizes common economic tools, ideas and applications to analyze issues concerning the sustainability of food using a combination of readings, lectures and discussions. Prerequisite: Graduate standing. Cross-listed with: FS 321.

**CDAE 326. Community Economic Development. 3 Credits.**

Examines how rural and urban communities address poverty, unemployment and other economic problems through job creation and retention, workforce training and support, and other development strategies. Cross-listed with: PA 326.

**CDAE 335. Qualitative Research Methods. 3 Credits.**

Provides an overview of qualitative research methods and an opportunity to apply such research methods for topics focusing on food systems and health. Prerequisite: Graduate Student standing. Cross-listed with: FS 335.

**CDAE 351. Research & Evaluation Methods. 0 or 3 Credits.**

Conceptualization, collection and analysis of primary and secondary data; interpretation, and communication of results of applied research and/or evaluation studies for decision makers. Separate lab required. Cross-listed with: PA 303. Prerequisite: Three hours of Statistics.

**CDAE 354. Advanced Microeconomics. 3 Credits.**

Principles and applications of advanced microeconomics: consumer and market demand, firm and market supply, perfect and imperfect markets, partial and general equilibrium, and policy analysis. Prerequisite: Graduate student standing.

**CDAE 359. Applied Econometrics. 3 Credits.**

Presents common econometric methods to perform regression analysis on empirical data. Upon completion, students will understand and apply econometric methods to conduct rigorous regression analysis. Students will also better read, interpret and discern research papers' quality using econometric methods.

**CDAE 370. Political Econ of Sustain Dev. 3 Credits.**

Introduction to the political economy of sustainable development from the theoretical perspective of complex adaptive socio-ecological systems. Political economy assesses relationships between the state, market, and civil society to understand how humans satisfy their material needs (human provisioning) through interaction with their social+natural environments. Prerequisite: Graduate standing.

**CDAE 371. Sustain Dev Policy & Gov. 3 Credits.**

History, evolution and foundations of sustainable development policy at multiple levels of governance, ranging from the UN to local communities/cities. Learn about analyzing/evaluating wide range of sustainable development policies. Emphasis on understanding complex system dynamics modeling and adaptive management approaches to address sustainable development challenges. Prerequisite: Graduate standing.

**CDAE 376. Communicating Science. 3 Credits.**

Advanced exploration, application of science communication theories, contexts, practices. Examine the relationship between science & society while learning communication skills that promote respect and shared understandings of science among researchers, extension professionals, journalists, public relations specialists, policy officials, and public. Prerequisite: Graduate standing.

**CDAE 377. Practicum in Extension Educ. 1-12 Credits.****CDAE 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CDAE 391. Master's Thesis Research. 1-18 Credits.****CDAE 392. Graduate Seminars. 1 Credit.**

Report and discuss research projects and findings of graduate students and faculty, and offer workshops on selected topics in community development and applied economics. May enroll more than once for up to three credits. Prerequisite: Graduate standing.

**CDAE 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CDAE 395. Advanced Special Topics. 1-18 Credits.**

Lectures or readings on contemporary issues in Community Development and Applied Economics at the graduate level. Prerequisite: Graduate standing.

**CDAE 396. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CDAE 400. Sustainable Dev PEG Doc Sem. 1 Credit.**

Focus will rotate among three main themes: project resource development skills and techniques (e.g. grant writing and management); stakeholder engagement; and dissertation proposal preparation. Prerequisite: Enrollment in the Sustainable Development Policy, Economics, and Governance PhD program.

**CDAE 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CDAE 491. Dissertation Research. 1-18 Credits.**

Doctoral Dissertation Research.

**CDAE 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CDAE 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CDAE 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**COMPLEX SYSTEMS (CSYS)****Courses****CSYS 266. QR: Chaos, Fractals & Dynamical Syst. 3 Credits.**

Discrete and continuous dynamical systems, Julia sets, the Mandelbrot set, period doubling, renormalization, Henon map, phase plane analysis, and Lorenz equations. Prerequisite: MATH 122 or MATH 124. CS 020 or CS 021 recommended. Cross-listed with: MATH 266.

**CSYS 287. QR: Data Science I. 3 Credits.**

Data harvesting, cleaning, and summarizing. Working with non-traditional, non-numeric data (social network, natural language textual data, etc.). Scientific visualization using static and interactive "infographics". A practical focus on real datasets, and developing good habits for rigorous and reproducible computational science. Project-based. Prerequisites: CS 020 or CS 021; STAT 141 or STAT 143 or STAT 211; CS 110 and MATH 122/124 recommended. Cross-listed with: CS 287, STAT 287.

**CSYS 300. Principles of Complex Systems. 3 Credits.**

Introduction to fundamental concepts of complex systems. Topics include: emergence, scaling phenomena and mechanisms, multi-scale systems, failure, robustness, collective social phenomena, complex networks. Students from all disciplines welcomed. Pre/co-requisites: calculus and statistics required; Linear algebra, differential equations, and computer programming recommended but not required. Cross-listed with: MATH 300.

**CSYS 302. Modeling Complex Systems. 3 Credits.**

Integrative breadth-first introduction to computational methods for modeling complex systems; numerical methods, cellular automata, agent-based computing, game theory, genetic algorithms, artificial neural networks, and complex networks. Semester team-based project. Prerequisite: Graduate standing. Pre/Co-requisites: Computer programming in any language; calculus. Linear algebra recommended. Cross-listed with: CS 302.

**CSYS 303. Complex Networks. 3 Credits.**

Detailed exploration of distribution, transportation, small-world, scale-free, social, biological, organizational networks; generative mechanisms; measurement and statistics of network properties; network dynamics; contagion processes. Students from all disciplines welcomed. Pre/co-requisites: MATH 301/CSYS 301, calculus, and statistics required. Cross-listed with: MATH 303.

**CSYS 352. Evolutionary Computation. 3 Credits.**

Theory and practice of biologically-inspired search strategies including genetic algorithms, genetic programming, and evolution strategies. Applications include optimization, parameter estimation, and model identification. Significant project. Students from multiple disciplines encouraged. Pre/co-requisites: Familiarity with programming, probability, and statistics. Cross-listed with: CS 352.

**CSYS 354. Deep Learning. 3 Credits.**

Introduction to Deep Learning algorithms and applications, including basic neural networks, convolutional neural networks, recurrent neural networks, deep unsupervised learning, generative adversarial networks and deep reinforcement learning. Includes a semester team-based project. Prerequisite: CS 254. Cross-listed with: CS 354.



**CSYS 369. Applied Geostatistics. 3 Credits.**

Introduction to the theory of regionalized variables, geostatistics (kriging techniques): special topics in multivariate analysis; Applications to real data subject to spatial variation are emphasized. Prerequisites: STAT 223; CS 020 or CS 021; or Instructor permission. Cross-listed with: CE 369, STAT 369.

**CSYS 387. Data Science II. 3 Credits.**

Advanced data analysis, collection, and filtering; statistical modeling, monte carlo statistical methods, and in particular Bayesian data analysis, including necessary probabilistic background material; a practical focus on real datasets and developing good habits for rigorous and reproducible computational science. Prerequisite: STAT 287 or CS 287 or CSYS 287 or Instructor permission. Cross-listed with: CS 387, STAT 387.

**CSYS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CSYS 391. Master's Thesis Research. 1-9 Credits.**

Masters thesis research under the supervision of a graduate faculty member. Prerequisite: Instructor permission.

**CSYS 392. Master's Project. 1-6 Credits.**

Masters Project under the supervision of a graduate faculty member. Prerequisite: Instructor permission.

**CSYS 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CSYS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CSYS 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**CSYS 491. Doctoral Dissertation Research. 1-18 Credits.****CSYS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CSYS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**COMPUTER SCIENCE (CS)****Courses****CS 201. QR: Operating Systems. 0 or 3 Credits.**

Supervisory and control software for multiprogrammed computer systems. Processes, threads, synchronization, interprocess communication, scheduling, memory management, resource allocation, performance evaluation, secondary storage, case studies. Prerequisites: CS 120 and CS 121.

**CS 202. Compiler Construction. 3 Credits.**

Covers the design and construction of compilers and translation of high-level programming languages to assembly language. Topics include code representation, register allocation, optimization, static analysis, mutable data, garbage collection, and compilation of higher-order language features. Prerequisites: CS 124, CS 125.

**CS 204. QR: Database Systems. 3 Credits.**

Techniques for processing very large collections of data. Secondary storage. Database design and management. Query languages and optimization. Database recovery. Prerequisite: CS 124.

**CS 205. QR: Software Engineering. 3 Credits.**

Treatment of software engineering problems and principles, with a focus on iterative software development. A significant part of the course is devoted to two multi-week team projects. Prerequisite: CS 120.

**CS 206. QR: Evolutionary Robotics. 3 Credits.**

Exploration of the automated design of autonomous machines using evolutionary algorithms. Coursework involves reading of research papers, programming assignments and a final project. Prerequisites: Junior standing and programming experience, or Instructor permission.

**CS 211. Data Privacy. 3 Credits.**

Explores the research field of data privacy, including privacy attacks on anonymized data, and formal approaches like k-Anonymity and differential privacy. Applies the theory of data privacy to real problems in programming projects. Prerequisites: CS 124, CS 125.

**CS 222. QR: Computer Architecture. 3 Credits.**

Architecture of computing systems. Control unit logic, input/output processors and devices, asynchronous processing, concurrency, parallelism, and memory hierarchies. Prerequisite: CS 121.

**CS 224. QR: Algorithm Design & Analysis. 3 Credits.**

Comprehensive study of algorithms including greedy algorithms, divide and conquer, dynamic programming, graph algorithms and network flow. Computational intractability. Approximation, local search and randomization. Prerequisite: CS 124. Pre/co-requisites: Recommended: CS 125; STAT 143, STAT 151, or CS 128.

**CS 225. QR: Programming Languages. 3 Credits.**

Principles of programming language design and fundamental implementation concepts. Syntax, semantics, and static analysis of programs. Provable properties of programming languages such as type safety. Prerequisites: CS 124, CS 125.

**CS 226. QR: Software Verification. 3 Credits.**

Principles and practice of software specification and verification. Design of algorithms which are verified correct using interactive or automated, software-based tools. Emphasis on the design space for software specification, and the spectrum of verification goals ranging from shallow to deep verification. Includes a course project. Prerequisites: CS 124, CS 125.

**CS 228. Human-Computer Interaction. 3 Credits.**

Covers the foundational theories and methods in the interdisciplinary field of human-computer interaction, focuses on the human-centered design and evaluation of user interfaces for various computing systems, as well as introduces a wide range of topics in current human-computer interaction research. Prerequisites: Minimum Junior standing. Pre/Co-requisites: Programming experience; CS 008 or equivalent web development experience.

**CS 237. QR: Intro to Numerical Analysis. 3 Credits.**

Error analysis, root-finding, interpolation, least squares, quadrature, linear equations, numerical solution of ordinary differential equations. Prerequisites: Math 121; MATH 122 or MATH 124 or MATH 271; CS 020 or CS 021. Cross-listed with: MATH 237.

**CS 243. QR: Theory of Computation. 3 Credits.**

Reducibility and decidability, recursion theory, time and space complexity, P, NP, NP-completeness, PSPACE, PSPACE-completeness, L and NL, advanced topics in computability and complexity. Prerequisites: CS 124 and CS 125.

**CS 253. QR: Reinforcement Learning. 3 Credits.**

Students will program agents that learn to optimize a reward function using Reinforcement Learning; Markov Decision Processes with discrete states, Value Iteration, Policy Iteration, Q-learning and SARSA, methods for value function approximation in complex domains using linear and non-linear methods. Prerequisites: CS 064 or MATH 052; STAT 151 or STAT 251; CS 110. Pre/Co-requisites: MATH 122 or MATH 124; CS 125.

**CS 254. QR: Machine Learning. 3 Credits.**

Introduction to machine learning algorithms, theory, and implementation, including supervised and unsupervised learning; topics typically include linear and logistic regression, learning theory, support vector machines, decision trees, backpropagation artificial neural networks, and an introduction to deep learning. Includes a team-based project. Prerequisites: STAT 151 or STAT 251; MATH 122 or MATH 124.

**CS 265. QR: Computer Networks. 3 Credits.**

Introduction to the theoretical and pragmatic principles and practices of computer networking. Topics include: the Internet; wired and wireless communications protocols; network security protocols. Prerequisites: CS 124.

**CS 266. QR: Network Security & Cryptography. 3 Credits.**

Security and secrecy in a networked environment. Cryptography: public and private key. Authentication: trusted agents, tickets. Electronic mail and digital signatures. Privacy and national security. Prerequisite: CS 124.

**CS 275. QR: Mobile App Development. 3 Credits.**

A projects-based course focusing on software development for mobile devices, including the concepts of event-driven programming, GUI design and implementation, utilization of hardware sensors, and client/server applications. A significant part of the course is devoted to a multi-month team development project. Prerequisite: CS 120, Senior standing. Pre/co-requisites: Recommended: CS 148 or CS 204.

**CS 287. QR: Data Science I. 3 Credits.**

Data harvesting, cleaning, and summarizing. Working with non-traditional, non-numeric data (social network, natural language textual data, etc.). Scientific visualization using static and interactive "infographics." A practical focus on real datasets, and developing good habits for rigorous and reproducible computational science. Project-based. Prerequisites: CS 020 or CS 021; STAT 141 or STAT 143 or STAT 211; CS 110 and MATH 122/124 recommended. Pre/co-requisites: Recommended: CS 110; Math 122 or Math 124. Cross-listed with: CSYS 287, STAT 287.

**CS 288. QR: Statistical Learning. 3 Credits.**

Statistical learning methods and applications to modern problems in science, industry, and society. Topics include: linear model selection, cross-validation, lasso and ridge regression, tree-based methods, bagging and boosting, support vector machines, and unsupervised learning. Prerequisites: STAT 143, STAT 183 or STAT 211. Cross-listed with: STAT 288.

**CS 302. Modeling Complex Systems. 3 Credits.**

Integrative breadth-first introduction to computational methods for modeling complex systems; numerical methods, cellular automata, agent-based computing, game theory, genetic algorithms, artificial neural networks, and complex networks. Semester team-based project. Prerequisite: Graduate standing. Pre/Co-requisites: Computer programming in any language, calculus; linear algebra recommended. Cross-listed with: CSYS 302.

**CS 352. Evolutionary Computation. 3 Credits.**

Theory and practice of biologically-inspired search strategies, including genetic algorithms, genetic programming, and evolution strategies. Applications include optimization, parameter estimation, and model identification. Significant project. Students from multiple disciplines encouraged. Pre/co-requisites: Familiarity with programming, probability, and statistics. Cross-listed with: CSYS 352.

**CS 354. Deep Learning. 3 Credits.**

Introduction to Deep Learning algorithms and applications, including basic neural networks, convolutional neural networks, recurrent neural networks, deep unsupervised learning, generative adversarial networks and deep reinforcement learning. Includes a semester team-based project. Prerequisite: CS 254. Cross-listed with: CSYS 354.

**CS 387. Data Science II. 3 Credits.**

Advanced data analysis, collection, and filtering; statistical modeling, monte carlo statistical methods, and in particular Bayesian data analysis, including necessary probabilistic background material; a practical focus on real datasets and developing good habits for rigorous and reproducible computational science. Prerequisite: STAT 287 or CS 287 or CSYS 287 or Instructor permission. Cross-listed with: CSYS 387, STAT 387.

**CS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CS 391. Master's Thesis Research. 1-18 Credits.****CS 392. Master's Project. 1-6 Credits.**

Prerequisite: Department permission.

**CS 393. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CS 394. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion. Prerequisite: Instructor permission.

**CS 395. Advanced Special Topics. 1-18 Credits.**

Subject will vary from year to year. May be repeated for credit with Instructor permission.

**CS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**CS 491. Doctoral Dissertation Research. 1-18 Credits.**

Credit as arranged.

**CS 493. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**CS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**COUNSELING (CNSL)****Courses****CNSL 300. Research Methods in Counseling. 3 Credits.**

This course is designed to assist counseling students in understanding research methods, qualitative and statistical analysis, needs assessment, and program evaluation relevant to the field of counseling. This course or an approved equivalent is required for CMHC and SC Program students.

**CNSL 320. Dev. Perspectives in CNSLNG. 3 Credits.**

Survey of major theories of human development and application of theoretical concepts to self and others from a counseling perspective. This course is required for CMHC and SC Program students. Prerequisites: Graduate Counseling majors only, or Instructor permission.

**CNSL 340. Development Guidance in Schls. 3 Credits.**

This course provides an introduction to the role of the professional counselor working in the school setting. Topics include state and national trends in school counseling, classroom and small group work in schools, advocacy, leadership, consultation, special education services, parenting skills, classroom and behavior management, and crisis intervention. This course is required for SC Program. Prerequisites: Counseling majors or Instructor permission.

**CNSL 341. Diagnosis in School Counseling. 1 Credit.**

This course reviews the presentation and etiology of child and adolescent and mental health disorders as included in the DSM-5. A comparison of the DSM to other categorization processes used within school environments is delineated. The emphasis will be on strength-based assessment that is culturally appropriate. Prerequisites: Counseling majors or permission.

**CNSL 342. Assessment in School CNSLNG. 1 Credit.**

Students will learn about common assessment tools and processes used in professional school counseling. Prerequisites: Counseling majors; CNSL 320, CNSL 350, CNSL 374, CNSL 375, CNSL 377 or Instructor permission.

**CNSL 344. Modalities: Counsel Child & Ad. 3 Credits.**

This course provides a study of counseling practices for working with children and adolescents. Learning will be facilitated through assigned readings, lectures, discussions, demonstrations, and student practice of skill. This course is required for CMHC and SC Program students. Prerequisites: Counseling majors and concurrent with internship or permission.

**CNSL 345. Diagnosis in CMH Counseling. 1-3 Credits.**

Etiology and diagnosis of mental disorders in children, adolescents, and adults according to DMS. Includes intake, evaluation, treatment planning, and clinical documentation skills. Prerequisites: Counseling majors or Instructor permission.

**CNSL 350. Prof Issues in Counseling. 3 Credits.**

A seminar in which professional, ethical, and legal issues facing counselors in schools and mental health settings are addressed through reading, research, presentation, and discussion. Prerequisites: Graduate standing or Instructor permission.

**CNSL 352. Assessment in CMH Counseling. 1-3 Credits.**

Provides students with knowledge about common assessment tools and processes used in clinical mental health practice. Prerequisites: Counseling majors; CNSL 320, CNSL 350, CNSL 374, CNSL 375, CNSL 377 or Instructor permission.

**CNSL 361. Practice of Mental Hlth Cnslng. 3 Credits.**

Introduction to issues, needs, models and sociopolitical factors present in community and private-practice mental health counseling, with an emphasis on prevention and wellness. Prerequisites: Counseling majors or Instructor permission.

**CNSL 363. Counseling Practicum. 3 Credits.**

Introductory supervised experience in counseling in a field setting. Includes 100 hours working as a counselor with a minimum of 40 direct service hours. Prerequisites: CNSL 320, CNSL 350, CNSL 374, CNSL 375 (School and Clinical Mental Health Counseling Programs), CNSL 340 (School Program) and CNSL 361 (Clinical Mental Health Program).

**CNSL 374. Counseling Theory & Practice. 3 Credits.**

Theoretical and practical approach to understanding the counseling process. Refinement of personal philosophy, theory of counseling, and implementation in practice. Prerequisites: Graduate standing or Instructor permission.

**CNSL 375. Lab Experience in Counseling. 3 Credits.**

Students learn and practice basic counseling skills and techniques. Videotaped practice sessions are supervised by course instructor. Prerequisites: Counseling majors only; CNSL 374 or concurrent with CNSL 374.

**CNSL 376. Addictions Counseling. 3 Credits.**

Development and culturally responsive treatment of addictions, e.g., Motivational Interviewing, family systems, Cognitive Behavioral Therapy (CBT) techniques, recovery maintenance, and an integrative approach to treatment. Prerequisites: Counseling majors or Instructor permission.

**CNSL 377. Diversity & Intersectionality. 3 Credits.**

Designed to assist students in recognizing and acknowledging diversity in society, and developing the knowledge and skills to recognize, interrupt and redress inequity within their spheres of influence. Prerequisites: Graduate Students in the Counseling Program or Instructor permission.

**CNSL 381. Counsel/Career&Lifestyle Dev. 3 Credits.**

An exploration of the theories, assessment instruments, counseling techniques, and issues most relevant in counseling for career and lifestyle development. Prerequisites: Counseling majors and CNSL 374, CNSL 375; Graduate standing or Instructor permission.

**CNSL 387. Therapeutic Psychopharmacology. 3 Credits.**

Introduction to neuroanatomy, neurophysiology, and pharmacology as they pertain to mental health counseling. Course also covers commonly prescribed medications, ethical issues and the referral process. Prerequisites: Counseling majors or program permission.

**CNSL 388. Family and Couples Counseling. 3 Credits.**

Theory and process of counseling with families and couples including family theory and family therapy orientations and intervention skills. Includes practice of counseling interventions. Prerequisites: CNSL 320, CNSL 350, CNSL 374, CNSL 375, CNSL 377, CNSL 392, or Instructor permission.

**CNSL 389. Counseling Internship. 1-3 Credits.**

A supervised experience in counseling in a field (school or mental health) setting. Prerequisites: Counseling majors only; CNSL 320, CNSL 350, CNSL 374, CNSL 363(Practicum), CNSL 375 (SC Program), CNSL 392, CNSL 340, CNSL 361 (CMHC Program).

**CNSL 392. Group Counseling Experience. 1 Credit.**

Encounter group experiences for prospective clinical mental health and school counselors providing increased awareness of self and models relating to others. Prerequisite: Graduate standing matriculated students.

**CNSL 393. Adv Group: Theory and Practice. 0 or 3 Credits.**

Group leadership skills are developed, practiced, and refined through in-class and laboratory experiences that focus on live group supervision, theory, feedback exchange, and ethical issues. Prerequisites: CNSL 320, CNSL 350, CNSL 363, CNSL 374, CNSL 375, CNSL 377, CNSL 392, CNSL 389; Instructor permission.

**CNSL 394. Special Topics in Counseling. 1-18 Credits.**

Special issues in counseling, administration and planning, social work or higher education not appropriate to content of existing courses. Courses reflect the social services orientation of the Department of Integrated Professional Studies.

**CNSL 397. Independent Study. 1-6 Credits.**

Individual work on a research problem selected by the student in consultation with a staff member. Prerequisites: Twelve hours in education and related areas; endorsement by a sponsoring faculty member. Prerequisites: Twelve hours in education and related areas; endorsement by a sponsoring faculty member.

**CNSL 401. Doctoral Sem Current Topics. 1 Credit.**

Examines current topical and political issues in counseling, and how these issues affect the daily work of counselors and counselor educators in the profession.

**CNSL 402. Professional Writing. 1 Credit.**

Provides an overview of different types of professional writing, including peer and non-peer reviewed publications, grant submissions (internal university and external grants), and conference proposals. Designed to de-mystify these processes and provide opportunities for students to practice these skills and further their professional repertoire.

**CNSL 404. Diversity Equity in Cou Ed. 3 Credits.**

Assists students in developing a more critical understanding of intersectional equity issues related to the field of counseling so they can develop into effective social justice-oriented counselor educators. Interrogates the influence of subjugating discourses on the counseling practice, clinical supervision, and research, and how we might engage. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program.

**CNSL 405. Leadership in Counselor Ed. 3 Credits.**

Students will become familiar with different models of leadership, their own strengths and weaknesses, and how to best work with others in leadership roles within counselor education and counseling. They will learn and apply leadership skills in a hands-on practical way. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program.

**CNSL 406. Counseling Theory & Research. 3 Credits.**

Designed to assist students in developing a more critical understanding of the epistemological, ontological, and axiological assumptions that undergird counseling theory and research methodology. By gaining a more critical understanding, students will develop skills to decolonize the dominant paradigms within the discipline. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program.

**CNSL 410. Professional Identity CourseEd. 1 Credit.**

Students examine their professional identity, roles, functions, and responsibilities related to educating counselors and counselor educators and supervisors; the responsibilities associated with professional gate keeping and student retention, mentoring and advising, equity centered and culturally responsive training, ethical and professional responsibilities of educators and their programs including strategies for success in the academy are examined. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program or Instructor permission.

**CNSL 411. Pathway to the Professoriate. 1 Credit.**

Students examine the dynamics of the dissertation completion process, impediments to success and strategies for a successful dissertation completion process. The pathway to the professoriate is explored including market analysis, dynamics of interviews for tenure track and non-tenure track positions and strategies for preparation for the counselor ed job market and transition to the professoriate.

**CNSL 420. Advanced Group and Supervision. 3 Credits.**

Examines modalities, theories, and approaches to group work, including understanding contemporary literature and research supporting evidence-based clinical practices and clinical supervision of group work. Also examines the impact of socio-cultural factors within the various group domains, between members and the leader, and among group members; and the supervisory dynamics of group work practice. Prerequisites: CNSL 480, CNSL 406.

**CNSL 421. Clinical Sup Theory & Practice. 3 Credits.**

Examines various modalities, theories, and approaches to clinical supervision, including understanding contemporary literature and research supporting evidence based clinical supervision practices. Explores the impact of socio-cultural factors within the supervisory relationship, the supervision triad (counselor/client/supervisor), and how attention to cultural implications can enhance the supervisory experience and outcomes. Prerequisites: CNSL 480, CNSL 406.

**CNSL 480. Doctoral Counseling Practicum. 3 Credits.**

Provides the practicum student with an opportunity to refine and expand their counseling skills at a designated field site location and advance their knowledge of evidence-based practices. Doctoral practicum students will receive weekly group supervision by a Counseling Program faculty member and individual/triadic supervision by a field site supervisor. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program.

**CNSL 490. Doctoral Internship. 3 Credits.**

Doctoral internship in 3 of 5 core areas of specialization to include: counseling, teaching, supervision, research and scholarship, and leadership & advocacy. Doctoral students must enroll in two separate internship courses, each consisting of 300 hours of applied work. Prerequisites: Enrollment in the Counselor Education and Supervision doctoral program; CNSL 400, CNSL 404, CNSL 406, CNSL 480, EDHI 387, CNSL 405, CNSL 407, CNSL 408, CNSL 401.

**CNSL 491. Doctoral Dissertation Research. 1-18 Credits.**

The dissertation is an original research project that provides an opportunity to demonstrate the ability to engage in independent supervised research. Twenty one dissertation credit hours are required. Prerequisites: Successful completion of Comprehensive Examinations and Oral Dissertation proposal.

**CURRICULUM & INSTRUCTION (EDCI)****Courses****EDCI 321. Learning, Design & Technology. 3 Credits.**

This course examines the relationship between learning theory and technology integration in K-12 classrooms and integrates backward design in standards-based units of study. Prerequisite: Teaching experience.

**EDCI 322. Differentiation & Technology. 3 Credits.**

This course enables educators to develop and utilize instructional frameworks based on current research related to differentiating instruction, universal design for learning and assistive technology.

**EDCI 323. Inquiry and Technology. 3 Credits.**

This course examines how technology can promote a student-centered active learning classroom environment that promotes problem-solving and critical thinking skills. Prerequisite: Prior teaching experience.

**EDCI 324. Assessment and Technology. 3 Credits.**

Students will cover assessment basics, the role of technology in education, information & knowledge management, and methods for integrating technology into assessment practice.

**EDCI 325. Leadership and Technology. 3 Credits.**

This course explores leadership and the role of the Integration Specialist and/or teacher leader in the context of educational technology integration planning.

**EDCI 331. Society, Stress and the Brain. 3 Credits.**

Explores brain development and the learning process under complex social conditions such as poverty, instability, and fear. Students study the effects of stress on learning and consider methods of instruction and interaction that address developmental needs of children and families from diverse contexts.

**EDCI 333. Curr Concepts/Planning/Develop. 3 Credits.**

Overview of conceptions of curriculum for elementary and secondary education; examination of contemporary curriculum trends, issues; processes for initiating, planning, developing curriculum activities and programs. Prerequisite: Twelve hours of Education or Instructor permission.

**EDCI 343. Fndns in Ed for Sustainability. 3 Credits.**

Prepares educators to use sustainability as an integrating lens for learning. Provides an introduction to Education for Sustainability (EFS), an approach that links teaching of social, environmental, and economic systems to foster the knowledge, inquiry, and action needed to build a healthy and just future for communities, both locally and globally.

**EDCI 344. Mthds in Ed for Sustainability. 3 Credits.**

Explores designing for education for sustainability (EFS). Participants should have a foundation in EFS, associated pedagogies, and curriculum or project development strategies. Action-oriented, culminating in a project or curriculum to implement. Pre/Co-requisite: EDCI 343.

**EDCI 345. Trnsfrm Ldrshp Edu for Sustain. 3 Credits.**

Focuses on developing students' education for sustainability leadership practices and offers tools to transform ourselves and our community. Explores a whole-systems and ecological approach for leading change in complex and emergent times. A core element of this course is the community that will be co-developed through collective work. Prerequisite: EDCI 343. Pre/Co-requisite: EDCI 344.

**EDCI 346. Edu for Sustain Inquiry Action. 3 Credits.**

Designed to support practitioners advanced in EFS. In collaboration with education experts, systems-thinking and leadership, students will develop a peer network committed to ecological integrity, economic vitality, and social justice. Students will also use inquiry and action research frameworks to investigate a personally meaningful question about their EFS practice. Prerequisite: EDCI 343. Pre/Co-requisites: EDCI 344, EDCI 345.

**EDCI 360. Professional Learning in Orgs. 3 Credits.**

Examines effective strategies for professional learning. Attends to different learning theories for professional learning and how organizational structures, political dynamics, and change processes can influence how professional learning is received and implemented. Prerequisite: Graduate student standing.

**EDCI 380. Professional Problems in Ed. 3 Credits.**

Designed to cover selected educational problems in depth. The major emphasis will be on intensive and critical analysis of the literature and practice in a given area.

**EDCI 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EDCI 391. Master's Thesis Research. 1-12 Credits.**

Thesis topic must be approved by a faculty committee. Credit as arranged.

**EDCI 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDCI 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDCI 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**DOCTOR OF PHYSICAL THERAPY (DPT)****Courses****DPT 401. Health Systems I - Policy. 2 Credits.**

Explores U.S. health systems including the role of public and private sectors. Federal and state health policy and legislation are examined in relationship to physical therapy. Examine mechanisms of health care delivery in the US in comparison to international systems. Co-requisite: Doctor of Physical Therapy student.

**DPT 402. Health Sys II-Quality Improvmt. 2 Credits.**

Principles and practices of health care quality, quality improvement, and design and management of continual improvement activities. Topics will include quality measurement, management, and patient safety and their application in a variety of health care delivery settings and organizations. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 403. Health Sys III-Business Mgt. 2 Credits.**

Physical therapist practice management including evidence-based business and financial management, administration, and health informatics. Topics will incorporate business management from a physical therapist perspective, while expanding knowledge on health systems and the role of physical therapist in various practice settings. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 404. Health Sys IV-Health Promotion. 3 Credits.**

Fundamental concepts of health behavior, health education, and health promotion. Examination of health promotion programs at the level of policy, community, social spheres, and individuals. Experiential learning through health promotion in consideration of health behavior science and evidence-based practice. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 405. Clinical Medicine. 4 Credits.**

Foundational knowledge and application of pathophysiology as it pertains general health and systemic disease and its relationship to the role of the physical therapist as a movement system expert and a primary care practitioner. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 406. Exercise Science. 3 Credits.**

Principles and applications of exercise assessment/testing, prescription and progression of the exercise program, including response to exercise. Course will emphasize understanding and application of the ACSM guidelines to exercise testing and prescription to individuals across the lifespan. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 407. Pharmacology and Nutrition. 1 Credit.**

Foundational knowledge of pharmacology and nutrition pertinent to physical therapist practice. Introduction to pharmacokinetics, pharmacodynamics, mechanisms of action of various drugs, and adverse reactions. Topics will also include nutrition in relation to primary, secondary, and tertiary prevention. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 408. Fundamentals Critical Inquiry. 3 Credits.**

In-depth application of scientific inquiry inclusive of research design, statistical methods, research question development, critical appraisal and interpretation of evidence related to clinical practice are explored. Diagnostic, intervention, and prognostic studies are used in the application of the inquiry process. Prerequisite: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 410. Fundamentals of Clinical Pract. 3 Credits.**

Fundamental skills for physical therapists including patient/client management principles and practices such as examination techniques, history taking and interviewing skills, fundamental patient handling skills, clinical documentation and patient handling skills. Prerequisite: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 411. Movement System I. 3 Credits.**

Application of kinesiology and biomechanical principles to the analysis and management of human movement, posture, joint structure and function, and gait. Examination of mechanical properties of tissue with respect to lifespan, injury and healing, and principles of diagnostic imaging. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 412. Movement System II. 4 Credits.**

Motor control/learning and development across the lifespan, and a theoretical framework to develop intervention strategies. Principles of examination and evaluation of normal and dysfunctional movement will be discussed, including posture, gait, reach and grasp. Electrodiagnostic testing will also be covered. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 413. Movement System III. 4 Credits.**

Utilize a movement systems approach to address the management of patients with multi-system involvement. Focus on the role of the physical therapist as primary care practitioner including emergency scenarios across the lifespan. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 414. Clinical Reasoning. 2 Credits.**

Fundamental clinical-decision making frameworks in contemporary physical therapy practice, using the International Classification of Functioning, Disability and Health (ICF) and the Hypothesis Oriented Algorithm for Clinicians within the context of patient/client management model. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 415. Psychsoc Aspcts Hlth Wellbeing. 3 Credits.**

Psychosocial dimensions of health, illness, and disability across the lifespan and in consideration of diverse perspectives. Consideration of physical therapy implications for management of common mental health conditions and integrate patient and family-centered communication skills in simulated clinical situations. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 416. Rehabilitation Technology. 3 Credits.**

Evaluation, prescription, and patient / client education of rehabilitation technology used in physical therapy management of individuals to address or enhance movement across the lifespan. Topics will include prescription of and training with technology, devices, and environmental modifications. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 420. Musculoskeletal Management I. 4 Credits.**

Screening, examination, evaluation, diagnosis, prognosis, management and outcomes for patients with musculoskeletal dysfunction of the extremities are covered. Topics include pathophysiology, risk appraisal, medical and surgical management, and biopsychosocial considerations in the management of these conditions across the lifespan. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 421. Musculoskeletal Management II. 4 Credits.**

Screening, examination, evaluation, diagnosis, prognosis, management and outcomes for patients with musculoskeletal dysfunction of the spine are covered. Topics include pathophysiology, risk appraisal, medical and surgical management, and biopsychosocial considerations in the management of these conditions across the lifespan. Prerequisite: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 422. Musculoskeletal Management III. 3 Credits.**

Screening, examination, evaluation, diagnosis, prognosis, intervention and outcomes for patients with complex musculoskeletal system dysfunction are covered. Case management as movement system experts of patient/client populations with complex primary or underlying conditions across the lifespan are explored. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 423. Neurological Management I. 4 Credits.**

Focus on movement system dysfunction among individuals with neuromuscular conditions across the lifespan. Introduction to the principles and components of neurological examination and interventions emphasizing body structure/function with neuropathology considerations will be discussed. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 424. Neurological Management II. 3 Credits.**

Screening, examination, diagnosis, prognosis, management and outcomes for individuals with neurological impairments across the life span are covered. Evaluation and interventions of the movement system deficits considering pathophysiology and biopsychosocial framework will be addressed through case-based learning. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 425. Neurological Management III. 3 Credits.**

Incorporate advanced clinical decision making in the plan of care of complex patients across the lifespan. Consideration of differential diagnosis, patient environment and case management will be discussed. Prevention, risk reduction strategies and continuum of care will be emphasized. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 426. Cardiovasc and Pulmonary Mgt. 3 Credits.**

Screening, examination, evaluation, diagnosis, prognosis, management and outcomes for patients with cardiovascular and pulmonary conditions are covered. Topics include pathophysiology, risk appraisal, medical and surgical management, and biopsychosocial considerations in the management of these conditions across the lifespan. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 427. Integmnt, Endocrine, Multi Sys. 3 Credits.**

Screening, examination, evaluation, diagnosis, prognosis, management and outcomes for patients with integumentary, endocrine, lymphatic, oncology, autoimmune and multisystem conditions are covered. Topics include pathophysiology, risk appraisal, medical and surgical management, and biopsychosocial considerations across the lifespan. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 450. Professional Form/Leadershp I. 1 Credit.**

Introduces professionalism, leadership, ethics, cultural competence, interprofessional education-practice and teaching-learning within the role of a doctoring professional, physical therapist contemporary practice and the healthcare environment. Prerequisite: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 451. Prof Formation/Leadrsph II-ICE. 2 Credits.**

Advanced study of professional formation and personal leadership development within the role of a doctoring professional. Focuses on role identity, professional practice expectations within ethical/legal standards of practice, teaching-learning, supervision/delegation, and introduces IPE role within Integrated Clinical Experiences (ICE). Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 452. Prof Formatn/Leadrsph III-ICE. 2 Credits.**

Advanced concepts of professional formation and personal leadership development within the role of a doctoring professional. Focuses on collaborative practice expectations within ethical/legal standards of practice, teaching-learning, supervision/delegation, and IPE. Prepares for assuming responsibilities within Integrated Clinical Experiences (ICE). Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 453. Prof Form/Leadrsph IV-ICE/IPE. 2 Credits.**

Integrates professional formation and leadership development as a doctoring professional. Emphasizes interprofessional practice, education and support of health and well-being of others. Justifies ethical/legal decisions, social responsibility and advocacy. Expands Integrated Clinical Experiences (ICE) to community engagement and health promotion. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 460. Clinical Edu Experience I. 2 Credits.**

Eight week supervised clinical experience in one of the following settings: outpatient, inpatient, or specialty clinics. Experience will include safe, effective, and comprehensive patient care. Students will demonstrate proficiency with skills applying foundational knowledge associated with patient care and management. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 461. Clinical Edu Experience IIA. 2 Credits.**

Six week supervised clinical experience in one of the following settings: outpatient, inpatient, or specialty clinics. Experience will include safe, effective, and comprehensive patient care. Students will demonstrate proficiency with skills applying foundational knowledge associated with patient care and management. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 462. Clinical Edu Experience IIB. 2 Credits.**

Six week supervised clinical experience in one of the following settings: outpatient, inpatient, or specialty clinics. Experience will include safe, effective, and comprehensive patient care. Students will demonstrate proficiency with skills applying foundational knowledge associated with patient care and management. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 463. Clinical Edu Experience III. 4 Credits.**

Twelve week supervised clinical experience in one of the following settings: outpatient, inpatient, or specialty clinics. Experience will include safe, effective, and comprehensive patient care. Students will demonstrate proficiency with skills applying foundational knowledge associated with patient care and management. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 491. Doctoral Dissertation Research. 1-18 Credits.****DPT 493. Doctoral Research Project I. 1 Credit.**

Advanced research methods, including development of a research question (PICO), research design, proposal and IRB submission. Research questions might be systematic reviews, intervention, diagnostic, or prognostic studies and may use qualitative, quantitative, or mixed-methods design. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 494. Doctoral Research Project II. 2 Credits.**

Implementation of research proposal including data collection and analysis. Research question might be systematic reviews, intervention, diagnostic, or prognostic studies; and may utilize qualitative, quantitative, or mixed-methods design. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 495. Doctoral Research Project III. 2 Credits.**

Completion of research project inclusive of comprehensive analysis, synthesis of findings based on research question, implications to practice and dissemination of finding via manuscript and presentations. This project fulfills a component of the Doctoral Comprehensive Examination. Prerequisites: Graduate student enrollment in the Doctor of Physical Therapy Program.

**DPT 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**DPT 498. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.



## EARLY CHILDHOOD PRE K-3 (EDEC)

### Courses

#### **EDEC 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **EDEC 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## EARLY CHILDHOOD SPECIAL EDUC (ECSP)

### Courses

#### **ECSP 202. D2:EI for Infants and Toddlers. 3 Credits.**

An introduction to the field of Early Intervention for supporting infants and toddlers with and at risk for developmental delay or disability and their families. Stresses a routines-based and family-centered approach within the natural environment. Prerequisites: Early Childhood Special Education undergraduate or graduate students or Instructor permission.

#### **ECSP 210. Curriculum in ECSP. 3-4 Credits.**

Designing and implementing services and supports for young preschool-age children with diverse abilities. Topics include IEPs, embedding instruction, specialized instruction, and inclusion. Three credits, four credits with 30-hour field experience. Prerequisites: Early Childhood Special Education undergraduate students or with Instructor permission.

#### **ECSP 211. Assessment in EI/ECSE. 3-4 Credits.**

Overview of the strengths and limitations of traditional and nontraditional assessments; legal responsibilities, eligibility, family, and cultural aspects. Three credits, four credits for Early Childhood Special Education majors with 30-hour field experience. Prerequisites: Early Childhood Special Education undergraduate students or with Instructor permission. Pre/Co-requisites: Early Childhood Special Education major; instructor permission required for Special Education minors.

#### **ECSP 310. Curriculum in ECSP. 3-4 Credits.**

Designing and implementing services and supports for young preschool-age children with diverse abilities. Topics include IEPs, embedding instruction, specialized instruction, and inclusion. Three credits, four credits with 30-hour field experience. Pre/Co-requisites: Special Education Graduate student; Praxis Core requirement fulfilled.

#### **ECSP 311. Assessment in EI/ECSE. 3 Credits.**

Overview of the strengths and limitations of traditional and nontraditional assessments; legal responsibilities, eligibility, family, and cultural aspects. Pre/co-requisites: Special Education Graduate student.

#### **ECSP 320. Seminar in EI/ECSE. 3 Credits.**

This seminar accompanies the student teaching or internship experiences. Students will create a variety of evidence-based products and complete their portfolios for licensure. Co-requisite: ECSP 386.

#### **ECSP 355. Implementation Science in ECSP. 3 Credits.**

This course will focus on increasing the quantity and quality of ECI practitioners who can meet the diverse needs of children and families by increasing their knowledge of evidence-based strategies for addressing barriers to implementing EBPs in home and school.

#### **ECSP 386. Internship: EI/ECSE. 3-9 Credits.**

Internship in an early intervention and/or early childhood special education setting. Pre/co-requisites: ECSP 202, ECSP 310, ECSP 311; Praxis Core requirement fulfilled; minimum GPA of 3 point 0 or higher.

#### **ECSP 390. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

#### **ECSP 391. Master's Thesis Research. 1-12 Credits.**

#### **ECSP 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **ECSP 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

#### **ECSP 397. Problems in Education. 1-6 Credits.**

#### **ECSP 398. Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

## ECONOMICS (EC)

### Courses

#### **EC 222. QR: Adv Macroeconomic Theory. 3 Credits.**

Tools and lessons of advanced macroeconomic theory with a focus on programming in Mathematica to simulate the predictions of advanced theoretical models. Prerequisites: EC 170 or STAT 141, EC 171, EC 172.

#### **EC 237. Economy as a Complex System. 3 Credits.**

Enhances understanding of the application of simulation methods to economics. Topics include problems from micro and macroeconomics; game theory and general equilibrium; cellular automata, and agent-based modeling with learning and evolution. Prerequisites: EC 170 and EC 171 and EC 172.

## EDUCATION (EDSS)

### Courses

#### **EDSS 319. Internship. 1-6 Credits.**

Students will undertake an approved internship in an institution which reflects the particular area of interest and needs of the student. Prerequisite: Instructor permission.

#### **EDSS 382. Teaching Internship. 3-12 Credits.**

Supervised teaching experiences on a full-time basis, with related seminars in teaching subject. Prerequisite: Permission of coordinator of Professional Laboratory Experiences.

**EDSS 390. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**EDSS 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

**EDSS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDSS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDSS 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## EDUCATION FOR CULTURAL AND LINGUISTIC DIVERSITY (ECLD)

### Courses

**ECLD 201. Developing Curriculum for ELs. 3 Credits.**

Prepares students who intend to teach in a K-12 classroom environment or similar setting by exploring language acquisition theories, instructional methods, and lesson planning for English language learners. Prerequisite: ECLD 056, ECLD 102, minimum Junior standing; or Instructor permission.

**ECLD 202. Bilingual Education & Policy. 3 Credits.**

Provides a foundation of bilingual education policy and practices. Explores theories of language acquisition and their relevance to current policies affecting linguistically diverse students and how these policies have developed through history. Prerequisite: ECLD 056, ECLD 189, Graduate student standing or Instructor permission.

**ECLD 205. Fmly Schl & Cmty Collaboration. 3 Credits.**

Provides a foundation for understanding basic concepts regarding home, school, and community collaboration. This course will focus specifically on creating partnerships between diverse families, families whose children have disabilities, and community partners and schools that serve these populations. Prerequisite: ECLD 056, ECLD 102, and minimum Junior standing; or Instructor permission. Pre/Co-requisite: Minimum Sophomore standing.

**ECLD 303. Language Policy, Race, & Schools. 3 Credits.**

Designed to provide a fundamental overview of theory and policy related to race and language, and how it shapes and impacts English acquisition for English learners in U.S. schools.

**ECLD 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ECLD 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## ELECTRICAL ENGINEERING (EE)

### Courses

**EE 210. Control Systems. 3 Credits.**

Analysis and design of continuous and discrete-time control systems; stability, signal flow, performance criteria, classical and state variable methods, simulation design tools, computer-based realizations. Credit not given for more than one of the courses EE 110, EE 210. Prerequisite: EE 171 or ME 111. Cross-listed with: ME 210.

**EE 211. Real-Time Control Systems. 3 Credits.**

Digital control systems analysis and design. Topics include: difference equations, the Z-transforms, discrete-time transfer functions, state-space models, sampled-data systems, discretization, real-time control, microprocessor implementation, and optimal control. Project-based final. Prerequisites: (C+ or better in EE 110 or EE 210 or ME 210) and (EE 134 or a B- or better in EE 101).

**EE 215. Electric Energy Systems Analys. 3 Credits.**

Transmission line, generator, transformer modeling and control, per-unit conversion, power flow calculations and software, symmetric components and fault analysis, protection/relaying, stability analysis, smart grid. Prerequisite: EE 113. Co-requisite: MATH 122 (preferred) or MATH 124.

**EE 217. Smart Grid. 3 Credits.**

Smart Grid: Using information/communication technology to modernize electric power/energy systems, including generation, transmission, distribution and consumption. Electricity physics/economics/policy; renewable energy; energy storage; demand response; energy efficiency; distributed generation; advanced metering infrastructure; distribution automation; microgrids; synchrophasors; HVDC and FACTS systems. Prerequisite: EE 113 or Graduate standing. Co-requisite: EE 215 recommended.

**EE 218. Power Electronics. 3 Credits.**

An introduction to the field of power conversion using power electronics devices. Topics include Energy and Power, AC-to-DC Converters, DC-to-DC Converters, DC-to-AC Converters, Elements of Control and Design of Power Converters, Applications of Power Electronics in Renewable Energy and Microgrids. Simulations and experiments illustrate concepts. Final project related to renewable energy. Prerequisites: EE 120 or Graduate student standing.

**EE 221. Digital VLSI Circuit Design. 0 or 3 Credits.**

Design of VLSI circuits using a modular approach with industrial grade software: schematic capture; circuit design languages (HDL); full-custom layouts; mixed signals; synthesis. Laboratory. Prerequisites: EE 120. Pre/co-requisites: EE 131.

**EE 222. Analog VLSI Circuit Design. 0 or 3 Credits.**

The design, layout, and simulation of VLSI analog circuits. Emphasis on small signal models and circuits used in operational amplifiers. Prerequisites: EE 120 or Graduate student standing in Electrical Engineering or Physics.

**EE 226. RF Circuit Design. 3 Credits.**

An introduction to the design and analysis of active and passive radio frequency and microwave circuits. Topics include radio frequency and microwave circuit analysis, measurement methods, transmission line structures, matching networks, computer-aided analysis and design. Prerequisites: EE 120, EE 121.

**EE 227. Biomedical Instrumentation. 3 Credits.**

Measurement techniques for biomedical engineering research and industry, and health care institutions. Integrated biomedical monitoring, diagnostic, and therapeutic instrumentation. Prerequisite: EE 100 or EE 004 or EE 021 or EE 075. Co-requisites: EE 120, ANPS 020, or Instructor permission. Cross-listed with: BME 227.

**EE 228. Sensors. 3 Credits.**

Sensor design, interrogation, and implementation. A wide variety of electrical, electronic, optical, mechanic, and cross-disciplinary devices. System designs, measurement techniques, and methodologies. Interface electronics, system grounding and shielding methods. Prerequisite: EE 101 or EE 120.

**EE 229. Biosignal Decoding. 3 Credits.**

Overview of biomedical measurement techniques; development of Python software to visualize, denoise, and decode biomedical signals. Prerequisites: CS021; (BME 111 or EE 171) or (ME 111 and EE 101) or Instructor permission. Pre/Co-requisite: Beginner knowledge of Python programming is strongly suggested. Cross-listed with: BME 229.

**EE 231. Digital Computer Design I. 3 Credits.**

Hardware organization and realization, hard-wired and microprogrammed control units, interrupt and I/O systems. Hardware design language introduced and used for computer design. Prerequisites: EE 131; EE 134 or CS 121.

**EE 261. Semiconductor Materials/Device. 3 Credits.**

Energy band theory, effective mass, band structure and electronic properties of semiconductors. Transport of electrons and holes in bulk materials and across interfaces. MOSFETs, BJTs, pn junctions, and Schottky barriers. Prerequisite: EE 120 or Graduate Student standing.

**EE 272. Information Theory. 3 Credits.**

Introduction to probability concepts of information theory; entropy of probability models; theoretical derivations of channel capacity; coding methods and theorems, sampling theorems. Prerequisite: Graduate student standing or STAT 151.

**EE 275. Digital Signal Processing. 3 Credits.**

Covers principles and methods for digital signal processing. The analysis and design of discrete-time systems as signal processing devices is provided in the context of filter design and topics on image processing. Topics covered: quantization, reconstruction of signals, z-transform, FIR/IIR, intro to images, pixel and region-based classification and segmentation, among others. Prerequisite: EE 171.

**EE 278. Wireless Communication. 3 Credits.**

Modern wireless systems, including cellular design, propagation modeling, multiple access and equalization techniques. Pre/co-requisites: EE 174, STAT 151.

**EE 279. Wireless Sensor Networks. 3 Credits.**

Applications of and technologies behind wireless sensor networks. A systems-level perspective that integrates wireless networking, antennas, radio frequency circuitry, sensors, digital signal processing, embedded systems, and energy. Term project. Prerequisite: EE 171 or Instructor permission.

**EE 301. System Theory. 3 Credits.**

Linear vector spaces. State equations and solution. Diagonalization and Jordan canonical form. Orthogonal and biorthogonal projections. Quadratic forms. Spectral resolution. Principal component analysis, singular value decomposition and Karhunen-Loeve transform. Compressive sensing. Prerequisites: MATH 230 or MATH 271, MATH 124, EE 171 or ME 111.

**EE 302. Stochastic Processes. 3 Credits.**

Probability theory, random variables and stochastic processes. Response of linear systems to random inputs. Applications in engineering. Prerequisites: EE 171 or ME 111; and STAT 151 or STAT 143.

**EE 303. Convex Optimization. 3 Credits.**

Provides advanced mathematical tools to recognize optimization problems from applications, presents rigorous theory of convex optimization with an emphasis on results that are helpful for implementation/computation/modeling, providing student with the experience and understanding necessary to use the tools in their own research work or applications. Prerequisites: Linear Algebra, Multi-variable calculus, Graduate student standing.

**EE 314. Nonlinear System Theory. 3 Credits.**

Basic nonlinear methods including computational and geometrical techniques for analysis of nonlinear systems. Describing function methods and bifurcation and catastrophe theory. Sensitivity and stability considerations. Prerequisite: MATH 230 or MATH 271. Pre/Co-requisites: EE 301 recommended.

**EE 371. Estimation Theory. 3 Credits.**

Foundations of linear and nonlinear least squares estimation, smoothing and prediction, computational aspects, Kalman filtering, nonlinear filtering, parameter identification, and adaptive filtering. Applications to students' research. Pre/co-requisite: STAT 151.

**EE 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EE 391. Master's Thesis Research. 1-18 Credits.****EE 392. Master's Project. 1-3 Credits.**

Master's Project.

**EE 393. Graduate Seminar. 1 Credit.**

Presentation and discussion of advanced problems, research, and current topics in Electrical Engineering by faculty, graduate students, and outside guest speakers.

**EE 394. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EE 395. Advanced Special Topics. 1-18 Credits.**

Advanced topics of current interest in electrical engineering. Prerequisite: Instructor permission.

**EE 398. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EE 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EE 491. Doctoral Dissertation Research. 1-18 Credits.****EE 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EE 498. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ELEMENTARY EDUCATION (EDEL)****Courses****EDEL 382. Teaching Internship. 3-8 Credits.**

Supervised teaching experiences on a full-time basis, with related seminars in teaching subject. Prerequisite: Permission of coordinator of Professional Laboratory Experiences.

**EDEL 391. Master's Thesis Research. 1-18 Credits.**

Thesis topic must be approved by a faculty committee.

**EDEL 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDEL 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ENGINEERING (ENGR)****Courses****ENGR 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ENGR 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ENGINEERING MANAGEMENT (EMGT)****Courses****EMGT 201. Engineering Project Management. 3 Credits.**

Principles of project management on designing, building/manufacturing engineering facilities, processes, products and structures; metrics for managing quality, schedule, and financial performance of projects; services and product procurement; project financial management; legal and insurance aspects. Prerequisites: Senior standing.

**EMGT 254. Optimization in Ops Research. 3 Credits.**

Students develop and refine their ability to build optimization models for a wide range of business and engineering decisions. Provides a sound conceptual understanding of mathematical optimization and learn techniques used for solving real-world problems. Emphasizes model formulation and the mathematics of commonly used algorithms. Prerequisites: MATH 121; MATH 122 or MATH 124.

**EMGT 391. Master's Thesis Research. 1-18 Credits.****EMGT 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EMGT 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EMGT 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ENGLISH (ENGS)****Courses****ENGS 201. Topics in Lang/Critical Theory. 3 Credits.**

Advanced study in literary and cultural theory. Representative topics: Feminist Memory; Re-disciplining the History of Literature and the Literature of History. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: ENGS 085, ENGS 100; Instructor permission for graduate students.

**ENGS 211. Topics in Advanced Writing. 3 Credits.**

Advanced study in writing practice, craft, and theory. Representative topics: Innovations in Life Writing; Protest and Persuasion; Stories of the Body. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Writing minor or (ENGS 085, ENGS 100); ENGS 104 or ENGS 105 or ENGS 107 or ENGS 114 or ENGS 115 or ENGS 117 or ENGS 118 or ENGS 119; Instructor permission for Graduate students.

**ENGS 221. Topics in Literature to 1800. 3 Credits.**

Advanced study in literature before 1800. Representative topics: Grief and Loss in Early Modern English Lit.; Taste and Judgement; Doubt and Knowledge. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: ENGS 085, ENGS 100; Instructor permission for graduate students.

**ENGS 241. Topics in 19th Century Lit. 3 Credits.**

Advanced study in nineteenth-century literature. Representative topics: Romantic Poetry and Poetics; Mary Shelley and Her Circle; The Gothic. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: ENGS 085, ENGS 100; Instructor permission for graduate students.

**ENGS 252. Topics in 20th Century Lit. 3 Credits.**

Advanced study in twentieth-century literature. Representative topics: Contemporary American Novel; Feminists Readings/Reading Feminism. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: ENGS 085, ENGS 100; Instructor permission for graduate students.

**ENGS 281. Topics in Theme and Genre. 3 Credits.**

Advanced study in literary genres, forms, and themes. Representative topics: Noir in Fiction and Film; Great American Race Novel; Post-Apocalyptic Fiction. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: ENGS 085, ENGS 100; Instructor permission for graduate students.

**ENGS 320. Seminar:Major Author. 3 Credits.**

In-depth study of the works, critical reception, and context of an author writing in English. Representative topics: Chaucer; Shakespeare; Milton; Austen; Dickinson; Morrison. Topics vary by offering; periodic offering at intervals that may exceed four years.

**ENGS 330. Seminar:Literary Period. 3 Credits.**

Advanced survey of authors, themes, genres, and/or cultural context in a British or American literary period. Representative topics: British Renaissance; Restoration and Eighteenth Century; Victorian; American Renaissance. Topics vary by offering; periodic offering at intervals that may exceed four years.

**ENGS 340. Studies in Rhetoric & Comp. 3 Credits.**

Introduction to current issues in the field. Representative topics: Rhetorical theory; gender, class, and composing: writing across the curriculum; collaborative learning, literature and composition. Topics vary by offering; periodic offering at intervals that may exceed four years.

**ENGS 345. Practicum in Teaching Writing. 3 Credits.**

Introduces new graduate teaching assistants in English to best practices in teaching college composition and provides support for their first semester teaching ENGS 001. Prerequisites: Admission to English Graduate program; appointment to a Graduate teaching assistantship; permission of Instructor or English department Graduate advisor.

**ENGS 350. Surv of Lit Theory & Criticism. 3 Credits.**

Theory and Criticism.

**ENGS 360. Seminar:Special Topics. 3 Credits.**

Topic varies, based on faculty research. Representative topics: orality and literacy in medieval literature; feminist theory; anthropological approaches to literature; narrative theory and Victorian novels.

**ENGS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ENGS 391. Master's Thesis Research. 1-6 Credits.****ENGS 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ENGS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ENGS 397. Special Readings & Research. 1-6 Credits.**

Directed individual study of areas not appropriately covered by existing courses. Permission of Graduate Director.

**ENGS 398. Teaching Practicum Continued. 3 Credits.**

Continued mentoring and professional development for Graduate Teaching Assistants who have completed ENGS 345. May be repeated once for credit. Prerequisite: ENGS 345; admission to English Graduate program; appointment to a Graduate teaching assistantship.

**ENVIRONMENTAL STUDIES (ENVS)****Courses****ENVS 212. SU:Advanced Agroecology. 0-4 Credits.**

An in-depth overview of research and application in the field of agroecology, including ecological and social dynamics in agricultural landscapes in Vermont and abroad. Pre/co-requisites: PSS 021 and one semester of ecology at the 100-level or above or Instructor permission. Cross-listed with: PSS 212.

**ENVS 293. Environmental Law. 3 Credits.**

Principles of environmental law, including legal research methods, threshold issues, case law, trial procedure, and international comparisons in aspects of air, land, and water law. Prerequisites: ENVS 142 or NR 153; Junior standing.

**ENVS 294. Environmental Education. 3 Credits.**

Philosophy, concepts, and strategies of environmental education, emphasizing integration of environmental concerns into formal and nonformal educational programs for youth and adults. Prerequisite: Junior standing.

## EXERCISE SCIENCE (EXSC)

### Courses

#### **EXSC 302. EBP in Physical Activity. 3 Credits.**

The course addresses the role of research in physical activity promotion and practice including utilization, dissemination and models of evidence-based practice. Refereed research and systematic reviews will be utilized to examine issues and consensus on aspects of measurement of-, factors influencing-, and promoting physical activity. Prerequisites: Undergraduate STAT course or Instructor permission.

#### **EXSC 303. Phys Act & Chronic Dis Epidem. 3 Credits.**

Understanding health benefits of physical activity on chronic disease prevention and health promotion throughout the life span, from clinical and public health perspectives. Discussion and application of real-life physical activity assessment, research, guidelines, and promotion in population levels.

#### **EXSC 345. Exercise Assessment & Prescrip. 3 Credits.**

Expand upon the clinical aspects of exercise physiology to evaluative and prescriptive aspects of exercise programming. Students will gain an understanding of how to evaluate testing results and prescribe safe and effective exercise programs using ACSM guidelines. Prerequisite: Master of Science in Physical Activity & Wellness Science Graduate student.

#### **EXSC 350. Physical Activity and Disease. 3 Credits.**

Empirically based exploration of the relationship between physical activity and chronic disease conditions such as obesity, cardiovascular disease, and type 2 diabetes. Prerequisite: RMS 220 or equivalent. Co-requisite: Physical Activity and Wellness Graduate student.

#### **EXSC 354. Phys Act & Wellness Promotion. 3 Credits.**

Examines leading theories of health behavior with emphasis on applying theoretical constructs in effective physical activity promotion. Multiple levels of influence on promoting behavior change, including policies, environments, social and personal factors, will be considered in light of contemporary challenges in health promotion. Prerequisite: MS in Physical Activity and Wellness Science student.

#### **EXSC 360. Energy Balance. 3 Credits.**

Empirically based exploration of human metabolism, energy balance, and weight management. An in-depth study of gold- standard and cutting- edge scientific literature regarding the impact of energy expenditure through physical activity and energy. Prerequisite: MS in Physical Activity and Wellness Science student.

#### **EXSC 365. Activity in the Underserved. 3 Credits.**

Emphasizes content areas related to access and accommodation in physical activity for individuals from underserved populations. Foci will include health promotion, physical activity barriers, and designing and modifying physical activity programs in schools, recreational programs, community settings, and sport. Prerequisite: Graduate student in Master's degree in Physical Activity and Wellness Science.

#### **EXSC 368. Phys Act Prog Design and Mngmt. 3 Credits.**

High-level review, application of designing, modifying, adapting individualized, evidence-based, exercise prescriptions. Emphasis on cardiorespiratory, muscular fitness. Students apply evidence-based knowledge related to development of comprehensive evidence based exercise programs. Co-requisite: Master of Science in Physical Activity & Wellness Science student.

#### **EXSC 370. Phys Act: Communication & Eval. 3 Credits.**

Focus on implementation of physical activity promotion which includes effective communication strategies, assessing methods of implementation, and evaluation of program outcomes. Prerequisite: Physical Activity and Wellness Science Master's student.

#### **EXSC 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

#### **EXSC 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **EXSC 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **EXSC 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

#### **EXSC 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

## FOOD SYSTEMS (FS)

### Courses

#### **FS 321. Econ of Sustainable Food Syst. 3 Credits.**

Utilizes common economic tools, ideas and application to analyze issues concerning the sustainability of food systems, using a combination of readings, lectures and discussions. Prerequisite: Graduate standing. Cross-listed with: CDAE 321.

#### **FS 335. Qualitative Research Methods. 3 Credits.**

Provides an overview of qualitative research methods and an opportunity to apply such research methods for topics focusing on food systems and health. Prerequisite: Graduate Student standing. Cross-listed with: CDAE 335.

#### **FS 340. Food Systems, Science & Policy. 3 Credits.**

This course examines key questions being asked about our contemporary food system by examining natural and life sciences scholarship and the applications for public policy.

**FS 345. Food Systems, Soc & Policy. 3 Credits.**

This course examines key questions being asked about our contemporary food systems by examining social science and humanities scholarship and the applications for public policy.

**FS 351. Professional Development Sem.. 1 Credit.**

This seminar will prepare students to successfully navigate the graduate school experience.

**FS 355. Ethics and the Food System. 3 Credits.**

Focus on certain food ethics issues. The in-depth consideration of these issues will build philosophical skills as well as knowledge as to the interdependence and interconnection of the food system. Prerequisite: Instructor permission only.

**FS 360. Dissertation Writing Seminar. 1 Credit.**

This seminar will prepare students to successfully navigate the dissertation process. The course serves as a PhD competency.

**FS 381. Issues & Solutions Seminar. 1 Credit.**

Focuses on transdisciplinary research intended to address the 'wicked problems' of contemporary food systems through weekly presentations of on-going research by University of Vermont faculty and doctoral students.

**FS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**FS 391. Master's Thesis Research. 1-18 Credits.****FS 392. Master's Project Research. 1-4 Credits.**

Food Systems Professional Track students are required to complete a final project. Students will design a project that must be approved by the Project Faculty Committee.

**FS 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**FS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**FS 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**FS 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**FS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**FS 491. Doctoral Dissertation Research. 1-12 Credits.**

Research requirement (up to 30 research credits) for Food Systems PhD students.

**FS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**FS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**FORESTRY (FOR)****Courses****FOR 228. Ecosystems Ecology. 3 Credits.**

Examination of the structure and function of terrestrial ecosystems focusing on carbon and nutrient cycles. Laboratory sessions involve spatial modeling and data analysis. Prerequisites: NR 103, BCOR 102, PSS 161, or Graduate student standing. Cross-listed with: NR 228.

**FOR 272. Sustain Mgmt Forest Ecosys. 0 or 4 Credits.**

Principles of long-term planning and plan implementation in support of sustainable forestry; Adaptive management; biodiversity and ecosystem health; major management planning project. Prerequisites: FOR 122, NR 205, FOR 223.

**FOR 385. Selected Problems in Forestry. 1-6 Credits.**

Advanced readings, or a special investigation dealing with a topic beyond the scope of existing formal courses.

**FOR 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**FOR 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**FOR 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**FOR 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**FOUNDATIONS (EDFS)****Courses****EDFS 203. Soc, Hst & Phil Found of Educ. 3 Credits.**

Critical examination of central educational/social issues and values with special emphasis on the struggle for justice and equality. Themes include schooling and social class, race, and gender; the purposes of education; and the responsibilities of teachers. Prerequisite: Enrollment in teacher licensing program.

**EDFS 209. Intro to Research Methods. 3 Credits.**

Seminars and research projects. Methods of historical, descriptive, experimental, quasi-experimental, field studies, and survey research.

**EDFS 301. Intro to Interdisciplinarity. 3 Credits.**

Introduction to the long-standing tradition of interdisciplinary inquiry. Begins with a short overview of this diverse field and then explores particular innovations in the humanities, arts, and sciences that have formed around interdisciplinarity. Examines a variety of interdisciplinary research and analyze the flexibilities and challenges of interdisciplinary inquiry.

**EDFS 302. Philosophy of Education. 3 Credits.**

Critical examination of key beliefs and values in current philosophies of helping, e.g. phenomenological, behavioral, holistic, as practiced in a variety of educational and social service institutions. Prerequisite: Twelve hours in education and related areas.

**EDFS 303. Ethics Helping Relationships. 3 Credits.**

Clarification of ethical dimensions of professional rights and obligations for educators, counselors, administrators, other helping professionals. Examination of selected ethical controversies currently facing the helping professionals. Prerequisite: Twelve hours in education and related areas.

**EDFS 304. Religion, Spirituality & Ed. 3 Credits.**

A narrative approach to thinking about religion and spirituality and theoretical and practical implications for policy making, pedagogy, curriculum development, and educational leadership.

**EDFS 305. Race, Justice, and Education. 3 Credits.**

Introduces students to key readings in theories and histories of the relationship among race, justice, and education. Starting with abolitionists in the 19th century and practices of literacy in enslaved communities, examines how education has played a key role in encouraging racial equity and justice up to contemporary times.

**EDFS 309. Schol Pers Narr Writing:ED&SS. 3 Credits.**

A workshop for educational writers of theses, dissertations, and scholarly articles. Students will be introduced to critical theory, postmodern, feminist, and narrativist conceptions of educational writing.

**EDFS 314. Modes of Inquiry. 3 Credits.**

A critical analysis of the various conceptual and methodological foundations of theory and practice in education and the human services. Prerequisite: Twelve hours in education and related areas.

**EDFS 320. Technology, Schooling, Society. 3 Credits.**

This course explores influences of technology on schooling and society. Using sociological, historical, and philosophical frameworks, participants examine equity, cultural diversity, student empowerment, and community.

**EDFS 347. Qualitative Research Methods. 3 Credits.**

Introduces students to qualitative methods as a research paradigm and develops skills in ethnographic techniques of field observation, interviewing, and data analysis. Out-of-class fieldwork required. Prerequisite: Master's or doctoral level standing or Instructor permission.

**EDFS 348. Analyze&Write Qualitative Rsch. 3 Credits.**

This course extends students' knowledge of and experience with qualitative research analysis and writing. Students must come with data collected previous to the start of the course. Prerequisite: EDFS 347 or Instructor Permission.

**EDFS 355. Appl Data Analysis for Dec Mkg. 3 Credits.**

Students will learn to apply quantitative techniques, using commonly available tools, to organizational data so that they can make data-based policy decisions. Prerequisite: Graduate standing.

**EDFS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EDFS 391. Master's Thesis Research. 1-18 Credits.**

Thesis topic must be approved by a faculty committee.

**EDFS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDFS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDFS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EDFS 455. Soc Process & Institutionl Chg. 3 Credits.**

Critical analysis of theory and research related to justice, caring, and change in education and other social institutions. Focus: ideology, diversity, and management of knowledge. Prerequisite: Doctoral level standing.

**EDFS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EDFS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDFS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## FRENCH (FREN)

### Courses

**FREN 237. Early French Women Writers. 3 Credits.**

Exploration of how women from the Middle Ages through the Revolution spoke of love, education, the place of women, the power of writing and more. Prerequisites: FREN 141 or FREN 142.

**FREN 266. Rev&React in 19th C Narrative. 3 Credits.**

Study of the representations of major social issues of the period, such as power, class, money, and women. Representative authors: Balzac, Flaubert, Sand, Stendhal, Zola. Prerequisites: FREN 141 or FREN 142.



**FREN 269. La Belle Epoque. 3 Credits.**

The aesthetic and moral dilemmas of the turn-of-the-century "decadent" period in French literature, focusing especially on the changing representation of the artist and intellectual. Prerequisites: FREN 141 or FREN 142.

**FREN 275. 20-C Lit - Society and Writers. 3 Credits.**

A study of twentieth-century French authors who shaped contemporary French culture by challenging traditional ethics and modes of thought. Representative authors include Beauvoir, Camus, and Sartre. Prerequisites: FREN 141 or FREN 142.

**FREN 280. Francophone Crossings. 3 Credits.**

Study of works in French that demonstrate multiple cultural influences. Topics may include: exile writings, cultural/linguistic mixing, colonialism and independence movements, human rights, immigration. Prerequisites: FREN 141 or FREN 142.

**FREN 285. Quebec Literature. 3 Credits.**

A study of contemporary (1960-1985) major works of fiction, poetry, and drama. Authors studied include Anne Hebert, Michel Tremblay, Jacques Godbout, Gaston Miron. Prerequisites: Either FREN 141 or FREN 142, or both.

**FREN 293. Quebec Culture. 3 Credits.**

Sociocultural study of the Francophone culture of Canada. Prerequisite: FREN 141 or FREN 142.

**GEOGRAPHY (GEOG)****Courses****GEOG 245. Adv Top:Human Env Interactions. 3 Credits.**

Advanced offerings on various manifestations of social-environmental relationships. Possible topics include sustainable development, environmental justice, and urban ecology. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Vary with course content; Minimum Junior standing.

**GEOG 246. Adv Top:Climate&Water Resource. 3 Credits.**

Analysis of regional climatology, paleoclimatology, hydroclimatological hazards, or fluvial geomorphology. Topics include droughts, severe weather, climate change, floods and floodplain management, mountain and lowland rivers. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Vary with course content; minimum Junior standing.

**GEOG 272. Adv Top:Space, Power, Identity. 3 Credits.**

Advanced offerings on topics related to the spatial regulation and geographic construction of social identity, paying particular attention to race, gender, and sexuality. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Vary with course content; minimum Junior standing.

**GEOG 274. Adv Top:Critical Urban&Soc Geo. 3 Credits.**

Advanced offerings in urban and critical social geography. Possible topics include social justice and the city, human rights, geographies of social control. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Vary with course content; minimum Junior standing.

**GEOG 281. Advanced Topics:Remote Sensing. 3 Credits.**

Applied, capstone course; remote sensing techniques will be applied to atmospheric issues at varying temporal and spatial scales, as well as to quantifying the influence of topography, vegetation, and land-water boundaries. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: GEOG 040; GEOG 143, GEOG 185, or NR 146 recommended.

**GEOG 287. Spatial Analysis. 3 Credits.**

Analysis of spatial pattern and interaction through quantitative statistical models; application of GIS to statistical modeling. Prerequisite: GEOG 081 or GEOG 184 or NR 143 or ENSC 130 or GEOL 185.

**GEOG 391. Master's Thesis Research. 1-18 Credits.**

Master's Thesis Research.

**GEOLOGY (GEOL)****Courses****GEOL 201. Advanced Field Geology. 3 Credits.**

Advanced field mapping techniques, analysis of field data, preparation of geological maps and reports. Prerequisite: GEOL 101.

**GEOL 231. Petrology. 4 Credits.**

The course covers the scope and methods of igneous, sedimentary and metamorphic petrology, and the geologic environments and processes relevant to the major rock types. Prerequisite: GEOL 110.

**GEOL 234. Global Biogeochemical Cycles. 3 Credits.**

Integrated perspective on biogeochemical cycles describing the transformation and movement of chemical substances in the natural environment, as seen on the global context. Prerequisite: CHEM 031.

**GEOL 235. Geochemistry of Natural Waters. 3 Credits.**

Basic concepts of chemical equilibria applied to natural waters, including thermodynamics, pH, oxidation-reduction, weathering, and solution equilibria. Prerequisite: Prerequisite: CHEM 032.

**GEOL 240. Tectonics. 3 Credits.**

Applications of igneous and metamorphic petrology to problems in tectonophysics, including petrochemistry of the earth's crust and upper mantle and the internal structure of orogenic belts. Prerequisites: GEOL 101, GEOL 110.

**GEOL 246. X-ray Diffractometry. 3 Credits.**

This course focuses on identification and characterization of materials using X-ray diffractometry. The course will include exercises using a modern powder diffractometer. Prerequisite: CHEM 032.

**GEOL 249. Crystal Chemistry. 3 Credits.**

A hands-on course involving crystal structure solutions, wherein grading will be based on various class projects, not examinations. Students will gain a deep understanding of how Nature arranges matter on Earth, and how to determine the atomic arrangement of compounds using X-ray diffractometry. Prerequisites: GEOL 110 or GEOL 246; or Chemistry, Physics, or Material Science major and minimum Junior standing; or graduate standing in Chemistry, Physics, or Material Science.

**GEOL 260. Structural Geology. 0 or 4 Credits.**

Examines processes and problems concerning the mechanical behavior of the Earth's crust and surface. Includes rock deformation stress, strain, and the interpretation of geological structures.

Prerequisites: GEOL 101, GEOL 110.

**GEOL 263. Geochronology. 3 Credits.**

This course will survey the basic concepts of radioactive decay, mass spectrometry, and isotopic systems commonly used to quantify the timing of geologic events. Prerequisite: GEOL 110.

**GEOL 302. Intro Graduate Studies Geology. 1 Credit.**

For first year graduate students in Geology. Includes orientation to faculty, abstract and grant writing, comprehensive exams, talk preparation and scientific method in the Geosciences. Prerequisite: Graduate standing in Geology.

**GEOL 352. Environmental Geology Seminar. 1-3 Credits.**

Geologic constraints on environmental problems including: groundwater flow, contaminant transport, slope stability, climate change, sedimentation, deforestation and earthquake hazards. Extensive readings and student-led discussions. Prerequisite: Graduate standing in science, natural resources, or engineering.

**GEOL 355. Critical Writing in Science. 3 Credits.**

Learn how to write better papers, give exciting presentations, and do peer-reviews. Write and review abstracts, articles, and professional presentations. Refine public science communication techniques including radio interviews and pitching work to the media. Takes a hands-on approach to improving science communication. Prerequisite: Graduate Student standing in science, mathematics, natural resources, agriculture and life sciences, plant and soil science, or engineering, or undergraduate thesis writers in these fields by Instructor permission.

**GEOL 361. Advanced Structural Geology. 3 Credits.**

Selected topics in analytical structural geology. Prerequisite: GEOL 260.

**GEOL 371. Advanced Readings. 1-3 Credits.**

Readings and research problems intended to contribute to the program of graduate students in areas of geology for which formal courses are not available. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Graduate standing in Geology.

**GEOL 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**GEOL 391. Master's Thesis Research. 1-9 Credits.**

Master's Thesis Research.

**GEOL 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GEOL 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GEOL 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GEOL 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**GERMAN (GERM)****Courses****GERM 282. Sem on Particular Author. 3 Credits.**

Study of author(s) through close readings of representative texts supplemented by lectures and reports on the works' socio-cultural context. May be repeated. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**GERM 391. Master's Thesis Research. 1-12 Credits.****GERM 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GERM 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GERM 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GERM 397. Teaching Assistantship. 1-18 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**GRADUATE (GRAD)****Courses****GRAD 395. Advanced Special Topics. 0-3 Credits.****GRAD 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GRAD 901. Continuous Reg Less Half. 0.25-4 Credits.****GRAD 902. Continuous Reg Half Time. 5-8 Credits.****GRAD 903. Continuous Reg Full Time. 9 Credits.**

## GRADUATE MEDICAL (GRMD)

### Courses

#### **GRMD 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

#### **GRMD 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## GRADUATE NURSING (GRNS)

### Courses

#### **GRNS 300. Professional Nursing Issues. 2 Credits.**

Issues affecting nursing practice provide framework for examination of and socialization into professional nursing. The historical, legal, ethical, cultural, structural, and economic aspects of nursing practice will be explored. Prerequisite: Admission to DEPN program. Co-requisites: GRNS 301, GRNS 302, GRNS 303. Pre/co-requisite: GRNS 313.

#### **GRNS 302. Sci Nsg:Adults Across Life I. 3 Credits.**

Identification and treatment of human responses to pathophysiological problems in adults with acute, chronic, or terminal conditions, with principles of general acute nursing practice emphasized. Prerequisite: Admission to DEPN program. Co-requisites: GRNS 300, PRNU 228, GRNS 303, NURS 220.

#### **GRNS 303. Practicum:Adults Lifespan I. 4 Credits.**

An initial experience in the nursing lab will be followed with a supervised clinical nursing practicum of adults with acute, chronic, or terminal conditions. Prerequisite: Admission to the DEPN program. Co-requisites: GRNS 300, PRNU 228, GRNS 302, NURS 220.

#### **GRNS 304. Pract:Adults Lifespan II. 1.25 Credit.**

80 hour supervised clinical nursing practicum provides an immersion experience in the medical/surgical acute care setting. Prerequisites: GRNS 300, PRNU 228, GRNS 302, GRNS 303, NURS 220.

#### **GRNS 305. Pract: Cmplx Nsg Care Adults. 2.5 Credits.**

Precepted clinical practice in adult acute care. Students will focus on an area in which more depth is desired. Prerequisite: GRNS 304. Co-requisites: GRNS 306, GRNS 308, GRNS 309, GRNS 312, PRNU 232.

#### **GRNS 306. Sci of Nsg: Mental Health. 3 Credits.**

Theories of human behavior form the foundation for understanding mental health and acute and chronic mental illnesses. Focus on assessment, treatment, and nursing care. Prerequisite: GRNS 304. Co-requisite: GRNS 312. Pre/Co-requisites: GRNS 305, GRNS 308, GRNS 309, GRNS 310.

#### **GRNS 307. Practicum: Mental Health. 1.25 Credit.**

Faculty guide students in clinical settings to maximize exposure to all aspects of the nursing process with adults having selected psychiatric/mental health problems. Prerequisite: GRNS 305. Pre/Co-requisite: GRNS 306.

#### **GRNS 308. Sci of Nsg:Women & Newborns. 2 Credits.**

Focus on healthy maternal-newborn care, and promotion of wellness and family integrity during transition within a family-centered framework. Prerequisite: GRNS 304. Co-requisites: GRNS 305, GRNS 306, GRNS 309, GRNS 310, GRNS 312.

#### **GRNS 309. Practicum:Women & Newborns. 1.25 Credit.**

Attention is focused on provision of nursing care to the expectant, laboring, or post-partum mother and to the newborn infant. Prerequisite: GRNS 304. Pre/Co-requisite: GRNS 308.

#### **GRNS 311. Practicum: Children. 1.25 Credit.**

Faculty guide students in clinical settings to maximize exposure to all aspects of the nursing process with children having selected pathophysiological problems. Prerequisite: GRNS 310. Pre/co-requisites: GRNS 307, GRNS 314, GRNS 315.

#### **GRNS 312. Sci of Nsg: Adults Lifespan II. 2 Credits.**

Continued exploration of pathophysiological phenomena of health conditions commonly experienced in an acute care setting. Prerequisite: GRNS 304. Co-requisites: GRNS 306, GRNS 308, GRNS 309, PRNU 232.

#### **GRNS 314. Public Health Nursing. 2 Credits.**

Emphasis on the epidemiological and biostatistical indicators of population health, methods of community health analysis, structure and function of federal, state and local health organizations. Prerequisites: GRNS 310, GRNS 311, GRNS 312. Co-requisite: GRNS 315.

#### **GRNS 315. Practicum: Public Health Nurs. 2 Credits.**

Statewide population-focused public health nursing experience involving needs assessment, program development, case management, health promotion, disease prevention, and protection strategies, with opportunities for interdisciplinary collaboration. Prerequisites: GRNS 311, GRNS 312. Co-requisite: GRNS 314.

#### **GRNS 321. Professional Role Development. 3 Credits.**

Examination of role development in advanced generalist and advanced nursing practice;including the development of competencies,licensing, and other specialized roles in nursing.

#### **GRNS 322. Org, Deliv & Finance Hlth Care. 3 Credits.**

Structure, organization, financing, and delivery of health care through complex systems in the United States. Focus on economic, social, ethical, political, and global structures. Prerequisite: Registered nurse licensure or matriculated graduate nursing student.

#### **GRNS 324. Theoretical Foundation Nsg Sci. 3 Credits.**

Exploration of philosophy of science, theory, and development of nursing knowledge. Nursing and non-nursing philosophies and theories relevant to advanced nursing practice will be discussed. Prerequisites: Graduate standing or by faculty permission.

#### **GRNS 325. Genetics for Clinicians. 3 Credits.**

This course provides an overview of contemporary human genetics and genomics with application to clinical practice. Prerequisite: Graduate standing. Cross-listed with: PATH 325.

#### **GRNS 326. Hlth Care Eth,Policy,Politics. 3 Credits.**

Examination of the processes of policy analysis and development with focus on advocacy. Prerequisite: Registered nurse licensure or matriculated graduate nursing student.

**GRNS 327. Adv Topics in Hlth Informatics. 3 Credits.**

This course provides an overview of informatics, the transformation of data into information, knowledge, decisions and actions to improve outcomes. This course offers the student an opportunity to study advanced topics in health informatics. Topics vary by offering; periodic offering at intervals that may exceed four years. Pre/Co-requisites: GRNS 322, GRNS 400.

**GRNS 328. Quality in Healthcare. 3 Credits.**

Introduces students to the principles and practices of health care quality and quality improvement. Principles in the design and management of continual improvement activities will be presented and applied. Prerequisite: Graduate standing. Cross-listed with: CTS 302.

**GRNS 335. Adv Pathophysiology. 3 Credits.**

In-depth examination of the biological and physical manifestations of disease as they correlate with pathophysiology to guide clinical decision making of the APRN and CNL. Prerequisites: RN license or completion of DEPN. Pre/Co-requisite: GRNS 404.

**GRNS 343. CNL Project Seminar I. 1 Credit.**

Provides an overview of the role of the Clinical Nurse Leader as a change agent at the point of care. Prerequisites: GRNS 327, GRNS 335. Co-requisites: GRNS 328, NH 399.

**GRNS 344. CNL Practicum I. 0.5 Credits.**

Students explore the clinical microsystem and identify areas to improve patient safety and health care outcomes. Students complete a minimum of 60 practicum hours in a practice setting(s) with clinical mentor(s) agreed upon by the student and the course faculty. Pre/Co-requisites: GRNS 326, GRNS 327, GRNS 328, GRNS 335, GRNS 343, NH 399.

**GRNS 345. CNL Project Seminar II. 1 Credit.**

Focuses on further refinement and completion of the CNL project proposal. The CNL project emphasis is on unit and organizational culture, structure and function, and effectiveness while considering relevant cost, quality, and patient outcome data. Prerequisites: GRNS 343, GRNS 328. Co-requisites: GRNS 321, GRNS 322, GRNS 406.

**GRNS 346. CNL Practicum II. 0.5 Credits.**

Students explore the clinical microsystem and identify areas to improve patient safety and health care outcomes in the inpatient and outpatient setting. These clinical opportunities will inform the CNL project. A minimum of 60 practicum hours will be completed in a setting(s) with clinical mentor(s) agreed upon by the student and the course instructor. Prerequisites: GRNS 343, GRNS 344. Co-requisites: GRNS 321, GRNS 322, GRNS 341, GRNS 406.

**GRNS 347. CNL Project Seminar III. 0.5 Credits.**

Students complete the implementation phase of the CNL project and initiate project evaluation measures. Details of process measures and outcomes, observed associations between outcomes, interventions, and relevant contextual elements, consequences of project implementation, and analytic strategies will be emphasized. Prerequisites: GRNS 345, GRNS 346. Co-requisites: GRNS 348.

**GRNS 348. CNL Clin Immersion Practicum. 2.5 Credits.**

Designed to implement and evaluate the CNL quality improvement project. Students will implement and evaluate the select microsystem change aimed to improve patient safety and outcomes. Students will evaluate the impact of the practice change and disseminate findings and implications for practice change. Prerequisites: GRNS 341, GRNS 346. Co-requisite: GRNS 343.

**GRNS 390. Master's Project. 1-3 Credits.**

Self-designed clinical paper or innovative production pertinent to advanced nursing practice. Prerequisites: GRNS 321, GRNS 322, GRNS 323, GRNS 324; approval of project committee. Pre/Co-requisite: Comprehensive Exam (completed prior to project presentation).

**GRNS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GRNS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GRNS 395. Independent Study. 1-6 Credits.**

Individual work in graduate nursing with a base of theory, research, or advanced practice. Student in consultation with faculty sponsor devises objectives, plan of work, and evaluation for designated credit hours. Graduate nursing faculty as selected by student. Prerequisite: Permission of academic advisor and sponsoring faculty.

**GRNS 396. Advanced Special Topics. 0.5-18 Credits.**

Topics of interest to graduate nursing which are based on theory, research or advanced practice. Course content will deal with topics beyond the scope of existing formal courses or DNP project. Prerequisite: Instructor permission.

**GRNS 400. Population-Based Hlth for APN. 3 Credits.**

The role of advanced practitioners in the care of populations with an emphasis on the U. S. health care system. Prerequisite: Graduate standing.

**GRNS 401. Leadership of HlthCare Systems. 3 Credits.**

Planning and implementation of programs, projects or systems of health care delivery. Prerequisite: GRNS 322.

**GRNS 404. Adv Pharmacology APRN. 3 Credits.**

In-depth examination of the pharmacokinetics and pharmacodynamics of select drugs for acute and chronic health conditions. Ethical and legal standards of prescriptive authority explored. Pre/Co-requisite: GRNS 335.

**GRNS 405. Adv Neuropsychopharmacology. 3 Credits.**

In-depth examination of the pharmacokinetics and pharmacodynamics of drugs used to treat individuals with acute and chronic pain, neurologic and psychiatric illnesses across the lifespan. Prerequisites: GRNS 335, GRNS 404.

**GRNS 406. Adv Hlth Assessment. 3 Credits.**

Development of advanced knowledge and skills in systematic collection, organization, interpretation, and communication of data necessary for formulation of nursing and medical diagnoses. Lab fee required. Prerequisite: Basic physical examination course. Pre/co-requisite: GRNS 335.

**GRNS 407. Opt Hlth & Mgt Com Hlth Issues. 2 Credits.**

Assessment and optimization of health of adolescents and adults. Diagnostic reasoning and management of common acute health conditions. Prerequisites: GRNS 335, GRNS 404, GRNS 406. Co-requisites: GRNS 405, GRNS 408.

**GRNS 408. Prac:Opt Hlth&Mgt Com Hlt Iss. 1 Credit.**

Assessment and optimization of health of adolescents and adults. Diagnostic reasoning and management of common acute health conditions. Prerequisites: GRNS 335, GRNS 404, GRNS 406. Co-requisites: GRNS 405, GRNS 407.

**GRNS 409. Pediatric Concepts APRN. 3 Credits.**

APN care to children and their families with an emphasis on the developmental, psychosocial, cultural, ethical, and spiritual needs of children and families. Pre/Co-requisites: GRNS 405, GRNS 407, GRNS 408.

**GRNS 410. Primary Care Mgmt Child & Adol. 3 Credits.**

Application in a clinical setting(s): assessment, evaluation, diagnostic reasoning, and management of common episodic and chronic health conditions in provision of primary care to children and adolescents. Prerequisites: GRNS 405, GRNS 407, GRNS 408, GRNS 409. Co-requisite: GRNS 411.

**GRNS 411. Practicum: Child & Adolescents. 1 Credit.**

Application in a clinical setting(s): assessment, evaluation, diagnostic reasoning, and management of common episodic and chronic health conditions in provision of primary care to children and adolescents. Prerequisites: GRNS 405, GRNS 407, GRNS 408, GRNS 409. Co-requisite: GRNS 410.

**GRNS 412. Adv Nsg Prac of Older Adult. 3 Credits.**

Focus on health and disease and associated care and treatment of older persons by the advanced practice nurse. Prerequisites: GRNS 335, GRNS 404, GRNS 406, GRNS 407, GRNS 408. Pre/Co-requisite: GRNS 405.

**GRNS 413. Practicum: Nursing Older Adult. 0.5 Credits.**

Practice assessment and care coordination skills in a practicum working with older adults in a variety of settings. Prerequisites: GRNS 407, GRNS 408. Co-requisite: GRNS 412.

**GRNS 414. Prim Care Acute&Comm Hlth Cond. 3 Credits.**

Focus will be on the assessment, evaluation and management of common episodic conditions in primary care FNP & AGNP. Prerequisites: GRNS 407, GRNS 408, GRNS 417, GRNS 418. Co-requisite: GRNS 415.

**GRNS 415. Practicum:Acute&Com Cond AGNP. 1 Credit.**

Practicum experience for assessment, evaluation and management of common episodic conditions in primary care AGNP. Prerequisites: GRNS 407, GRNS 408, GRNS 417, GRNS 418. Co-requisite: GRNS 414.

**GRNS 416. Practicum:Acute&Com Cond FNP. 1 Credit.**

Practicum experience for assessment, evaluation and management of common episodic conditions in primary care FNP Track. Prerequisites: GRNS 407, GRNS 408, GRNS 409, GRNS 410, GRNS 411, GRNS 417, GRNS 418. Co-requisite: GRNS 414.

**GRNS 417. Mgt Women & Gendered Hlth Care. 2.25 Credits.**

Advanced nursing practice focusing on the assessment, diagnosis, management, and evaluation of acute and chronic health conditions commonly encountered in the area of women's and gendered related health conditions. Prerequisites: GRNS 407, GRNS 408, GRNS 412. Co-requisite: GRNS 418.

**GRNS 418. Practicum:Women Gender Splcly. 0.75 Credits.**

Practicum experience for assessment, evaluation and management of common conditions of women and other gendered health conditions in primary care for FNP/AGNP. Additional practicum hours in various specialty settings. Prerequisites: GRNS 407, GRNS 408, GRNS 412. Co-requisite: GRNS 417.

**GRNS 419. Prim Care Chron/Cmplx Hth Cond. 3 Credits.**

Focuses on the refinement diagnostic and therapeutic interventions in the provision of primary health care to individuals and families with chronic and complex health conditions. Prerequisites: GRNS 414, GRNS 415 or GRNS 416 and Comprehensive Exam. Co-requisites: GRNS 420 or GRNS 421.

**GRNS 420. Practicum:Chrn&Cplx Cond AGNP. 2.5 Credits.**

Practicum focuses on the refinement diagnostic and therapeutic interventions in the provision of primary health care to individuals and families with chronic and complex health conditions. Prerequisites: GRNS 412, GRNS 414, GRNS 415. Co-requisite: GRNS 419.

**GRNS 421. Practicum:Chrc&Cmplx Cond FNP. 2.5 Credits.**

Focuses on the refinement diagnostic and therapeutic interventions in the provision of primary health care to individuals and families with chronic and complex health conditions. Practicum. Prerequisites: GRNS 414, GRNS 416. Co-requisite: GRNS 419.

**GRNS 422. DNP Project Seminar I. 1 Credit.**

Provides structure for the development of a conceptual framework and methodological approach to the DNP project; a project where a clinically relevant problem is addressed through application of the best evidence. Prerequisites: GRNS 321, GRNS 324, NH 399, GRNS 326, GRNS 327. Pre/Co-requisite: GRNS 328.

**GRNS 423. DNP Project Practicum I. 1 Credit.**

This practicum guides project initiation including summary tasks and milestones, business plan, identification of resources assigned to tasks, and task interdependencies. Project monitoring, reporting, and management are required. Prerequisites: GRNS 422.

**GRNS 424. DNP Project Seminar II. 1 Credit.**

Students will prepare and implement the DNP Project. Prerequisites: GRNS 422, GRNS 423. Co-requisite: GRNS 425.

**GRNS 425. DNP Project Practicum II. 1 Credit.**

DNP project will be implemented including critical analysis of data and evidence for improving nursing practice. Project monitoring, reporting, and management are required. Prerequisites: GRNS 422, GRNS 423. Co-requisite: GRNS 424.

**GRNS 426. DNP Project Seminar III. 1 Credit.**

Requires the analysis, completion, and dissemination of the DNP project for the preparation of advanced practice nurse with the practice doctorate. Prerequisites: GRNS 424, GRNS 425, and GRNS 427 or GRNS 428.

**GRNS 427. Ex Nurse Leader Role Transform. 1 Credit.**

This individualized practicum focuses on synthesis and application of prerequisite learning in a mentored nurse executive role.

**GRNS 428. Executive Nurse Leader Immersi. 2 Credits.**

This practicum is a continuation of the role transformation learning experience. Prerequisite: GRNS 427.

**GRNS 430. Practicum: Clin Immersion APRN. 0.5 Credits.**

Provides an immersion clinical practicum of 60 hours for the primary care management of acute and common health problems encountered in primary care. To provide an opportunity for the student to promote optimal levels of well-being and functioning. Prerequisites: GRNS 407, GRNS 408, GRNS 412, GRNS 417, GRNS 418.

**GRNS 435. Health and Culture: Oaxaca. 3 Credits.**

Gain appreciation for cultural diversity by exploring the social, psychological, health practices and historical trajectories of Oaxacan perceptions within the overarching theme of health. Prerequisites: Graduate standing and instructor permission.

**GRNS 491. Doctoral Dissertation Research. 1-18 Credits.****GRNS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GRNS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GREEK (GRK)****Courses****GRK 205. Greek Philosophers. 3 Credits.**

Dialogues of Plato with attention to language and dialectical method; Aristotle, Xenophon or Presocratic philosophers may be read. Alternate years, as needed. Prerequisite: GRK 052 or equivalent.

**GRK 206. Greek Epic. 3 Credits.**

Reading in the Iliad and Odyssey. Problems of epic composition and language together with mythological and historical background. Alternate years, as needed. Prerequisite: GRK 052 or equivalent.

**GRK 211. Greek Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Greek majors. Prerequisite: GRK 052 or equivalent. Co-requisite: GRK at the 200-level.

**GRK 212. Greek Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Greek majors. Prerequisite: GRK 052 or equivalent. Co-requisite: GRK at the 200-level.

**GREEK & LATIN (GKLT)****Courses****GKLT 381. Seminar. 0 or 3 Credits.**

Intensive study at the graduate level of Greek and Latin authors not read in the candidate's undergraduate program. Prerequisite: 200-level LAT or the equivalent.

**GKLT 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**GKLT 391. Master's Thesis Research. 1-6 Credits.****GKLT 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GKLT 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**GKLT 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**HEALTH EDUCATION (EDHE)****Courses****EDHE 382. Teaching Internship. 3-8 Credits.**

Supervised teaching experiences on a full-time basis, with related seminars in teaching subject. Prerequisite: Permission of coordinator of Professional Laboratory Experiences.

**EDHE 391. Master's Thesis Research. 1-12 Credits.**

Thesis topic must be approved by a faculty committee.

**EDHE 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDHE 393. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**EDHE 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDHE 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## HEALTH (HLTH)

### Courses

#### **HLTH 241. D2: Exploring Healthcare Systems. 3 Credits.**

Explores a healthcare system outside the USA. Common elements in all healthcare systems are required for effective and efficient delivery. Field visits, presentations, and cultural exposure are included in the program. Prerequisite: Instructor permission.

#### **HLTH 287. Health Coach Immersion Advance. 1 Credit.**

Interactive comprehensive evaluation course for Integrative Health & Wellness Coaching for students to refine and demonstrate the Health and Wellness Coaching session. The class is interspersed with Integrative therapies that support healthy behavioral change and compassionate self-awareness. Required for NBHWC Certification Exam. Prerequisites: HLTH 187, HLTH 188, HLTH 189. Co-requisites: HLTH 288, HLTH 289.

#### **HLTH 288. Motivational Interview Advance. 0 or 1 Credits.**

Students learn the theoretical framework, strategies and techniques of advanced motivational interviewing, positive psychology and behavioral change. This course examines evidence-based practice as it relates to skillful conversation, clinical interventions and strategies to actively engage complex clients in health-related behavior change. Required for NBHWC Exam. Prerequisites: HTLH 187, HLTH 188, HLTH 189. Co-requisites: HLTH 287, HLTH 289.

#### **HLTH 289. Health Coach Skill Lab Advance. 0 or 2 Credits.**

Interactive course where students learn to apply advanced motivational interviewing skills to the practice of Integrative Health & Wellness Coaching. Advanced coaching skills/structure with complex patients/situations and professional conduct will be covered. Required for NBHWC National Certification Exam. Prerequisites: HTLH 187, HLTH 188, HLTH 189. Co-requisites: HLTH 287, HLTH 288.

#### **HLTH 292. HLTH Wellness Coach Practicum. 2 Credits.**

This course supports students as they integrate relevant knowledge from their academic Integrative Health and Wellness Coaching studies through a practical learning opportunity. Through classroom and practicum experiences, students will have the opportunity to build upon their learnings as an emerging health and wellness coach. Prerequisites: HLTH 187, HLTH 188, HLTH 189.

## HIGHER EDUCATION (EDHI)

### Courses

#### **EDHI 300. Prgrm Eval & Assess in HESA. 3 Credits.**

Focuses on promoting an understanding of assessment and evaluation in student affairs with particular emphasis on the ACPA/NASPA Assessment, Evaluation, and Research professional competency area. Students will learn how to implement an assessment plan and effectively report assessment efforts to broad audiences. Prerequisite: Graduate Student standing or Instructor permission.

#### **EDHI 319. Internship. 1-6 Credits.**

Students will undertake an approved internship in an institution which reflects the particular area of interest and needs of the student. Prerequisite: Instructor permission.

#### **EDHI 361. The (Un)Changing Academy. 3 Credits.**

This course examines the historical trends that have shaped higher education and the tensions around stability and change affecting colleges and universities. Prerequisite: Graduate standing.

#### **EDHI 362. College Students and Contexts. 3 Credits.**

An overview of college and university contexts, including the impact of various environments on student success.

#### **EDHI 363. Controversies of the Academy. 3 Credits.**

Critical and timely look at challenges confronting campus leaders. Implications for administrative practice shape seminar conversations of readings and case studies. Pre/co-requisite: Graduate standing or permission.

#### **EDHI 364. Helping Skills in Stdn Affairs. 3 Credits.**

An exploration of studies, techniques, and methods for advising and helping skills in higher education and student affairs administration.

#### **EDHI 375. Social Justice/Inclusion in HE. 3 Credits.**

Explores cultural pluralism philosophies, racial identity development, racial incidences, and educational practices related to racism and diversity for implementation in higher education. Prerequisite: Graduate standing.

#### **EDHI 376. Student Development Theory. 3 Credits.**

Explores student development theories and research relevant to student learning and personal development; includes the ability to apply theory to improve and inform student affairs and teaching practice.

#### **EDHI 377. Higher Education Law. 3 Credits.**

Examines the relationship between higher education and the law, including how various substantive areas of the law affect colleges/universities and their stakeholders. Focuses on the major topical areas, key concepts, sociocultural contexts, and precedential cases pertinent to the law and higher education. Prerequisite: Graduate student standing.

#### **EDHI 380. Professional Problems in Educ. 3 Credits.**

Designed to cover selected educational problems in depth. The major emphasis will be on intensive and critical analysis of the literature and practice in a given area.

#### **EDHI 383. Higher Ed Admin & Organization. 3 Credits.**

Introduction to concepts of administration and organization as applied to contemporary higher education setting. Characteristics of organizations, dynamic elements of administration, and theories and processes of change.

#### **EDHI 385. Foundations & Functions of CSP. 3 Credits.**

Overview of the work of the student affairs profession, including philosophical base, historical development, current practices, and future trends. Prerequisite: Higher Education and Student Affairs majors.

#### **EDHI 387. Seminar in Higher Education. 1-3 Credits.**

Designed for graduate students concentrating in programs in Higher Education. Analysis and discussion of current issues and problems in higher education.

**EDHI 390. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDHI 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

**EDHI 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDHI 393. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EDHI 395. Lab Experience in Education. 2 Credits.**

Practica internships, offered in various University departments and offices, enable students to integrate conceptual knowledge with professional practices. Prerequisite: Graduate standing in HESA.

**EDHI 396. Capstone:Eth,Val&Mean/High Ed. 3 Credits.**

An applied student affairs seminar featuring ethical problem-solving, appreciation of religious pluralism, and approaches to facilitating the search for moral and spiritual meaning in the American university.

**EDHI 397. Problems in Education. 1-6 Credits.**

Individual work on a research problem selected by the student in consultation with a staff member. Prerequisite: Twelve hours in education and related areas; endorsement by a sponsoring faculty member.

**EDHI 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EDHI 491. Doctoral Dissertation Research. 1-12 Credits.****EDHI 493. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EDHI 495. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**HISTORIC PRESERVATION (HP)****Courses****HP 200. History American Architecture. 3 Credits.**

Study of architectural history to gain fluency in the stylistic terms so essential to historic preservation and to public support for conserving our architectural heritage. Prerequisites: Admission to the Historic Preservation graduate program; or twelve hours of History and minimum Junior standing.

**HP 201. History on the Land. 3 Credits.**

Identifying and interpreting evidence of the cultural forces - early settlement patterns, transportation, industry, agriculture, planning, conservation - that have shaped our land, buildings, towns, and cities. Prerequisites: Admission to the Historic Preservation graduate program; or twelve hours of History and minimum Junior standing. Cross-listed with: HST 201.

**HP 205. Historic Preservation Law. 3 Credits.**

Legal issues in conservation of the built environment. Basic legal techniques for protection of historic structures (historic districts, protective legislation, easements, covenants). Study of significant court decisions.

**HP 206. Rschg Historic Structure/Sites. 3 Credits.**

Methods for researching historic structures and sites using archival and physical evidence, deciphering archaic building technologies, and documenting structures through professional reports, architectural photography, measured drawings.

**HP 302. Community Preservation Project. 3 Credits.**

Third-semester graduate students apply developed professionals skills to actual community preservation problems. Projects include strategy development, securing and allocating funds, research, advocacy, and implementation. Prerequisite: Historic Preservation major.

**HP 303. Grad Internship. 3 Credits.**

Participants will devote a semester to preservation within an appropriate institution or agency. Prerequisite: HP 304 or HP 305.

**HP 304. Contemp Preservation Plan&Pol. 3 Credits.**

This introduction to the professional practice of preservation planning traces the evolution of the historic preservation movement and examines contemporary preservation policy-making issues. Prerequisite: HP 200.

**HP 305. Hst Preservation Pract Methods. 3 Credits.**

This course introduces students to professional practice methods for conducting historic site and structures surveys. National Register nominations, and rehabilitation investment tax credit application projects. Prerequisites: HP 200, HP 205.

**HP 306. Architectural Conservation I. 3 Credits.**

An examination of the physical properties of historic building materials, their deterioration mechanisms, and strategies for assessing conditions, conserving and rehabilitating historic resources. Lecture and lab. Prerequisite: HP 206.

**HP 307. Architectural Conservation II. 3 Credits.**

A continuation of Architectural Conservation I, emphasizing an integrated examination of historic preservation through lectures, seminars, and field and laboratory research projects. Prerequisite: HP 306.

**HP 308. Mgmt of Historic Site Museums. 3 Credits.**

Provides essential training for the management of historic site museums and will give students an opportunity to study and apply best practices established by national standards for preservation and restoration in the context of Vermont's state historic sites as study models. Prerequisites: HP 306.



**HP 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**HP 391. Master's Thesis Research. 1-6 Credits.**

Total of six hours required.

**HP 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**HP 395. Advanced Special Topics. 1-3 Credits.**

Credit as arranged.

**HP 397. Special Readings & Research. 1-6 Credits.**

Credit as arranged.

**HISTORY (HST)****Courses****HST 201. History on the Land. 3 Credits.**

Identifying and interpreting evidence of the cultural forces - early settlement patterns, transportation, industry, agriculture, planning, conservation - that have shaped our land, buildings, towns, and cities. Prerequisites: Admission to the Historic Preservation graduate program; or twelve hours of History and minimum Junior standing. Cross-listed with: HP 201.

**HST 209. Seminar in Global History. 3 Credits.**

Topics examining themes in Global history. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Twelve hours of History; minimum Junior standing.

**HST 224. Seminar in Medieval Europe. 3 Credits.**

Topics examining themes in Medieval European history. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 225. Seminar in Early Modern Europe. 3 Credits.**

Topics examining themes in Early Modern European history. Representative topics: Books & Readers in Europe, 1250- 1650. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 227. Seminar in Modern Europe. 3 Credits.**

Topics examining themes in Modern European history and Holocaust Studies. Representative topics: The Holocaust & Memory; Auschwitz; The Holocaust in Poland. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing. Cross-listed with: HS 227.

**HST 240. D2: Comparative Slavery. 3 Credits.**

History of slavery from a comparative perspective, including Classical Antiquity, Islam and the Middle East, Africa, Latin America, and the Southern United States. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 250. Seminar in East Asian Hst. 3 Credits.**

Topics examining East Asian history. Representative topics: Postwar Japan; Japan in the World; Modern Japan-China Relations. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 252. Seminar on China. 3 Credits.**

Topics examining Chinese history. Representative topics: China under Chairman Mao; 20th-century China; China and the West. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 265. Seminar in Canadian History. 3 Credits.**

Topics in Canadian history. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Twelve hours of History; minimum Junior standing.

**HST 271. Seminar in American Social Hst. 3 Credits.**

Topics examining themes in American social history. Representative topics: US Social History. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 275. Seminar in Early American Hst. 3 Credits.**

Topics examining themes in early American history. Representative topics: American Slavery; Early Republic. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 280. D2: Queer Lives: LGBT History. 3 Credits.**

Advanced readings and research on the diverse history of LGBT peoples in Europe and North America with a focus on case studies, recent scholarship, and major theoretical works. Prerequisites: minimum Junior standing. Cross-listed with: GSWS 280.

**HST 284. Seminar in Vermont History. 3 Credits.**

Topics exploring themes in Vermont history. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: Twelve hours of History; minimum Junior standing.

**HST 301. Graduate Historiography. 3 Credits.**

Historical methods, philosophy of history, and the history of history writing. Prerequisite: Graduate students only.

**HST 391. Master's Thesis Research. 1-6 Credits.**

Required of all candidates for the M.A. who are writing a thesis. Normally arranged for two semesters at three hours each. Prerequisite: Graduate students only.

**HST 393. Graduate Internship. 1-6 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member the instructor of record, for which academic credit is awarded. Offered at department discretion. Prerequisite: Instructor permission.

**HST 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Graduate standing.

**HST 397. Special Readings and Research. 1-6 Credits.**

Directed individual study of areas not appropriately covered by existing courses. Prerequisite: Instructor permission.

## HUMAN DEVELOPMENT & FAMILY SCIENCE (HDF)

### Courses

**HDF 260. Family Ecosystem. 3 Credits.**

Family viewed in and as an environment for human development. The family ecological approach applied to practical family concerns. Prerequisites: HDF 161, HDF 189, PSYS 053 OR EDFS 209 OR SOC 100 OR SWSS 164; Minimum Junior standing.

**HDF 263. Advanced Child Development. 3 Credits.**

Survey of professional literature in child development with special emphasis on influence of early life experiences throughout the life cycle. Prerequisites: HDF 161, HDF 189; PSYS 053 OR EDFS 209 OR SOC 100 OR SWSS 164; Minimum Junior standing.

**HDF 266. Seminar in Human Development. 3 Credits.**

Intensive study of issues in human development and their application in a wide variety of professional areas. May be taken more than once up to a maximum of 12 hours. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisites: HDF 161, HDF 189, PSYS 053 OR EDFS 209 OR SOC 100 OR SWSS 164; Minimum Junior standing.

**HDF 267. Adv Gender & Sexual Iden. 3 Credits.**

Intensive study of lesbian, gay, bisexual, and/or transgender identities, families, and communities in diverse individual, social, political, and cultural contexts. Prerequisite: Minimum Junior standing.

**HDF 268. Sem In Close Relationships. 3 Credits.**

Causal conditions influencing formation, maintenance, and dissolution of intimate adult relationships. Draws on theory and students' personal experiences to explicate the nature of close relationships in contemporary American society. Prerequisite: Minimum Junior standing.

**HDF 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

## HUMANITIES (HUMN)

### Courses

**HUMN 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**HUMN 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## INTERNSHIP (SINT)

### Courses

**SINT 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member/faculty-staff team with faculty member as instructor of record; academic credit not degree eligible; offered at department discretion. May be crosslisted with departmental internship courses.

## INTERPROFESSIONAL HEALTH SCIENCES (IHS)

### Courses

**IHS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**IHS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**IHS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**IHS 401. Topics & Measurement in IHS. 3 Credits.**

Fundamental interprofessional health sciences (IHS) concepts, principles, equipment, and tools for conduction quantitative research in the areas of human movement, communication, and physical activity.

**IHS 402. Applying the ICF Model in IHS. 3 Credits.**

Application of International Classification of Functioning (ICF) concepts to translational research in human function and rehabilitation science.

**IHS 430. Sem/Pract Teach & Learn IHS. 3 Credits.**

Students will be exposed to an mentored in the fundamentals of health professions teaching and learning and gain applied experience in the university classroom.

**IHS 450. Prof Writing & Grantsmanship. 2 Credits.**

Topics include grant selection and approval processes, selection of appropriate publication outlets for a given research study, and report of research results. Prerequisites: Graduate student standing, masters level students require Instructor permission.

**IHS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**IHS 491. Doctoral Dissertation Research. 1-18 Credits.**

Directed interprofessional dissertation research in Interprofessional Health Sciences. Prerequisite: Doctoral candidacy status.

**IHS 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion. Prerequisite: Graduate standing.

**IHS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**IHS 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**LATIN (LAT)****Courses****LAT 204. Roman Epic Poetry. 3 Credits.**

Extensive reading in Lucretius, Vergil, Ovid, and others. Alternate years, as needed. Prerequisite: LAT 101 or LAT 102 or equivalent.

**LAT 211. Latin Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Latin majors. Prerequisite: LAT 101 or LAT 102 or equivalent. Co-requisite: LAT at the 200-level.

**LAT 212. Latin Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Latin majors. Prerequisite: LAT 101 or LAT 102 or equivalent. Co-requisite: LAT at the 200-level.

**LAT 227. Roman Lyric Poets. 3 Credits.**

Selections from the works of Catullus, Horace, Propertius, and Tibullus. Alternate years, as needed. Prerequisite: LAT 101 or LAT 102 or equivalent.

**LAT 251. Roman Letters. 3 Credits.**

Letters of Cicero, Horace, and Pliny. Alternate years, as needed. Prerequisite: LAT 101 or LAT 102 or equivalent.

**LAT 253. Roman Oratory. 3 Credits.**

Selections from Cicero's *De Oratore*, *Orator*, *Brutus*, and from his speeches. Historical development of forensic and other rhetorical canons. Alternate years, as needed. Prerequisite: LAT 101 or LAT 102 or equivalent.

**LEADERSHIP AND POLICY STUDIES (EDLP)****Courses****EDLP 300. Leading Learning Organizations. 3 Credits.**

Course topics include the roles, functions, relationships and responsibilities in creating learning communities; leadership values, styles and behavior; trends and issues that impact organizations. Prerequisites: Graduate standing or Instructor permission.

**EDLP 310. Effecting & Managing Change. 3 Credits.**

Change processes and models, the dynamics of change within the organization, and external factors affecting change. Prerequisite: Twelve hours of Graduate study.

**EDLP 320. Collaborative Consultation. 3 Credits.**

Adult development and group dynamics theory provide the knowledge base for collaborating with parents and teachers to meet the diverse needs of students with disabilities. Cross-listed with: EDSP 387.

**EDLP 333. Education Finance & Policy. 3 Credits.**

Course examines national, state and local policies of educational financing, measurement of equity, state aid to schools, taxation, school finance litigation and cost-effectiveness analysis. Prerequisites: Twelve hours in Education or Instructor permission.

**EDLP 335. Staff Evaluation & Development. 3 Credits.**

Supervisory roles, behavior, responsibilities, and relationships in educational and social service organizations; processes for evaluating the performance, promoting the development of staff, and increasing organization effectiveness.

**EDLP 336. Curr Mgmt in Ed & Soc Srv Org. 3 Credits.**

Approaches to coordinating and managing curriculum or programs at the classroom, department, or organizational level; examination of factors effecting design and delivery of curriculum; developing curriculum guides and assessment methods. Prerequisite: Eighteen hours of education and related areas or appropriate professional certification.

**EDLP 350. Survey Research Methods. 3 Credits.**

This course introduces survey research design, implementation and planning processes.

**EDLP 365. Policy to Practice. 3 Credits.**

Education policy development and governance; frameworks for understanding and assessing education policy implementation by agencies, districts, schools, and classroom teachers.

**EDLP 380. Professional Problems in Educ. 0-3 Credits.**

Designed to cover selected educational problems in depth. The major emphasis will be on intensive and critical analysis of the literature and practice in a given area.

**EDLP 390. Internship. 1-6 Credits.**

Students will undertake an approved internship in an institution which reflects the particular area of interest and needs of the student. Prerequisite: Instructor permission.

**EDLP 391. Master's Thesis Research. 1-12 Credits.**

Thesis topic must be approved by a faculty committee.

**EDLP 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDLP 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EDLP 397. Problems in Education. 1-6 Credits.**

Individual work on a research problem selected by the student in consultation with a staff member. Prerequisites: Twelve hours in education and related areas; endorsement by a sponsoring faculty member.

**EDLP 400. ProSeminar: Doctoral Intro. 3 Credits.**

Designed to build a learning community among students and faculty to explore issues related to careers and research in educational policy; provides opportunities for collaboration, planning, academic research, relevant practical experiences and site visits. Pre/Co-requisites: Educational Policy and Leadership Studies doctoral student standing.

**EDLP 407. Epistemologies in Education. 3 Credits.**

Introduces students to foundational traditions and practices related to epistemologies that shape conceptual frameworks in educational research. Provides both breadth and depth to students' understandings of definitions of knowledge, criteria for evaluating knowledge claims, and the potentials and limitations to each epistemology.

**EDLP 409. Applied Educational Research. 3 Credits.**

Introduction to philosophical and methodological foundations of interpretive and empirical-analytic research with emphasis on systems change. Preparation of critical readers and synthesizers of research studies. Prerequisite: Doctoral level standing.

**EDLP 419. Quantitative Research Methods. 3 Credits.**

This course provides knowledge and skill in conducting quantitative research studies for education and social services. Students apply social science research methods in a laboratory setting and produce a model study. Pre/co-requisite: EDLP 409.

**EDLP 429. Adv Quantitative Rsch Methods. 3 Credits.**

This course covers advanced statistical techniques that are commonly used in education and social sciences. Pre/co-requisite: EDLP 419.

**EDLP 431. Adv Sem Organizational Ldrshp. 3 Credits.**

Students inquire into new theories on leadership and the cognitive processes that define the intentions, values, beliefs, and future perspectives of themselves as leaders. Prerequisite: Doctoral level standing.

**EDLP 437. Sem on Educational Policy. 3 Credits.**

An examination of the nature and function of education policy, emphasizing the structure and processes in education policy formulation and implementation. Prerequisite: Doctoral level standing.

**EDLP 439. Hierarchical Linear Modeling. 3 Credits.**

This course serves as an introduction to the concepts and applications of Hierarchical Linear Modeling. Pre/co-requisites: EDLP 419 and EDLP 429.

**EDLP 449. Dissertation Writing Seminar. 3 Credits.**

This seminar is designed for Graduate students working on their dissertation proposals or dissertations.

**EDLP 459. Mixed Method Research. 3 Credits.**

An advanced research seminar designed to introduce students to mixed methods research, which integrate qualitative and quantitative approaches, inquiries, and data collection and analysis strategies into a single study or research project. Prerequisite: Documented completion of basic quantitative and qualitative research methods courses.

**EDLP 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**EDLP 491. Doctoral Dissertation Research. 1-12 Credits.**

EDLP 494. Independent Graduate Research. 1-8 Credits. Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDLP 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**LIBRARY SCIENCE (EDLI)****Courses****EDLI 371. Children's/YA Literature. 3 Credits.**

Designed as a survey of the context and merit of children's and young adult literature, that is, books written for and read by readers from ages Pre K-Grade 12. Prerequisites: Twelve hours in education and related areas.

**EDLI 372. Manage Schl Library Media Ctrs. 3 Credits.**

Examines the fundamental principles and issues of school librarianship in contemporary educational communities. Overview of administrative issues, including development of policies and procedures, budget preparation, personnel administration, and public relations. Prerequisite: Twelve hours in education and related areas or Instructor permission.

**EDLI 373. Dev/Org Schl Libr Collections. 3 Credits.**

Principles for developing and organizing physical and virtual library collections, including evaluation, selection, and acquisition of resources appropriate for students, staff and other patrons; methods used to access library collections, standard cataloging practices, and selection of integrated library systems (ILS). Prerequisites: EDLI 372 or equivalent.

**EDLI 374. Design Learning in Libr/Med Ct. 3 Credits.**

Explores theories and best practice for teaching and learning in today's library/media learning centers. It also examines the school librarians role as teacher and instructional collaborator with an emphasis on curriculum design, inquiry learning, and information literacy standards. Prerequisite: EDLI 372 or equivalent.

**EDLI 376. Information Sources & Services. 3 Credits.**

Focuses on the librarian's role in curating, using, teaching, evaluating, and providing service with multimedia reference materials for the physical and virtual library learning spaces to meet the needs of a diverse learning community. Prerequisite: EDLI 372 or equivalent.

**EDLI 377. Info Tech Schl Libr Media Ctrs. 3 Credits.**

Designed to provide both a theoretical and a pragmatic understanding of information technology in the modern school library with a focus on the integration of technology within teaching and learning. Prerequisite: EDLI 372 or equivalent.

**EDLI 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDLI 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**LINGUISTICS (LING)****LITERACY (EDLT)****Courses****EDLT 222. Cltvate Chil Lit in El/Mid Sch. 3 Credits.**

Contemporary research and practice related to the development of strategic, motivated, and independent readers and writers. Emphasis on integrating reading and writing within collaborative environments. Prerequisite: Twelve hours in Education and/or related areas including an introductory course in reading or Instructor permission.

**EDLT 236. Multicultural Children's Lit. 3 Credits.**

Current research in multicultural education and literacy informs examination of representation and perspective in literature for children and youth. Perspectives include religion, race, gender, SES.

**EDLT 319. Internship for Spec Pers in Ed. 1-18 Credits.**

**EDLT 375. Lit Assmt: Understand Indiv Dif. 3 Credits.**  
Designing and using assessment strategies to improve and adapt instruction. Identify, evaluate, and document literacy development, emphasizing students at risk of reading failure. Prerequisite: EDLT 222 or Instructor permission.

**EDLT 376. Clin/Tut Appr for Lit Intrvntn. 3-6 Credits.**

Approaches for prevention, correction of reading and written language difficulties. Supervised teaching of individuals and/or small groups experiencing reading and language problems. Apprenticeships in reading instructional program. Pre/co-requisite: Three graduate credits in Reading/Language Arts or Instructor permission.

**EDLT 379. Seminar in Reading Instruction. 3 Credits.**

Study of reading relative to total curriculum. Significant trends, concepts related to specific problems, programs in reading and language arts instruction; role of supervisor and reading consultant. Prerequisite: Fifteen hours of Education including nine hours in the field of reading and language education; Instructor permission.

**EDLT 385. Critical Issues in Lang&Litrcy. 3 Credits.**

Explores the relationships between language and literacy and cultural-linguistic influences on language/literacy development. Topics include phonemic awareness, phonics instruction, fluency, comprehension, spelling and writing. Pre/co-requisite: EDLT 222; nine graduate credits in related areas; Instructor permission.

**EDLT 391. Master's Thesis Research. 1-18 Credits.****EDLT 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDLT 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDLT 395. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**EDLT 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**MASTER OF BUSINESS ADMIN (MBA)****Courses****MBA 301. Foundations of Management. 0 or 10 Credits.**

Provides background on sustainable business practices and offer tools to analyze a business and structure a business opportunity, including how to: develop/defend competitive advantage, perform financial analysis, implement marketing strategy, organize a firm, and manage technological innovation. Prerequisite: MBA standing.

**MBA 302. Bldg a Sustainable Enterprise. 0 or 9 Credits.**

Provides students with the tools for starting and building a sustainable business. Topics include: public policy, value creation, assessments under market uncertainty, the meaning of sustainability and CSR, triple bottom line reporting, ethics for entrepreneurs, and mindfulness. Prerequisite: MBA standing.

**MBA 303. Growth of Sust Enterprise. 0 or 9 Credits.**

Provides tools for managing the growth of a sustainable business. Topics include: entrepreneurial leadership, systems tools for sustainability, business law, negotiations, financing an innovative venture, and sustainable operations/green supply chains. Students will frame and research their practicum project. Prerequisite: MBA standing.

**MBA 304. Focusing on Sustainability. 0 or 9 Credits.**

Provides students with an understanding of how to run a responsible/sustainable business within the constraints of finite physical resources and legal frameworks. Students will explore how management approaches, creativity, and technology can find opportunities within those constraints. Prerequisite: MBA standing.

**MBA 305. Sus Entrepreneurship in Action. 0 or 6 Credits.**

Provides a meaningful hands-on experience through the development of a business plan for a new sustainable venture. Students will spend three months conceptualizing, designing, and presenting a business case for a new sustainable venture. Prerequisite: MBA Graduate student standing.

**MBA 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MBA 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**MATERIALS SCIENCE (MATS)****Courses****MATS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MATS 391. Master's Thesis Research. 1-18 Credits.****MATS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MATS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MATS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MATS 491. Doctoral Dissertation Research. 1-18 Credits.****MATS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MATS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MATHEMATICS FOR EDUCATORS (MAED)****Courses****MAED 315. Capstone VMI Experience. 3 Credits.**

This course concludes the VMI's school-based-research component. Teachers synthesize their coursework and field experiences and revisit key mathematical concepts from arithmetic through calculus. Prerequisite: 30 hours MAED courses.

**MAED 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MATHEMATICS (MATH)****Courses****MATH 230. QR: Ordinary Diffrentl Equation. 3 Credits.**

Solutions of linear ordinary differential equations, the Laplace transformation, and series solutions of differential equations. Prerequisite: MATH 121. Corequisite: MATH 122 or MATH 124. Credit not granted for more than one of the courses MATH 230 or MATH 271.

**MATH 235. QR: Mathematical Models&Anlysis. 3 Credits.**

Techniques of Calculus and linear algebra are applied for mathematical analysis of models of natural and human-created phenomena. Students are coached to give presentations. Prerequisites: MATH 121; MATH 122 or MATH 124 or MATH 230 or MATH 271.

**MATH 237. QR: Intro to Numerical Analysis. 3 Credits.**

Error analysis, root-finding, interpolation, least squares, quadrature, linear equations, numerical solution of ordinary differential equations. Prerequisites: MATH 121; MATH 122 or MATH 124 or MATH 271; CS 020 or CS 021. Cross-listed with: CS 237.

**MATH 241. QR: Anyl in Several Real Vars I. 3 Credits.**

Properties of the real numbers, basic topology of metric spaces, infinite sequences and series, continuity. Prerequisites: MATH 141 or MATH 151 or C- or better in Math 052; MATH 121; MATH 122 or MATH 124.

**MATH 242. QR: Anyl Several Real Vrbes II. 3 Credits.**

Differentiation and integration in n-space, uniform convergence of functions, fundamental theorem of calculus, inverse and implicit function theorems. Prerequisite: MATH 241.

**MATH 247. QR: Complex Analysis. 3 Credits.**

An introduction to the theory of analytic functions of one complex variable, covering the techniques of complex analysis useful in science and engineering as well as the theory. Topics include complex numbers, analytic and holomorphic functions, power and Laurent series expansions, and Cauchy's theorems on integration. Prerequisites: MATH 052 or CS 064; MATH 121.

**MATH 251. QR: Abstract Algebra I. 3 Credits.**

Basic theory of groups, rings, fields, homomorphisms, and isomorphisms. Prerequisites: MATH 141 or MATH 151 or C- or better in MATH 052; MATH 122 or MATH 124.

**MATH 252. QR: Abstract Algebra II. 3 Credits.**

Modules, vector spaces, linear transformations, rational and Jordan canonical forms. Finite fields, field extensions, and Galois theory leading to the insolvability of quintic equations. Prerequisite: MATH 251.

**MATH 254. QR: Topology. 3 Credits.**

An introduction to point set topology. Topics include open and closed sets, continuous functions, compactness, connectedness, metric and Hausdorff spaces. If time permits, introduction to algebraic topology through topics such as the fundamental group. Provides background for analysis and graduate topology courses as well as for topological data science. Prerequisites: MATH 052 or CS 064; MATH 121 or MATH 122 or MATH 124.

**MATH 255. QR:Elementary Number Theory. 3 Credits.**

Divisibility, prime numbers, Diophantine equations, congruence of numbers, and methods of solving congruences. A significant portion of the course devoted to individual and/or team projects. Prerequisite: MATH 052; MATH 121 or MATH 122 or MATH 124.

**MATH 259. QR: Cryptography. 3 Credits.**

A survey of classical and modern cryptography. The strengths and weaknesses of various cryptosystems are discussed. Topics include specific public-key and private-key cryptosystems such as RSA, ElGamal, and elliptic curve cryptosystems, as well as digital signatures and key exchange. Prerequisite: MATH 052 or CS 064; MATH 121 or MATH 122 or MATH 124.

**MATH 260. QR: Foundations of Geometry. 3 Credits.**

Complex numbers as tool to solve problems in Euclidean geometry. Two models of hyperbolic (non-Euclidean) geometry: Poincare and upper-half plane. Invariants and Moebius transformations. Prerequisite: MATH 052 or CS 064; MATH 121, MATH 122, or MATH 124; or Instructor permission.

**MATH 266. QR:Chaos,Fractals&Dynamical Syst. 3 Credits.**

Discrete and continuous dynamical systems, Julia sets, the Mandelbrot set, period doubling, renormalization, Henon map, phase plane analysis and Lorenz equations. Prerequisite: MATH 122 or MATH 124. CS 020 or CS 021 recommended. Cross-listed with: CSYS 266.

**MATH 268. QR:Mathematical Biology&Ecol. 3 Credits.**

Mathematical modeling in the life sciences. Topics include population modeling, dynamics of infectious diseases, reaction kinetics, wave phenomena in biology, and biological pattern formation. Prerequisite: MATH 122 or MATH 124; MATH 230 or MATH 271; or Instructor permission.

**MATH 271. QR:Adv Engineering Mathematics. 3 Credits.**

Differential equations, Laplace transforms, and systems of differential equations; brief introduction to Fourier series. Examples from engineering and physical sciences. Credit not granted for both MATH 230 and MATH 271. No credit for Mathematics majors. Prerequisite: MATH 121. Co-requisites: Preferred: MATH 122 or MATH 124; or MATH 120.

**MATH 273. QR:Combinatorial Graph Theory. 3 Credits.**

Paths and trees, connectivity, Eulerian and Hamiltonian cycles, matchings, edge and vertex colorings, planar graphs, Euler's formula and the Four Color Theorem, networks. Prerequisite: MATH 052.

**MATH 300. Principles of Complex Systems. 3 Credits.**

Introduction to fundamental concepts of complex systems. Topics include: emergence, scaling phenomena, and mechanisms, multi-scale systems, failure, robustness, collective social phenomena, complex networks. Students from all disciplines welcomed. Pre/co-requisites: Calculus and statistics required; Linear Algebra, Differential Equations, and Computer programming recommended but not required. Cross-listed with: CSYS 300.

**MATH 303. Complex Networks. 3 Credits.**

Detailed exploration of distribution, transportation, small-world, scale-free, social, biological, organizational networks; generative mechanisms; measurement and statistics of network properties; network dynamics; contagion processes. Students from all disciplines welcomed. Pre/co-requisites: MATH 300/CSYS 300, Calculus, and Statistics required. Cross-listed with: CSYS 303.

**MATH 330. Adv Ordinary Diff Equations. 3 Credits.**

Linear and nonlinear systems, approximate solutions, existence, uniqueness, dependence on initial conditions, stability, asymptotic behavior, singularities, self-adjoint problems. Prerequisite: MATH 230.

**MATH 331. Theory of Func of Complex Var. 3 Credits.**

Complex functions, differentiation and the Cauchy-Riemann equations, power and Laurent series, integration, calculus of residues, contour integration, isolated singularities, conformal mapping, harmonic functions. Prerequisite: MATH 242.

**MATH 333. Thry Functions Real Variables. 3 Credits.**

Lebesgue measure and integration theory, Monotone and Dominated Convergence Theorems and applications, product measures, basic theory of LP-spaces. Prerequisite: MATH 242.

**MATH 337. Numerical Diff Equations. 3 Credits.**

Numerical solution and analysis of differential equations: initial-value and boundary-value problems; finite difference and finite element methods. Prerequisites: MATH 121; MATH 122 or MATH 124; MATH 230 or MATH 271 or MATH 237 recommended.

**MATH 339. Partial Differential Equations. 3 Credits.**

Classification of equations, linear equations, first order equations, second order elliptic, parabolic, and hyperbolic equations, uniqueness and existence of solutions. Prerequisite: MATH 230.

**MATH 349. Nonlinear Partial Diff Eqs. 3 Credits.**

This course covers modern mathematical theories and numerical methods for nonlinear partial differential equations. Topics include: inverse scattering transform; solitons; bilinear method; Darboux transformation; solitary waves; Vakhitov-Kolokolov stability criterion; transverse instability; virial theorem; wave collapse; pseudo-spectral method; split-step method. Prerequisites: MATH 330 (or equivalent) or Instructor permission.

**MATH 350. Abstract Algebra III. 3 Credits.**

Advanced group theory and field theory. Prerequisites: MATH 252 or Graduate standing.

**MATH 351. Topics in Algebra. 3 Credits.**

Topics will vary each semester and may include algebraic number theory, algebraic geometry, and the arithmetic of elliptic curves. Repeatable for credit with Instructor permission. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: MATH 252.

**MATH 352. Abstract Algebra IV. 3 Credits.**

Ring theory and module theory at the graduate level, with emphasis on commutative algebra. Prerequisite: MATH 350.

**MATH 354. Algebraic Topology. 3 Credits.**

Homotopy, Seifert-van Kampen Theorem; simplicial, singular, and Cech homology. Prerequisite: MATH 241 or MATH 254.

**MATH 373. Topics in Combinatorics. 3 Credits.**

Topics will vary each semester and may include combinatorial designs, coding theory, topological graph theory, cryptography. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: MATH 251 or MATH 273.

**MATH 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MATH 391. Master's Thesis Research. 1-18 Credits.****MATH 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MATH 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MATH 395. Advanced Special Topics. 1-18 Credits.**

Subject will vary from year to year. May be repeated for credit.

**MATH 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MATH 491. Doctoral Dissertation Research. 1-18 Credits.****MATH 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MATH 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MECHANICAL ENGINEERING (ME)****Courses****ME 201. Biomaterials Engineering. 3 Credits.**

A materials science and engineering approach is used to explore the structure-function relationships of natural and bio-inspired materials for various engineering applications. The emphasis is on mechanical design and function. The medical applications of biomaterials will be discussed. Prerequisite: ME 101 or BME 112. Cross-listed with: BME 201.

**ME 203. Machinery Analysis & Synthesis. 3 Credits.**

Kinematic and kinetic analysis of two- and three-dimensional machines; kinematic synthesis, electromechanical and servo mechanisms; application to robotic mechanisms. Prerequisite: Senior standing in ME.

**ME 204. Biothermodynamics. 3 Credits.**

Inter-disciplinary; guides the student through the thermodynamics of living organisms, comprised of the study of energy transformation in the life sciences. Designed for students from the STEM disciplines. Covers Gibbs free energy, statistical thermodynamics, binding equilibria, and reaction kinetics. Prerequisites: ME 123, ME 124, or BME 112. Cross-listed with: BME 204.

**ME 206. Biomechanics of Human Motion. 3 Credits.**

Biomechanics of Human Motion will describe the typical processes-from small scale protein interactions to large scale joint torques-that result in human locomotion. Clinical problems and athletic performance will be discussed. Students will learn about musculoskeletal tissues related to force generation/transmission and will perform kinematic/kinetic analyses. Prerequisites: BME 011 or ME 012. Pre/Co-requisites: ME 101 or ME 111 or BME 111. Cross-listed with: BME 206.

**ME 207. Intro Biomedical Engineering. 3 Credits.**

Introduction to bioengineering science including biomechanics, biomaterials, biomedical imaging, rehabilitation engineering, biomedical computing, biomedical instrumentation, and transport phenomena. Prerequisite: Senior standing in all engineering majors other than Biomedical Engineering, Graduate Student standing with Instructor permission. Cross-listed with: EE 207.

**ME 208. Biomechanics: Tissue Engr. 3 Credits.**

Solid biomechanics including structure, function and mechanical properties of biological tissues. Tissue engineering involving cell mechanics, scaffold materials, and signaling. Current literature topics are covered. Prerequisites: ME 101 or BME 112. Cross-listed with: BME 208.

**ME 210. Control Systems. 3 Credits.**

Analysis and design of continuous and discrete-time control systems; stability, signal flow, performance criteria, classical and state variable methods, simulation design tools, computer-based realizations. Credit not given for more than one of the courses EE 110, ME 210. Prerequisites: EE 171 or ME 111. Cross-listed with: EE 210.

**ME 218. Numerical Methods for Engineer. 3 Credits.**

Foundational concepts of numerical integration, numerical differentiation, and numerical approximation and solution of differential and partial differential equations of the type encountered in the analysis of engineering problems and data processing. Prerequisites: MATH 271, CS 020; MATH 122 or MATH 124. Cross-listed with: CE 218.

**ME 234. Mechanical Vibrations. 3 Credits.**

Analysis, measurement, and control of mechanical vibrations; SDOF, MDOF, and rotating systems, forced, free, and random vibrations. Prerequisite: ME 111 or Senior/ Graduate standing in engineering or physical sciences.

**ME 236. Renewable Energy Harvesting. 3 Credits.**

Covers the engineering fundamentals of different renewable energy technologies, including wind power, tidal power, solar power, biomass, hydropower, etc. Focus placed on the mathematical derivation and application of small scale vibration energy harvesting technologies. Prerequisite: ME 143 or CE 160.



**ME 237. Turbulence. 3 Credits.**

Description of turbulent flows; statistical and modeling of turbulent flows; Navier Stokes as a dynamical system; experimental and numerical approaches. Prerequisite: ME 143.

**ME 238. Energy Systems Engineering. 3 Credits.**

Engineering assessment of both potentially sustainable and unsustainable practical primary energy systems. Examination of options of meeting demand and impacts on the environment. Prerequisite: ME 042.

**ME 239. Rocket Propulsion. 3 Credits.**

Flight mechanics and propulsion requirements for atmospheric and space flight. Thermochemistry of fuels and propellants. Operating principles of chemical, electrical and nuclear propulsion systems. Pre-co-requisites: ME 143/ME 240 recommended or permission of the Instructor.

**ME 240. Compressible Flow. 3 Credits.**

Theory of compressible flow. Normal and oblique shocks; expansion waves; unsteady wave motion; method of characteristics; linearized external flows; conical and 3D flows. Prerequisite: ME 143 or equivalent.

**ME 242. Adv Engr Thermodynamics I. 3 Credits.**

Foundations of statistical mechanics. Gases and crystals. Chemical equilibrium. Irreversible processes. Prerequisite: Senior/Graduate standing or permission.

**ME 243. Incompressible Flow. 3 Credits.**

Intermediate treatment of incompressible fluid flow; Navier-Stokes equations; two-dimensional potential flows; wing theory; vorticity and vortex structures; laminar and turbulent boundary layers. Prerequisites: ME 143 or equivalent.

**ME 245. Advanced Heat Transfer I. 3 Credits.**

Analytical methods for multidimensional steady and transient heat conduction; phase change and moving boundaries. Thermal radiation exchange in enclosures; view factors; emitting/absorbing gases. Prerequisites: ME 144 or equivalent, or by Instructor permission.

**ME 249. Computational Fluids Engr. 0 or 3 Credits.**

Project-based. Computational methods for solving the Navier-Stokes equations and combined thermo-fluid flows; finite-differences and finite-volume techniques; use of standard commercial CFD software. Prerequisite: ME 143 or equivalent.

**ME 250. Air Breathing Propulsion. 3 Credits.**

Presents a study on air-breathing propulsion systems. Initial focus will be on various types of engine systems, real and ideal parametric cycle analysis, and individual internal component performance. Will then move to contemporary propulsion topics and research that push aerospace systems to new flight envelopes. Prerequisites: ME 144, ME 240.

**ME 252. Mechanical Behavior Materials. 3 Credits.**

Isotropic and anisotropic elasticity; theory of plasticity; deformation mechanisms in crystalline solids; dislocation theory; creep behavior; advanced fatigue and fracture mechanisms. Prerequisites: ME 101; Instructor permission.

**ME 255. Adv Engineering Materials. 3 Credits.**

Advanced material processing; physical and mechanical principles of high-temperature alloys, light-weight materials, thin films, nanomaterials, and biomedical materials; elements of computational materials design. Prerequisites: Senior/Graduate standing; or Instructor permission.

**ME 257. Composite Materials. 3 Credits.**

Fibers, matrices. Unidirectional and short fiber composites. Experimental characterization. Prerequisite: ME 101.

**ME 259. Computational Solid Mechanics. 3 Credits.**

Project-based. Computational methods using the finite element analysis (FEA) applied to linear elastic and non-linear problems in the mechanics of deformable solids and structures, contact mechanics, and fracture mechanics. Hands-on computational experience using a commercial FEA software. Prerequisites: ME 014, MATH 124, and MATH 271, or equivalent.

**ME 265. QR: Integrated Product Dev. 3 Credits.**

Project-based course focusing on the entire product life cycle. Team dynamics, process and product design, quality, materials, management, and environmentally-conscious manufacturing. Prerequisite: Senior standing. Cross-listed with: BSAD 293.

**ME 270. Structural Dynamics. 3 Credits.**

Vibrations, matrices, earthquake engineering, stability and wave propagation. Prerequisites: Senior/Graduate standing in Engineering or physical sciences, or Instructor permission. Cross-listed with: CE 272.

**ME 271. Micro and Nano Systems. 3 Credits.**

Operating principles, fabrication and design of engineered systems with submillimeter dimensions. Prerequisites: Senior/Graduate standing in Engineering or physical sciences.

**ME 281. Seminar. 1 Credit.**

Presentation and discussion of advanced mechanical engineering problems and current developments. Prerequisite: Senior/Graduate engineering enrollment.

**ME 282. Seminar. 1 Credit.**

Presentation and discussion of advanced mechanical engineering problems and current developments. Prerequisite: Senior/Graduate engineering enrollment.

**ME 304. Adv Engineering Analysis I. 3 Credits.**

Analytical methods for the solution of partial differential equations in engineering mechanics and physics, including: eigenfunction expansions; Fourier series; Sturm-Liouville theory and special functions. Prerequisites: Graduate standing in engineering, mathematics, or physical sciences or Instructor permission.

**ME 305. Adv Engineering Analysis II. 3 Credits.**

Advanced analytical techniques for problems in engineering mechanics and physics, including: integral transform methods Green's functions, perturbation methods, and variational calculus. Prerequisites: ME 304 or equivalent.

**ME 312. Adv Bioengineering Systems. 3 Credits.**

Advanced bioengineering design and analysis for current biomedical problems spanning molecular, cell, tissue, organ, and whole body systems including their interactions and emergent behaviors.

**ME 336. Continuum Mechanics. 3 Credits.**

Tensors, conservation laws, field equations for solids and fluids.

**ME 338. Advanced Dynamics. 3 Credits.**

Application of Lagrange's equation, Hamilton's principle to mechanical systems. Systems with constraints. Matrix formulation of problems in kinematics, dynamics. Stability of linear, nonlinear systems.

**ME 343. Advanced Fluid Dynamics. 3 Credits.**

Stress in continuum; kinematics, dynamics; potential fields; Wing theory; Navier-Stokes equation; hydrodynamic stability; turbulence; laminar, turbulent boundary layer theory; transient flows; free laminar, turbulent flows; mixing.

**ME 346. Advanced Gas Dynamics. 3 Credits.**

Transonic flows; hypersonic flows and shock relations; boundary layer interactions; high-temperature gases and aerothermodynamics; rarefied flows; computational methods. Prerequisite: ME 240 or equivalent.

**ME 350. Multiscale Modeling. 3 Credits.**

Computational modeling of the physics and dynamical behavior of matter composed of diverse length and time scales. Molecular simulation. Coarse-graining. Coupled atomistic/continuum methods.

**ME 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ME 391. Master's Thesis Research. 1-18 Credits.****ME 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ME 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ME 395. Advanced Special Topics. 1-18 Credits.**

Advanced topics in recently developed technical areas. Prerequisites: three hours with Instructor permission.

**ME 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**ME 491. Doctoral Dissertation Research. 1-18 Credits.****ME 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ME 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MEDICAL LABORATORY SCIENCE (MLS)****Courses****MLS 221. Clinical Chemistry I. 3 or 4 Credits.**

Lectures and laboratory experiences introduce basic principles in clinical quantitative analysis and laboratory instrumentation; test results are correlated with clinical case studies. Prerequisites: ANPS 019 and ANPS 020; CHEM 031 and 032; CHEM 042 or CHEM 141.

**MLS 222. Clinical Chemistry II. 3 Credits.**

Advanced instruction in body chemistry and pathophysiology of disease with emphasis on diagnostic lab techniques in chemistry. Prerequisites: MLS 221, PATH 101.

**MLS 231. Hematology. 3-4 Credits.**

Advanced theory and analysis of blood cell physiology and related pathology. Concepts of hemostasis and clinical assessment methods. Prerequisites: One semester of organic chemistry, one semester of biochemistry.

**MLS 255. Clinical Microbiology II. 3 Credits.**

Comprehensive study of non-bacterial pathogenic microorganisms and their disease states in humans. Includes medical mycology, parasitology and virology. Prerequisites: MMG 065 or MMG 101.

**MLS 262. Immunohematology. 4 Credits.**

Advanced theory and experience related to human blood groups and transfusion practice. Prerequisite: MLRS 242 or MMG 223.

**MLS 301. Clinical Practicum. 12 Credits.**

Clinical Practicum involves a semester long directed clinical practice in Hematology, Chemistry, Microbiology, Immunohematology, and Molecular Biology at assigned clinical affiliate sites. Prerequisites: MLRS 281, MLRS 282, MLS 255; MLRS 242 or MMG 223; MLRS 244, MLS 221, MMG 222, MLS 222, MLS 231, MLS 262.

**MLS 302. Certification Review. 1 Credit.**

Certification review of the Medical Laboratory Science Body of Knowledge. It is designed to provide a challenging self directed assessment of practical and theoretical knowledge and will prepare students to successfully pass the ASCP certification exam in MLS. Prerequisites: MLRS 281, MLRS 282, MLS 255; MLRS 242 or MMG 223; MLRS 244, MLS 221, MMG 222, MLS 222, MLS 231, MLS 262. Pre/Co-requisite: MLS 301.

**MLS 310. Advanced Immunobiology. 3 Credits.**

Advanced survey of key current topics in immunology. Focus on understanding the key concepts and experimental approaches in the major areas in immunology, with an emphasis on applications to human disease. Prerequisites: Graduate student standing; Cell Biology and Biochemistry recommended.

**MLS 371. Clinical Correlations. 3 Credits.**

Advanced, graduate-level education in medical laboratory testing. The appropriate utilization of laboratory tests for screening, diagnosis, monitoring and determining prognosis of various human diseases will be discussed.

**MLS 372. Emerging Diag. Technologies. 3 Credits.**

Provides advanced, graduate-level education in medical laboratory testing. Using the scientific literature, students will review and discuss historical and emerging medical laboratory strategies that relate to human health and disease and the clinical environment.

**MLS 389. Research and Design I. 3 Credits.**

Guides students to identify a research capstone project and will include instruction in literature evaluation, review of experimental design and evaluation, and a foundational understanding of evidence based practice.

**MLS 390. Research and Design II. 3 Credits.**

Provides students with a foundation in how to read the primary literature, understanding the major sections of a primary literature reports, and instruction on writing their own reports to facilitate their success for their capstone project. Prerequisite: MLS 389.

**MLS 391. Research Capstone. 3 Credits.**

Students will complete a capstone project under the guidance of his/her research mentor. Findings will be communicated both through a formal oral presentation and a written research paper that will be submitted for publication. Prerequisites: MLS 389, MLS 390.

**MLS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MLS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MLS 397. Clinical Leadership & Mgt. 3 Credits.**

Focuses on the fundamentals of clinical leadership and management, with particular emphasis on organizational design, problem solving, communication and change theories. Strategies for human resource management, project management, quality improvement, increasing productivity, and ensuring financial viability are covered.

**MEDICINE (MED)****Courses****MED 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**MED 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**MICROBIOLOGY & MOLECULAR GENETICS (MMG)****Courses****MMG 201. Molecular Cloning Lab. 4 Credits.**

Intensive advanced laboratory course in the fundamentals of recombinant DNA technology through the isolation and characterization of a unique gene. Prerequisite: MMG 104 or BIOC 207 or Instructor permission. Fall.

**MMG 205. Biochemistry I. 3 Credits.**

Introduction to chemistry and structure of biological macromolecules; examination of mechanisms of chemical processes in biological systems, including enzyme catalysis, biosynthesis, regulation, and information transfer. Prerequisite: CHEM 048 or CHEM 142 or CHEM 144. Cross-listed with: BIOC 205, CHEM 205. Fall.

**MMG 206. Biochemistry II. 3 Credits.**

Continuation of Biochemistry I. Biochemistry of nucleic acids; nucleic acid based processes, such as replication and transcription; cellular information transfer, genomics, and proteomics. Prerequisite: MMG 205. Cross-listed with: BIOC 206, CHEM 206. Spring.

**MMG 207. Biochemistry Lab. 3 Credits.**

Introduction to biochemical tools, including spectrometry, chromatography, and electrophoresis; natural and recombinant enzyme isolation; assays of DNA-modifying enzymes; computer-based structure/function exercises. Prerequisite: BIOC 205 or CHEM 205 or MMG 205. Cross-listed with: BIOC 207, CHEM 207.

**MMG 211. Prokaryotic Molecular Genetics. 3 Credits.**

The organization, replication, and expression of genes in prokaryotes, focusing on the genetics of *Escherichia coli* and its viruses. Prerequisite: Introductory microbiology, biochemistry, genetics, and/or cell biology courses. Fall.

**MMG 220. Environmental Microbiology. 3 Credits.**

The activities of microorganisms, primarily bacteria, in air, soil, and water. Prerequisites: MMG 101 and Organic Chemistry Alternate years.

**MMG 222. Advanced Medical Microbiology. 4 Credits.**

Comprehensive study of human pathogenic bacteria and their disease states in humans. Laboratory sessions provide practical experience in handling and identifying these pathogens. Alternate years. Spring. Prerequisites: MMG 065 or MMG 101 or equivalent or Instructor permission.

**MMG 223. Immunology. 3 Credits.**

Analysis of the immune response with respect to structure and function of immunoglobulins and the T-cell receptor, tolerance, innate and adaptive immunity, the Major Histocompatibility Complex, hypersensitivity states, transplantation, cancer, and AIDS. Prerequisite: Instructor permission. Alternate years, Spring.

**MMG 225. Eukaryotic Virology. 3 Credits.**

An in-depth analysis of eukaryotic virus-mammalian cell interactions emphasizing mechanisms by which viruses modulate gene expression in infected cells. Prerequisite: MMG 101 or MMG 104 or equivalent. Alternate years. Fall.

**MMG 231. Bioinformatics&Data Analysis. 3 Credits.**

Methodological survey of bioinformatics in the -omics era, focusing on genomics data of medically relevant microbes. Topics include data mining, metagenomics, phylogenetics, and comparative genomics. Mix of lecture and hands-on interaction utilizing analysis tools on the Vermont Advanced Computing Core. Prerequisite: Instructor permission.

**MMG 232. QR: Advanced Bioinformatics. 3 Credits.**

Advanced data processing and genome assembly analysis, data integration, and machine learning. Python, R, and Linux-scripting are used to assemble genomes, integrate large data sets, and build complex biological models. Topics include genomics, meta-data management, and multi-omics analyses at systems biology levels. Alternate Years. Spring. Prerequisites: MMG 104 or BCOR 101; MMG 231, or Instructor permission.

**MMG 233. Genetics and Genomics. 3 Credits.**

Integrated entry into both genome science and modern genetic analysis. Students will develop skills needed to access, organize and interpret emerging genomic information. Fall. Prerequisite: Junior/Senior/Graduate standing in biological or computational sciences.

**MMG 320. Cellular Microbiology. 4 Credits.**

Utilizes primary literature to explore the cellular and molecular basis of microbial pathogenesis caused by viruses, pathogenic bacteria and protozoan parasites. Alternate years. Spring.

**MMG 391. Master's Thesis Research. 1-18 Credits.****MMG 393. Graduate Teaching Practicum. 3 Credits.**

Required practicum for all Microbiology and Molecular Genetics Masters Students. Students will be exposed to and mentored in the fundamentals of undergraduate teaching and learning in the laboratory setting.

**MMG 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MMG 395. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MMG 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MMG 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**MMG 491. Doctoral Dissertation Research. 1-18 Credits.****MMG 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MMG 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MIDDLE LEVEL TEACHER EDUCATION (EDML)****Courses****EDML 207. Adoles Lrng&Beh&Cog Perspect. 3 Credits.**

In-depth examination of cognitive learning theory and its background in behavioral and other learning theories, with application to teaching in a middle or secondary setting. Prerequisite: Acceptance to Master of Arts in Teaching or EDML 171 or Instructor permission.

**EDML 260. Teaching Young Adolescents. 3-6 Credits.**

Focus on understanding and reflecting on an integrative and developmental approach to the design of middle level curriculum, as well as teaching in one area of specialization.

**EDML 261. Mid Lev Teaching Practicum II. 3 Credits.**

Teaching practicum on middle level team in one of two areas of academic concentration, acquiring knowledge of and skills in curriculum, pedagogy, and assessment. Pre/Co-requisite: Admission to Middle Level Professional Program.

**EDML 270. Middle School Org & Pedagogy. 3-6 Credits.**

Focuses on exploring theory and practice in responsive school organization for young adolescents, including interdisciplinary/partner teaming, block scheduling, and teacher advisories, as well as teaching lessons in one area of specialization. Pre/co-requisite: EDML 024, EDML 056.

**EDML 285. Middle Level Student Teaching. 9-12 Credits.**

Full-time supervised student teaching internship as a member of a middle school team. Development of a professional portfolio as stipulated in the Middle Level Program Handbook. Pre/co-requisite: EDML 260, EDML 261, EDML 270, and Instructor permission.

**EDML 286. Internship Support Seminar. 3 Credits.**

Seminar addresses and responds to internship experiences including planning, reflective practice, classroom management, teamwork, and assessment of learning. Guidance in development of Professional Teaching Portfolio. Pre/co-requisites: EDML 260, EDML 261, EDML 270.

**EDML 287. Content Literacy in Mid Grades. 3 Credits.**

Focus on the use of content and disciplinary literacy strategies, including multiliteracies, in middle level content areas. Pre/co-requisite: Minimum Junior standing.

**EDML 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDML 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## MOLECULAR PHYSIOLOGY & BIOPHYSICS (MPBP)

### Courses

#### **MPBP 301. Human Physiology & Pharm I. 4 Credits.**

An integrated examination of the physiology and pharmacology of the peripheral nervous, muscle and cardiovascular systems in the human body. Pre/co-requisites: CHEM 032 and CHEM 042 or equivalent, two semesters general physics, and two semesters calculus. May not be taken for credit with MPBP 306.

#### **MPBP 303. Critical Reading. 1 Credit.**

Critical reading of the current literature, team taught by the faculty in the Dept. of Molecular Physiology & Biophysics, giving broad exposure to the expertise present in the department.

#### **MPBP 310. Molecular Control of the Cell. 3 Credits.**

Examines the fundamental molecular mechanisms that control dynamic cellular processes. Advanced topics in cell biology will be explored from the single molecule to the whole tissue level with an emphasis on the coordination of complex molecular systems. Prerequisites: MPBP 301, BIOC 301, BIOC 302; Instructor permission.

#### **MPBP 330. Biomedical Grantsmanship. 2 Credits.**

Introduces graduate students in the biomedical life sciences to process of writing competitive research proposals for funding from federal and private agencies such as the National Institutes of Health (NIH).

#### **MPBP 381. Seminar. 1 Credit.**

Presentation and discussion by advanced students, staff, and invited speakers, of current topics in physiology. Prerequisite: Department permission.

#### **MPBP 390. Medical Master's Capstone. 2 Credits.**

Students advance their fundamental knowledge in biochemistry, pharmacology, and physiology by addressing therapeutic applications in a discussion format. Students will choose and research current clinical problems and will communicate new molecular strategies through formal presentations. Prerequisites: Graduate Student standing in the Medical Science program; BIOC 301, MPBP 301, or Instructor permission.

#### **MPBP 391. Master's Thesis Research. 1-18 Credits.**

#### **MPBP 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **MPBP 395. Advanced Special Topics. 1-18 Credits.**

Topics of interest to Graduate students beyond the scope of existing courses.

#### **MPBP 491. Doctoral Dissertation Research. 1-18 Credits.**

#### **MPBP 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## MUSIC (MU)

### Courses

#### **MU 211. Senior Music History Project. 1 Credit.**

Directed readings and research. Research project. Prerequisites: Music History concentration; Senior standing; Instructor permission.

## NATURAL RESOURCES (NR)

### Courses

#### **NR 220. Landscape Ecology. 3 Credits.**

The course examines the critical role of landscape pattern in determining ecological process and dynamics, as well as human-ecological interactions. Includes field labs. Prerequisites: NR 103 or BCOR 102; Senior/Graduate standing.

#### **NR 228. Ecosystems Ecology. 3 Credits.**

Examination of the structure and function of terrestrial ecosystems focusing on carbon and nutrient cycles. Laboratory sessions involve spatial modeling and data analysis. Prerequisites: NR 103, BCOR 102, PSS 161, or Graduate student standing. Cross-listed with: FOR 228.

#### **NR 242. Adv Geospatial Techniques. 1-3 Credits.**

Advanced course encompassing a wide range of topics in GIS, remote sensing, GPS, modeling, and visualization designed to provide technical expertise in geospatial techniques. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: NR 143, GEOG 184, NR 343, NR 146, NR 346, or GEOG 185.

#### **NR 243. GIS Practicum. 3 Credits.**

An applied course in geospatial technology with a focus on ESRI's ArcGIS software suite. Prerequisite: NR 143 or NR 343.

#### **NR 250. Limnology. 0 or 4 Credits.**

Ecology of lakes and reservoirs, including their origin, physics, chemistry and biology, and the effects of anthropogenic perturbations. Field and laboratory experience. Prerequisites: BIOL 001 and BIOL 002 or BCOR 011 and BCOR 012, and CHEM 023 and CHEM 026 or CHEM 031 and CHEM 032, and NR 103 or BCOR 102.

#### **NR 268. Soil Ecology. 0 or 4 Credits.**

Underlying concepts and theory of modern soil ecology will be reviewed including spatial and temporal distributions, sampling methods, biogeochemical cycles, and ecological functions of soil. Prerequisites: BCOR 102 or NR 103, Prerequisites: BCOR 102 or NR 103, and PSS 161. Cross-listed with: PSS 268.

#### **NR 280. Stream Ecology. 0 or 4 Credits.**

Ecology of streams including hydrodynamics, morphology, sediment transport, chemistry, biology and human impacts. Field and laboratory experience. Prerequisites: BIOL 001 and BIOL 002 or BCOR 011 and BCOR 012, and CHEM 023 and CHEM 026 or CHEM 031 and CHEM 032, and NR 103 or BCOR 102.

#### **NR 288. Ecol Design & Living Technol. 0 or 3 Credits.**

The course explores the potential for ecological design to shape a sustainable future. It analyzes living technologies for food production, waste management and environmental restoration. Prerequisite: Junior standing.

**NR 289. Advanced Ecological Design. 3 Credits.**

A problem-based, cross-disciplinary design course in which existing conditions are integrated with the redesign of place and system in alignment with ecological design principles. Prerequisite: NR 288.

**NR 306. Envisioning a Sust Future. 2 Credits.**

Seminar orienting graduate students to RSENR and providing frameworks for collaborative leadership, whole systems thinking, and intercultural competency.

**NR 311. Leadership for Sustainability. 3 Credits.**

Provides an experiential and theoretical orientation to foundational practices, principles, and skills of sustainability leadership with an emphasis on ecological/systems thinking, sustainability, and leadership.

**NR 312. Power Privlge & Catalyz Change. 3 Credits.**

Focuses on leadership skills and systems frameworks for engaging with issues of diversity, power, and privilege and the implications of these topics on leaders' capacity. Designed to meet the RSENR graduate diversity requirement. Prerequisite: NR 311.

**NR 333. Professional Writing Essential. 1 Credit.**

Basics of good writing, essay and report writing, as published in both popular and professional journals in the environment and natural resources. Prerequisite: Graduate standing. Cross-listed with: PBIO 333.

**NR 334. Professional Writing AdvTopics. 1 Credit.**

Writing workshop that explores essay and report writing, as published in both popular and professional journals that examine the natural world and its resources. Prerequisite: Graduate standing. Cross-listed with: PBIO 334.

**NR 341. Ecological Economic Theory. 3 Credits.**

A transdisciplinary study of the economic system as embedded and interdependent on social institutions and environmental systems. Prerequisite: Graduate standing.

**NR 342. Ecosystem Services. 3 Credits.**

Examines the economic and other benefits nature provides to people. Covers the ecological foundations of quantifying ecosystem services, the economics of valuing them, and the practical issues involved with putting them to work for conservation. Prerequisites: Graduate standing; Instructor permission.

**NR 343. Fndmntls of Geog Info Systems. 0 or 3 Credits.**

Concepts and methods in Geographic Information Systems (GIS) presented at an accelerated pace for Graduate students using ArcGIS software. Prerequisite: Graduate standing.

**NR 372. Transdisc Leadshp & Creatvty. 3 Credits.**

Explores the theoretical and practice-based fields and lineages associated with transdisciplinary leadership and creativity while providing a solid structural and relational grounding for students in the Transdisciplinary Leadership, Creativity and Sustainability PhD Program.

**NR 373. Transdisc Mthds&Modes of Inqry. 3 Credits.**

Focuses on practices for engaging with inquiry, methods, and practice as students develop more clarity about the research questions, practices, structure, methods, and lineages that will inform their dissertation proposal and research.

**NR 376. Graduate Teaching Practicum. 2 Credits.**

Natural Resource teaching practicum for doctoral students in the Rubenstein School. Course is required if students are following the academic option. Should be taken concurrently or one semester in advance of completion of the doctoral teaching requirement. Prerequisite: Doctoral standing.

**NR 384. Independent Study in NR. 1-18 Credits.**

Readings, with conferences, to provide graduate students with backgrounds and specialized knowledge relating to an area in which an appropriate course is not offered.

**NR 388. Ecological Leadership Seminar. 3 Credits.**

Explores emerging topics and themes related to the theory and practice of ecological leadership. Can be taken in successive semesters (up to 2 times), as learning module topics will change.

**NR 389. Ecological Ldership Practicum. 3 Credits.**

An advanced exploration of ecological/systems thinking, sustainability, leadership skills, and leveraging change; offering students the opportunity to integrate these concepts and skills through an applied leadership practicum. Prerequisite: NR 388.

**NR 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**NR 391. Master's Thesis Research. 1-18 Credits.****NR 392. Master's Project Research. 1-12 Credits.****NR 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**NR 395. Advanced Special Topics. 1-18 Credits.**

Graduate topics and material that may eventually develop into a regular course offering.

**NR 474. Creative Practice & Dissertatn. 3 Credits.**

For PhD students nearing the end of dissertation research and beginning the integration, diffraction, synthesis, and meaning-making process essential to their dissertation. Provides structure, support and feedback in the creative act of crafting a dissertation. Prerequisites: NR 372, NR 373.

**NR 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**NR 491. Doctoral Dissertation Research. 1-18 Credits.****NR 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**NR 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## NEUROSCIENCE (NSCI)

### Courses

#### **NSCI 222. Cellular Neurophysiology. 3 Credits.**

Fundamentals of cellular neurophysiology through lecture, independent student reading and faculty-led group discussions of journal articles. Prerequisites: NSCI 110 or, NSCI 111 and NSCI 112, or Instructor Permission.

#### **NSCI 225. Human Neuroanatomy. 0 or 3 Credits.**

Functional anatomy of the human nervous system on both the microscopic and macroscopic scales. Focuses on the structures of the peripheral nervous system, spinal cord, and brain, and how they work together to achieve behavior. Lectures and a required laboratory (gross and microscopic anatomy). Prerequisite: NSCI 111.

#### **NSCI 230. Comparative Neurobiology. 3 Credits.**

Examination of the cellular mechanisms that underlie selective motor and sensory abilities, and unique behaviors that have evolved in various species. Discussion and student presentations. Prerequisite: NSCI 141 or BIOL 106 or NSCI 111 or PSYS 115 or Instructor permission.

#### **NSCI 280. Glia: Not Just Neuron Glue. 3 Credits.**

Interdisciplinary course in which students engage in a focused, in-depth exploration of how glial cells contribute to neurological and psychiatric disorders. Prerequisites: NSCI 111; Course director approval. Pre/Co-requisites: NSCI 111; Course Director permission.

#### **NSCI 300. Intro Functional Neuroimaging. 3 Credits.**

Functional neuroimaging may be the most exciting recent development in cognitive neuroscience. Students will learn about neuroimaging, and work in small groups to develop experiments, acquire and analyze functional MRI data on an MRI scanner.

#### **NSCI 301. Intro Functional Neuroimaging. 3 Credits.**

Part 1 will offer lecture-based technical background on in vivo brain-imaging techniques (e.g. MRI, PET; MEG; EEG; TMS). Part 2 will focus on hands-on fMRI data processing including data collection at UVMCC research MRI unit and in-class analysis instruction. Prerequisites: Graduate standing or Senior standing with Instructor permission. Pre/Co-requisites: Basic statistics and/or introductory physics helpful.

#### **NSCI 302. Neuroscience. 3 Credits.**

Functional anatomy of the human nervous system. Lectures and laboratory providing learning experience with dissected specimens, gross and microscopic anatomy. Incorporates clinical information from physician-scientists. Prerequisite: Physical Therapy major or Instructor permission.

#### **NSCI 303. Human Gross and Microanatomy. 3 Credits.**

Combination of gross anatomy, histology, embryology, physiology and medical imaging to present an integrated overview of the human body. Emphasis on peripheral nervous system including autonomic nervous system and cranial nerves. Cadaver dissection laboratory combined with lecture and/or content modules and research and teaching presentations. Pre/Co-requisites: Graduate standing; Neuroscience Graduate Program or others with Instructor permission; six credits coursework, plus two credits lab in biology, general chemistry, organic chemistry and Physics.

#### **NSCI 323. Neurochemistry. 3 Credits.**

Biochemistry of the nervous system. Topics include ion channels, synaptic function, neurotransmitters and neuropeptides, signal transduction, and hormones in brain function. Prerequisite: Permission of the Instructor.

#### **NSCI 327. Resp Conduct in Biomed Rsch. 1 Credit.**

Topics in Scientific Integrity surrounding responsible conduct and practices in biomedical research. Prerequisites: Advanced Graduate students, postdoctoral fellows and assistant professors in the biological or biomedical sciences.

#### **NSCI 381. Seminar in Neuroscience. 1 Credit.**

Research presentations and critical review of the literature in various areas of anatomical and neurobiological sciences.

#### **NSCI 382. Seminar in Neuroscience. 1 Credit.**

Research presentations and critical review of the literature in various areas of anatomical and neurobiological sciences.

#### **NSCI 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

#### **NSCI 391. Master's Thesis Research. 1-18 Credits.**

#### **NSCI 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **NSCI 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **NSCI 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Instructor permission.

#### **NSCI 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

#### **NSCI 491. Doctoral Dissertation Research. 1-18 Credits.**

#### **NSCI 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **NSCI 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## NURSING & HEALTH SCIENCES (NH)

### Courses

#### **NH 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **NH 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

#### **NH 399. Fundamentals Critical Inquiry. 3 Credits.**

Interprofessional research/evidence-based practice course; instructs students from a variety of healthcare professions to develop skills in research/clinical question development, appraisal of literature and practice guidelines, experimental, quantitative and qualitative studies, and a fundamental understanding of evidence to inform their practice. Prerequisite: Graduate student standing.

## NUTRITION AND FOOD SCIENCES (NFS)

### Courses

#### **NFS 203. Food Microbiology. 3 Credits.**

Desirable and undesirable activities of bacteria in foods. Mechanisms of food-borne infection and intoxication. Laboratory methods to enumerate and identify microorganisms associated with food. Prerequisite: NFS 153 or Instructor permission. Co-requisite: NFS 213.

#### **NFS 205. Functional Foods:Prncpl & Tech. 3 Credits.**

Examines the constituents that make food products functional and provides laboratory techniques needed to create a functional food. Prerequisites: NFS 153, NFS 154, or Instructor permission.

#### **NFS 223. Nutrition Educ & Counseling. 3 Credits.**

Use of appropriate education theory, techniques, and media in nutrition education and counseling theories and negotiation, interviewing and counseling skills in individual and group counseling. Pre/co-requisites: NFS Prerequisites: NFS 043, NFS 053, NFS 143.

#### **NFS 243. Advanced Nutrition. 3 Credits.**

Study of nutrients and their specific functions in metabolic process integrating cellular physiology, biochemistry, and nutrition. Prerequisites: NFS 043, ANPS 019, NFS 183 or PBIO 185; minimum Junior standing. Spring.

#### **NFS 244. Nutr in Hlth & Disease Prevntn. 3 Credits.**

Examination of dietary planning, nutrition assessment, genetics, drug-nutrient interactions, CAM therapies and nutrition related to health and prevention of disease. Pre/co-requisites: NFS 053, NFS 143; minimum Junior standing.

#### **NFS 245. Nutrition for Global Health. 3 Credits.**

Exposes students to global nutrition issues, with an emphasis on maternal and child nutrition in low- and middle-income countries. Focus on the interplay between demographic, nutritional, and epidemiologic transitions. Examines nutrition issues and investigates efforts to control and prevent malnutrition. Prerequisites: NFS 043; and NFS 113 or NFS 114 or FS 103 or ANTH 173 or HLTH 103 or Instructor permission. Co-requisites: Minimum Junior undergraduate or Graduate student standing.

#### **NFS 250. Foodservice Systems. 4 Credits.**

Emphasis on the foodservice system model for understanding quality control; food procurement, production, and marketing; management and evaluation of foodservice facilities, human and financial resources. Prerequisites: BSAD 060 or CDAE 158; BSAD 120; minimum Junior standing; Dietetics or Nutrition and Food Sciences, and Dietetics, Nutrition and Food Sciences majors only.

#### **NFS 253. Food Regulation. 3 Credits.**

Comprehensive examination of U.S. food laws and regulations and their relationships to the safety of the U.S. food supply. Focus on how food-related laws and regulations are enacted and enforced, through detailed examination of selected food regulation topics. Prerequisite: NFS 153 or equivalent course/training with Instructor permission.

#### **NFS 254. Global Food Safety. 3 Credits.**

An overview of food safety issues, policies, and opportunities around the globe, with a focus on bacterial, viral, and parasite-based food safety challenges. Prerequisites: NFS 113 or NFS 114; NFS 153 or MMG 002 or MMG 101.

#### **NFS 260. Clinical Nutrition 1. 3 Credits.**

Focuses on understanding various disease conditions and how different food patterns relate to the prevention and management of common diseases. The Nutrition Care Process will be used throughout, and the importance of interprofessional practice as well as the dietitian's role on the healthcare team will be emphasized. Prerequisites: NFS 143, NFS 243; Senior standing.

#### **NFS 262. Community Nutrition. 3 Credits.**

Study of U.S. public health nutrition policies, programs and practices. Emphasis on community nutrition program planning including needs assessment, intervention development and evaluation. Prerequisite: Minimum Junior or Graduate standing. Spring.

#### **NFS 285. Food, Exchange and Culture. 3 Credits.**

Examines practices and principles that cannot be fully understood within market based, industrially manufactured and/or globally sourced food and drink. These practices and principles shape food systems at the level of individual behavior and social institutions, including reciprocity, subsistence, charity, mutual aid and more. Prerequisites: NFS 053 or ANTH 085; and NFS 113 or ANTH 179.

#### **NFS 310. MSD Journal Club. 2 Credits.**

Critical review of current scientific, peer-reviewed literature, student-facilitated discussions, abstract writing on topics related to nutrition, sustainable food systems, hunger and food insecurity, health promotion, chronic disease prevention and management. Prerequisite: Master of Science in Dietetics students only.



**NFS 311. Supervised Practice I. 4 Credits.**

Through lecture, discussion, presentations, and practical experience, students develop competencies in clinical dietetics, community nutrition, and food service management. Prerequisite: Master of Science in Dietetics student.

**NFS 312. Supervised Practice II. 4 Credits.**

Through lecture, discussion, presentations, and practical experience, students develop competencies in clinical dietetics, community nutrition, and food service management. Prerequisite: Master of Science in Dietetics student.

**NFS 313. Food Safety and Public Policy. 3 Credits.**

An exploration of issues that impact the development of microbiological food safety policy through analysis of how science and risk assessment are used in establishing policy. Prerequisites: NFS 203 or NFS 253 or Instructor permission.

**NFS 350. Nutrition&Food Science Seminar. 1 Credit.****NFS 362. Intro to Research Methods. 3 Credits.**

Basic introduction to research methods at the MS level, including formulation of a research question and hypothesis, literature searching and preparation of a literature review, analytical methods and experimental design, data analysis and presentation, and journal article publication. Prerequisites: Graduate standing.

**NFS 390. Master's Project Research. 1-6 Credits.**

Final project under the direction of a graduate faculty mentor. Prerequisite: Nutrition and Food Sciences non-thesis Graduate Student, Instructor permission.

**NFS 391. Master's Thesis Research. 1-15 Credits.**

Final research thesis under the direction of a graduate faculty mentor. Prerequisite: Nutrition and Food Science graduate students only.

**NFS 392. Evidence-based Practice Prjct. 2 Credits.**

On site identification, review of literature for background and possible solutions, data collection and analysis, and writing and presenting the results and conclusions of a research problem. Pre/co-requisites: Successful completion of the first year of the Master in Dietetics program.

**NFS 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**NFS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**NFS 395. Special Topics. 1-18 Credits.****NFS 396. Advanced Special Topics. 1-18 Credits.****NFS 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory-level course in the discipline, for which credit is awarded. Offered at department discretion.

**NFS 398. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**OBSTETRICS & GYNECOLOGY (OBYG)****Courses****OBYG 200. Understanding Human Pregnancy. 3 Credits.**

Healthy pregnancy outcome depends on a confluence of sexual, social and biological processes. Explores the female sexual response, how a child is conceived (or not), maternal gestational physiology and embryology, and medical management of common diseases. Prerequisite: ANPS 019 and ANPS 020, or ASCI 141, or BIOL 255 or Instructor permission.

**OBYG 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**OBYG 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**OCCUPATIONAL THERAPY (OT)****Courses****OT 410. Foundations for OT Practice. 2 Credits.**

The history of occupational therapy, and exploration of theories and frames of reference that guide practice. Introduction to documentation, ethical practice, professionalism, goal writing, APA, and scholarly writing. Prerequisite: Graduate student in the Occupational Therapy Doctoral program.

**OT 411. Functional Anatomy. 4 Credits.**

Students will develop a working knowledge of the structure of the human body. Cardiovascular, respiratory, digestive, renal and urinary, and immune systems will be reviewed. Musculoskeletal and nervous systems will be reviewed detail in terms of normal and abnormal function. Functional implications will be explored. Prerequisite: Graduate student in Occupational Therapy Doctoral program.

**OT 412. Mvt and Occup Performance. 3 Credits.**

Exploration of how movement deficits impact functional performance. Kinesiology, biomechanical concepts and everyday physics are incorporated with anatomy concepts to help students understand normal and abnormal movement patterns. Goniometers, manual muscle testing, observation, and palpation will be utilized to assess normal and abnormal movement patterns. Prerequisite: Graduate student in the Occupational Therapy Doctoral program.

**OT 413. Dev of Humans as Occ Beings. 2 Credits.**

Exploration of normal development of humans from birth to death through the lens of occupational science. Motor development, biological variables, social development, social determinants of health, environmental factors, and health-related factors are explored as students understand variables that influence occupational participation throughout the lifespan. Prerequisite: Graduate student in the Occupational Therapy Doctoral program.

**OT 414. Psych & MH Influence on Occup. 3 Credits.**

Explores the ways in which psychosocial variables and mental health can influence occupation; the history of OT in mental health; and the influence of psychosocial variables on health. Students learn motivational interviewing and mindfulness, and practice running groups. Prerequisite: Graduate student in the Occupational Therapy Doctoral program.

**OT 418. Analyze Activity & Performance. 2 Credits.**

Explains how to break down activities into minute pieces to gain an understanding of barriers that may impact desired participation. Performance skills and patterns, contexts and environments, and client factors will be analyzed as students explore the occupational therapy practice framework. Prerequisite: Graduate student in the Occupational Therapy Doctoral program.

**OT 420. Therapeutic Interventions. 3 Credits.**

Covers a variety of therapeutic interventions that can assist clients with everyday living. Includes concepts such as wheelchair fitting, orthosis fabrication, prosthetic management, modalities, telehealth, and assistive technology. Teaches 3D design and printing. Prerequisite: OT 410.

**OT 424. Vis&Cog-Percep Infl Occupation. 3 Credits.**

Examines how vision, cognition, and perception can be an underlying barrier to performance in desired activities. Visual screening, visual attention, visual field deficits, executive functioning, awareness and attention deficits, visual-spatial impairments, cognitive function, neurocognitive disorders, memory deficits, and perceptual problems are addressed. Prerequisite: OT 410.

**OT 425. Older Adults as Occup Beings. 6 Credits.**

Examines occupational performance for older adults and treatment strategies. Common health conditions and psychosocial conditions are addressed. An experiential learning course with class happening in nursing homes, assisted living facilities, and senior-citizen centers to provide hands-on experiences. Prerequisite: OT 410.

**OT 435. Cultural Immersion. 2 Credits.**

Immersion in a practice setting to explore cultural, socioeconomic, racial, ethnic, and diversity factors that impact occupational performance. Students may engage in local projects, or participate in a travel-study course. Students uncover methods to improve occupational performance in community and emerging practice areas. Prerequisite: OT 420.

**OT 437. Research I: Identifying Gaps. 2 Credits.**

Students begin the formulation of research groups and identify a research faculty mentor. Students explore the literature on a focused topic, work with their research groups and faculty mentor, formulate their research question, and write their IRB proposal. Prerequisite: OT 420.

**OT 440. Teaching and Advocacy. 2 Credits.**

Teaches advocacy techniques, teaching strategies, marketing concepts, and health literacy concepts. Students utilize this knowledge to explain and advocate for the occupational therapy practice to a variety of stakeholders. Prerequisite: OT 435.

**OT 445. Young Adults as Occup Beings. 6 Credits.**

Examines occupational performance for young adults and treatment strategies. Common health conditions and psychosocial conditions are addressed. An experiential learning course with class happening in rehabilitation facilities, hand therapy clinics, and additional centers to provide hands-on experiences. Prerequisite: OT 435.

**OT 447. Research II: Implementing. 2 Credits.**

Student groups from OT 437 implement their research project. Students will learn to conduct research, implement recruitment strategies, gather and analyze data, and draw conclusions from the findings. Prerequisite: OT 437.

**OT 448. Designing Creative Ther Interv. 2 Credits.**

Uses traditional or modern crafts or activities to design a creative therapeutic intervention. Students will choose a skill, craft or activity that is new to them, learn it, analyze it, and demonstrate how that skill or craft can be utilized in a therapeutic manner. Prerequisite: OT 435.

**OT 449. OT Practice Management. 3 Credits.**

Examines the practice management side of occupational therapy including electronic medical systems, the interprofessional team, the role of the occupational therapy assistant, reimbursement systems, legislative and regulatory issues, financial management, business planning, strategic planning, program evaluation, marketing, liability, and supervision. Prerequisite: OT 435.

**OT 455. Children as Occup Beings. 6 Credits.**

Examines occupational performance for children and treatment strategies. Common health conditions and psychosocial conditions are addressed. An experiential learning course with class happening in pediatric rehabilitation facilities and school settings to provide hands-on experiences. Prerequisite: OT 445.

**OT 456. Living Life to the Fullest. 3 Credits.**

Students utilize knowledge gained throughout the program to explore advanced cases and helping people with complex scenarios live their life to the fullest. Technology, occupational science, and OT theories will be utilized as students piece together assessment and intervention of clients with advanced, complex cases. Prerequisite: OT 445.

**OT 457. Research III: Disseminating. 2 Credits.**

Student groups prepare their research for presentation at the University of Vermont. Includes formatting research (1) as a poster presentation for a national conference, (2) as a presentation, and (3) submitting research posters to a regional, national, or international conference. Prerequisite: OT 447.

**OT 459. Becoming Life Long Pract. 3 Credits.**

Students prepare to become professionals and life-long learners by reflecting on their experiential learning courses and exploring who they are as therapists. Students learn the registration and licensure process, the value of participation in national organizations, and life-long learning. Prerequisite: OT 445.

**OT 460. Cap I: Prof Scholar & Explor. 1 Credit.**

First in a capstone series. Students are introduced to Boyer's four areas of scholarship: Scholarship of Discovery, Scholarship of Integration, Scholarship of Applications, Scholarship of Teaching. Students choose one area that will guide their capstone project. Prerequisite: OT 420.

**OT 461. Cap II: Devel & Support Evid. 1 Credit.**

Second in the capstone series. Students will find evidence to support the capstone. Quantitative and qualitative literature will be critiqued and synthesized into a comprehensive literature review. Students develop the capstone proposal. Prerequisite: OT 460.

**OT 462. Capstone III: Proposal Defense. 1 Credit.**

Students finalize their capstone proposal. Includes the literature review, goals/objectives, implementation plan, and an evaluation plan. Students must successfully defend their capstone proposal to a committee. Prerequisite: OT 461.

**OT 463. Capstone IV: Capstone Experien. 8 Credits.**

Capstone experience required for all entry-level OTD program students. Students will spend a minimum of 14-weeks or 560 hours with their identified capstone mentor to implement and evaluate their capstone project. Most students will be off-campus for their capstone experience. Prerequisite: Level II fieldwork.

**OT 467. Cap III: Implementation. 2 Credits.**

The third course in the capstone series. Students will implement the capstone. Throughout the implementation steps, students will reflect on the process, linking leadership skills and traits. Program evaluation will be examined and an evaluation plan will be devised. Prerequisite: OT 466.

**OT 468. Cap IV: Dissemination. 2 Credits.**

The fourth and final course in the capstone series. The purpose of this course is to disseminate the capstone. Evidence of dissemination is necessary for successful completion of this course. Prerequisite: OT 467.

**OT 470. Fieldwork I. 2 Credits.**

A traditional level I fieldwork experience. Students will be placed in a clinical setting for 2-weeks and observe occupational therapy practice with a clinician. Prerequisite: OT 420.

**OT 471. Fieldwork Level IIA. 8 Credits.**

The first Level II fieldwork experience. Students are placed full-time (minimum 30 hours/week or 360 hours total) at a clinic under the guidance of a Level II Fieldwork Supervisor. This Level II fieldwork experience is a minimum of 12 weeks. Prerequisites: OT 470, OT 455.

**OT 472. Fieldwork Level IIB. 8 Credits.**

The second Level II fieldwork experience. Students are placed full-time (minimum 30 hours/week or 360 hours total) at a clinic under the guidance of a Level II Fieldwork Supervisor. This Level II fieldwork experience is a minimum of 12 weeks. Prerequisite: OT 471.

**OT 481. Evidence-based practice II. 3 Credits.**

Students will design a quantitative and qualitative study. Students will examine the literature and identify an area where further research is needed. Knowledge translation skills will be utilized to implement evidence into occupational therapy clinical practice. Prerequisite: NH 399.

**OT 482. Leadership Exploration. 3 Credits.**

Explores leadership theories and practices. Leadership traits and scenarios will be examined, compared, and contrasted. Students will reflect on who they are as a leader and in doing so, will create an individualized leadership plan. Pre/Co-requisites: OT 465, OT 480.

**OT 483. Max Leadership Potential. 3 Credits.**

Students implement the individualized leadership plan developed in the course OT 482, Leadership Exploration. Students apply leadership concepts to a professional scenario and assess the effectiveness. Peer-to-peer mentoring is incorporated. A future leadership plan will be developed. Prerequisite: OT 482.

**OT 484. Innovation and Creative Think. 3 Credits.**

Students must think outside the box and explore an unmet individual, community, or professional need through innovative and creative thinking. Explores characteristics and traits of innovators, and design a product, program, or treatment scenario implementing innovation concepts. Pre/Co-requisites: OT 465, OT 480.

**OT 485. Impl Adult Learning Theory I. 3 Credits.**

Students examine and utilize adult learning theories to create a teaching opportunity they implement in the OT 486 class. Students explore various presentation styles, both face-to-face and on-line as they identify the best method of conveying their idea to an adult audience. Pre/Co-requisites: OT 465, OT 480.

**OT 486. Impl Adult Learning Theory II. 2 Credits.**

Students implement and assess their proposed individualized teaching project from OT 485 Implementing Adult Learning Theory I class. Students will use a variety of presentation styles as they convey their message to a larger audience. Prerequisite: OT 485.

**OT 487. Examining Occ-based Practice. 3 Credits.**

Students learn to examine, define, defend, and implement occupation-based practice. Students will examine current evidence related to occupation-based practice, advocate for it, and assess its utilization in a practice setting. Pre/Co-requisites: OT 465, OT 480.

**OT 488. Expl current OT theory pract. 3 Credits.**

For practicing occupational therapists with a bachelor's degree who wish to matriculate into the post-professional Doctorate of Occupational Therapy program. Students explore updated occupational theories and practice guidelines. Prerequisite: Instructor permission.

**OT 489. Designing your portfolio. 2 Credits.**

Gives students the opportunity to present key aspects of their work as they create a portfolio. The portfolio serves as a comprehensive exam and should demonstrate sufficient work in all key threads of the program. Prerequisite: OT 467.

**OT 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**OT 491. Dissertation Research. 1-18 Credits.**

Dissertation research.

**OT 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**OT 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**OT 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**ORTHOPEDIC SURGERY (ORTH)****Courses****ORTH 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**ORTH 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PARKS, RECREATION AND TOURISM (PRT)****Courses****PRT 235. Outdoor Recreation Planning. 3 Credits.**

Planning large land areas for outdoor recreation use. Emphasis on the planning process relative to the leisure time use of natural resources. Prerequisites: Junior standing; Parks, Recreation and Tourism major or minor.

**PRT 255. Environmental Interpretation. 3 Credits.**

Philosophy, principles, and techniques of communicating environmental values, natural history processes, and cultural features to recreation visitors through the use of interpretive media. Prerequisites: Junior standing; Parks, Recreation and Tourism major or minor.

**PATHOLOGY (PATH)****Courses****PATH 300. Biomedical Research Design. 1 Credit.**

Covers the anatomy of research: what it is made of; and the physiology of research: how it works. Introduces techniques and strategies of research design, implementation, and interpretation. Provides basic tools needed to understand how research in pathology is conducted.

**PATH 307. Molecular Pathology. 3 Credits.**

Covers mechanisms of disease, molecular biology and genetics, diagnostic molecular pathology, as well as principles, tools and applications in research of molecular pathogenesis. Prerequisite: PATH 300.

**PATH 308. Pathology Journal Club. 1 Credit.**

Develops ability to read and present findings communicated in peer-reviewed research articles at the level necessary to formulate and plan independent research. Co-requisites: PATH 300, PATH 303, or Instructor permission.

**PATH 309. Pathology Grand Rounds. 1 Credit.**

Develops ability to prepare and deliver research presentations/Grand Rounds, and to participate in Grand Rounds discussion by critically reading related literature. Builds on the reading skills developed in PATH 308. Prerequisites: PATH 300, PATH 303, PATH 308, or Instructor permission.

**PATH 310. Clinical Genomic Medicine. 1 Credit.**

Covers the basic concepts of genomic medicine and its clinical application, procedures and techniques of clinical molecular testing, and management of a clinical molecular laboratory; focuses on diagnostic molecular testing on solid tumors, hematopathology, constitutional disorders, and pharmacogenomics. Prerequisite: PATH 330 or Instructor permission; experience in either clinical or anatomic pathology required.

**PATH 325. Genetics for Clinicians. 3 Credits.**

Provides an overview of contemporary human genetics and genomics with application to clinical practice. Prerequisite: Graduate standing. Cross-listed with: GRNS 325.

**PATH 328. Techniques in Microscopy. 3 Credits.**

Introduces many of the microscopy systems and techniques available in the Microscopy Imaging Center core facility in the Larner College of Medicine at UVM.

**PATH 330. Pathology Rotations. 3-9 Credits.**

Laboratory practicum for Pathology Master's students. Engages students in clinical and anatomic pathology laboratory rotations under supervision of attending physicians and senior residents in the University of Vermont Medical Center Pathology Department.

**PATH 331. Pathology Clinical Practice. 1 Credit.**

An opportunity to become familiar with how pathologists work in a team with other clinicians to solve difficult problems in clinical practice. Prerequisites: PATH 300.

**PATH 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PATH 391. Master's Thesis Research. 1-18 Credits.****PATH 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PATH 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PATH 395. Advanced Special Topics. 1-18 Credits.**

Special Topics in Pathology. Prerequisites: Graduate Students, Department Permission Immunology (MMG 223) desirable. Alternate year course with PATH 305.

**PHARMACOLOGY (PHRM)****Courses****PHRM 200. Medical Cannabis. 3 Credits.**

An introduction to the pharmacology underlying recreational and medicinal uses of Cannabis. Focuses on Cannabis taxonomy, chemistry of cannabinoids, physiological effects, and emerging therapeutic applications. Discusses historical, political and socio-economic influences on medical marijuana legislation. Prerequisite: BCOR 103, NSCI 110, NSCI 111 or PHRM 201, or Instructor permission.

**PHRM 201. Introduction to Pharmacology. 3 Credits.**

This course will focus on biochemical and physiological actions of prototype drugs used in the treatment and prevention of human diseases. Prerequisite: Introductory courses in Biology and Organic Chemistry.

**PHRM 240. Molecules & Medicine. 3 Credits.**

This course conveys an understanding about drug design and the molecular mechanisms by which drugs act in the body. It highlights the importance of medicinal chemistry as it overlaps with the disciplines of chemistry, biochemistry, microbiology, cell biology, and pharmacology. Prerequisites: Intro to Organic Chemistry, Intro to Biology; Permission.

**PHRM 272. Toxicology. 3 Credits.**

This course is intended to provide an understanding of the chemical, biochemical and physiological factors that determine the pathological effects of chemicals in living systems. Prerequisites: Organic chemistry, background in Biology, or Instructor permission.

**PHRM 290. Topics Molecular&Cell Pharm. 3 Credits.**

Focuses on basic principles, drug interactions with receptors, membranes, synapses, neurotransmitters, macromoles, cytoskeleton, ion channels and pumps, and mechanisms of drug resistance. Prerequisite: Introductory course in organic chemistry, background in physiology or health sciences.

**PHRM 301. Medical Pharmacology. 6 Credits.**

All topics for a conventional course in pharmacology for medical students or health science students. General pharmacokinetic and pharmacodynamic principles, treatment rationales and adverse effects.

**PHRM 302. Pharmacological Techniques. 1-4 Credits.**

Experiments conducted under supervision in the areas of drug metabolism, modes of drug action, physicochemical properties of drugs, bioassay, and toxicology. Thesis masters students limited to three credits.

**PHRM 305. Milestones in Pharmacology. 2 Credits.**

A critical readings class where students read and present landmark pharmacology papers and link them to modern experiments and clinical applications. Co-requisites: PHRM 201 or Graduate standing.

**PHRM 308. Integrative Physiol. & Pharm.. 3 Credits.**

Intended for students pursuing careers in basic scientific research or health-related fields, designed to combine general physiological principles with examples of disease-based pathophysiology and targeted pharmacological approaches. Case studies will emphasize the impact of these processes on human function. Pre/Co-requisites: Two semesters of chemistry, two semesters of physics, and a background in biology/physiology or health sciences.

**PHRM 372. Special Topics. 1-3 Credits.**

Topics of current interest and importance in pharmacology are considered in depth through presentations by staff, students, and visiting scientists. Prerequisite: Instructor Permission. Credit variable.

**PHRM 373. Readings in Pharmacology. 2 Credits.**

Intensive directed reading in one area of pharmacology. Pharmacology students must choose a topic outside thesis research area. Term paper and seminar on selected topic required. Prerequisite: Instructor Permission.

**PHRM 381. Seminar. 1 Credit.**

Current developments in pharmacology are presented for discussion by students. Prerequisite: Instructor Permission.

**PHRM 390. Medical Master's Capstone. 2 Credits.**

Students advance their fundamental knowledge in biochemistry, pharmacology, and physiology by addressing therapeutic applications in a discussion format. Students will choose and research current clinical problems and will communicate new molecular strategies through formal presentations. Prerequisites: Graduate Student standing in Medical Science program; BIOC 301, MPBP 301, or Instructor permission.

**PHRM 391. Master's Thesis Research. 1-12 Credits.****PHRM 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHRM 393. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PHRM 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHRM 396. Advanced Special Topics. 1-18 Credits.**

See schedule of courses for specific titles.

**PHRM 491. Doctoral Dissertation Research. 1-12 Credits.****PHRM 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## PHILOSOPHY (PHIL)

### Courses

#### **PHIL 235. Topics in Phil of Religion. 3 Credits.**

Advanced study of such issues as the metaphysics of religion, the epistemology of religious belief, philosophy and faith, religion and science, and religion and ethics. May be repeated for credit with different content. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: PHIL 101, PHIL 102.

#### **PHIL 240. Contemporary Ethical Theory. 3 Credits.**

In-depth study of metaethics, emphasizing recent work. Topics include moral objectivity, moral language, moral epistemology, and the relationship between morality and reasons. May be repeated for credit with different content. Prerequisite: One course in Philosophy at the 100-level.

## PHYSICAL EDUCATION-PROF (EDPE)

### Courses

#### **EDPE 220. Sport in Society. 3 Credits.**

Examines sport as a social institution, emphasizing interrelationships between sport and the social context in which it exists; analyzes functions and dysfunctions of sport in contemporary society.

#### **EDPE 267. Sci Strength Training&Condtnng. 3 Credits.**

Course focuses on physiology of muscle adaptation following resistance or aerobic training. Particular attention is paid to specificity of metabolic adaptation for individual sports.

#### **EDPE 391. Master's Thesis Research. 1-12 Credits.**

Thesis topic must be approved by a faculty committee.

#### **EDPE 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

#### **EDPE 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## PHYSICS (PHYS)

### Courses

#### **PHYS 202. Experimental Physics II. 3 Credits.**

Experiments in classical and modern physics. Prerequisites: PHYS 128; MATH 121; Junior standing.

#### **PHYS 211. Classical Mechanics. 3 Credits.**

Newtonian dynamics of particles and systems of particles, with applications to problems of special importance, such as driven and coupled harmonic oscillators and central field trajectories. Prerequisites: PHYS 152, MATH 121.

#### **PHYS 213. Electricity & Magnetism. 3 Credits.**

Fundamental principles of electricity and magnetism; electrostatic fields, and magnetic fields of steady currents. Electric and magnetic properties of matter and electromagnetic energy. Prerequisites: PHYS 152 or PHYS 125 and MATH 121. Credit not given for more than one of PHYS 213 or EE 141.

#### **PHYS 214. Electromagnetism. 3 Credits.**

Introduction to time dependent electromagnetic fields. Maxwell's equations in vacuum and in matter. Electromagnetic waves and radiation. Prerequisite: PHYS 213. Credit not given for more than one of PHYS 214 or EE 241.

#### **PHYS 222. Intro Biological Physics. 3 Credits.**

General survey course in biological physics. Introduction to biological building blocks (proteins, lipids and nucleic acids) and macromolecular structure, thermostatics of biological systems and two-state models, random walks and polymers, elasticity and mechanics of filaments and membranes, physics of water and molecular solvation, brownian motion and diffusion. Prerequisites: PHYS 012 or PHYS 152, MATH 121.

#### **PHYS 242. Intro to Solid State Physics. 3 Credits.**

Introduction to crystal structures, reciprocal lattices, lattice vibrations. Thermal properties of solids and free electron theory of metals and semiconductors. Elementary band theory and introduction to electronic transport theory. Prerequisite: PHYS 128.

#### **PHYS 264. Nuclear & Elem Particle Physic. 3 Credits.**

Introduction to theoretical and experimental aspects of nuclear and elementary particle physics. Prerequisite: PHYS 128; Junior standing.

#### **PHYS 265. Thermal & Statistical Physics. 3 Credits.**

Thermodynamics, kinetic theory, statistical mechanics. Prerequisites: PHYS 152 or PHYS 125 and MATH 121.

#### **PHYS 273. Quantum Mechanics I. 3 Credits.**

Introduction to nonrelativistic quantum mechanics. Schrodinger equation and applications to simple systems. Prerequisite: PHYS 128, PHYS 211.

#### **PHYS 274. Applctns of Quantum Mechanics. 3 Credits.**

Applications of Quantum Mechanics including Quantum Statistical Mechanics, Time-Independent and Time- Dependent Perturbation Theory, WKB Approximation, Variational Principle and Scattering. Prerequisite: PHYS 273.

#### **PHYS 301. Mathematical Physics. 3 Credits.**

Introduction to basic mathematical methods of theoretical physics; vector and tensor analysis, partial differential equations, orthogonal functions, complex variables and variational techniques. Prerequisites: PHYS 211, PHYS 214. Alternate years.

#### **PHYS 305. Teaching of College Physics. 1 Credit.**

Instructional strategies and techniques with application to the teaching of laboratories and recitations. Prerequisites: Undergraduate degree in Physics; Instructor permission.

#### **PHYS 311. Advanced Dynamics. 3 Credits.**

Classical mechanics presented as the basis of the concepts and methods of modern physics. Variational, Lagrangian, and Hamiltonian formulations, canonical transformations, continuous systems. Prerequisite: PHYS 211. Alternate years.

**PHYS 313. Electromagnetic Theory. 3 Credits.**

Development of Maxwell's theory of electromagnetism emphasizing its physical basis and the modes of mathematical description.

Prerequisite: PHYS 214. Alternate years.

**PHYS 323. Contemporary Physics. 0-6 Credits.**

Topics of current interest in physics to be offered as student and faculty interest warrants. May be repeated for credit with department approval. Topics vary by offering; periodic offering at intervals that may exceed four years. Prerequisite: Instructor permission.

**PHYS 333. Biological Physics. 3 Credits.**

Physical principles of biological systems including advanced techniques in macromolecular structure (experimental and computational), molecular solvation and hydration models, thermostatics, two-state models and cooperativity, elasticity and mechanics of soft tissues, chemical equilibria and reaction kinetics including enzymes. Prerequisites: PHYS 152, MATH 121, or Instructor permission.

**PHYS 341. Solid State Physics. 3 Credits.**

Introduction to crystal symmetry and the reciprocal lattice. Crystal binding and lattice vibrations. Thermal, electrical, and magnetic properties of solids, free electron theory of metals, and band theory. Prerequisites: PHYS 214, PHYS 265, PHYS 273 or their equivalents; Instructor permission.

**PHYS 362. Quantum Mechanics II. 3 Credits.**

Mathematical and physical foundations of nonrelativistic quantum mechanics from the unifying point of view of Dirac. Symmetry operations and the algebraic structure of quantum mechanics are emphasized. Prerequisite: PHYS 273. Alternate years.

**PHYS 365. Statistical Mechanics. 3 Credits.**

Following a review of thermodynamics, we study the fundamentals of classical and quantum statistical mechanics including ensembles, identical particles, Bose and Fermi statistics, phase-transitions and critical phenomena, renormalization group, irreversible processes and fluctuations. Prerequisites: PHYS 265 or equivalent.

**PHYS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PHYS 391. Master's Thesis Research. 1-12 Credits.****PHYS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHYS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHYS 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PHYS 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**PHYS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PHYS 491. Doctoral Dissertation Research. 1-18 Credits.****PHYS 492. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHYS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PHYS 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PLANT BIOLOGY (PBIO)****Courses****PBIO 209. Biology of Ferns. 3 Credits.**

Evolutionary biology; a survey of New England ferns and discussion of their phylogenic relationships; current research emphasizing morphological, biogeographical, genetic, and phytochemical aspects of speciation. Prerequisite: PBIO 108 or PBIO 109 (BCOR 101 recommended).

**PBIO 223. Fundamentals of Field Science. 3 Credits.**

Pattern and process in natural systems. Weekly discussion of unifying questions in science. Field labs teach sampling and analysis of vegetation, soils, and animals. Prerequisite: Graduate standing or several university courses in earth sciences, life sciences, and chemistry.

**PBIO 232. Plant Systematics in Costa Rica. 2 Credits.**

Intensive field trip to Costa Rica with the goal of comparing the diversity of flowering plants and ferns in four distinct tropical American forests. Emphasis on field recognition of flowering-plant families, with an appreciation of the relationship between the Costa Rican people and their landscape. Prerequisites: PBIO 109; Instructor permission.

**PBIO 241. Tropical Plant Systematics. 3 Credits.**

Principles and methods of angiosperm phylogeny. Recent systematic and evolutionary research on flowering plants; survey of tropical flowering plant families. Student presentations on recent research. Prerequisite: PBIO 109.

**PBIO 261. Plant Growth & Development. 3 Credits.**

Concepts in plant structure and development. Biophysics of plant structure and pattern-formation. Introduction to methods of plant microscopy and microtechnique. Prerequisites: PBIO 104, PBIO 108, introductory Physics, or Instructor permission.

**PBIO 275. Global Change Ecology. 3 Credits.**

Survey of global climate change including its causes, mechanisms, and ecological and societal impacts. Prerequisite: BCOR 102 or Instructor permission.

**PBIO 281. Botany Seminar. 0 Credits.**

Presentations of personal research by faculty, graduate students, and outside guest speakers. Attendance required of plant biology Graduate students and Seniors in botanical research programs. Without credit.

**PBIO 282. Botany Seminar. 0 Credits.**

Presentations of personal research by faculty, graduate students, and outside guest speakers. Attendance required of plant biology Graduate students and Seniors in botanical research programs. Without credit.

**PBIO 288. The Evolution of Development. 3 Credits.**

Highlights how the integration of key concepts from developmental biology has contributed to our understanding of the proximate causes of plant and animal diversification. Prerequisite: BCOR 102 or equivalent, BCOR 101 or equivalent.

**PBIO 294. QR:Ecological Modeling. 3 Credits.**

Provides an introduction to process-based modeling of ecological systems. Explores system dynamics and agent-based approaches to modeling ecological systems and processes. Includes a focus on the system dynamics modeling software Stella and the agent-based language Netlogo. Prerequisite: BCOR 102 or Instructor permission.

**PBIO 311. Field Naturalist Practicum. 0-3 Credits.**

Landscape analysis; planning and designing field projects; integrated problem solving. Prerequisite: Enrollment in the Field Naturalist program. Variable hours up to three.

**PBIO 333. Professional Writing Essential. 1 Credit.**

Basics of good writing, essay and report writing, as published in both popular and professional journals in the environment and natural resources. Prerequisite: Graduate standing. Cross-listed with: NR 333.

**PBIO 334. Professional Writing AdvTopics. 1 Credit.**

Writing workshop that explores essay and report writing, as published in both popular and professional journals that examine the natural world and its resources. Prerequisite: Graduate Standing. Cross-listed with: NR 334.

**PBIO 369. Field Botany for NR Profession. 3 Credits.**

Identification of flowering plants and ferns; survey of prominent Vermont plant families; natural communities, ecological determinants of plant distribution, especially soils; preparation of herbarium specimens. Prerequisite: Graduate Standing; Instructor Permission.

**PBIO 380. Ecological Genomics. 4 Credits.**

An exploration of the merger of ecology and genomics to address the genetic basis of adaptive variation in natural populations. Emphasis on integrating quantitative approaches and hands-on analysis of large genomic and ecological data sets. Pre/Co-requisites: BCOR 101, BCOR 102, STAT 141 or STAT 211; basic knowledge of statistics, probability, genetics, and evolution required; familiarity with programming in R or bash is recommended. Cross-listed with: BIOL 380.

**PBIO 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PBIO 391. Master's Thesis Research. 1-10 Credits.**

Credit as arranged.

**PBIO 392. Master's Project Research. 0-3 Credits.**

Credit as arranged.

**PBIO 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PBIO 394. Data Modeling for Envir Scienc. 3 Credits.**

Introduction to data modeling using R statistical computing language, emphasizing likelihood, information theoretic, and Bayesian approaches to inference. Course focuses on the R language as a tool for data modeling. Class time divided between lectures that introduce statistical concepts and R language constructs and labs that stress applications. Successful participants will have some statistical background. Prerequisite: A course in introductory statistics.

**PBIO 395. Graduate Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PBIO 396. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PBIO 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PBIO 491. Doctoral Dissertation Research. 1-15 Credits.**

Credit as arranged.

**PBIO 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PBIO 495. Doctoral Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.



## PLANT & SOIL SCIENCE (PSS)

### Courses

#### **PSS 209. Diversified Farm Operations. 6 Credits.**

An experiential course in sustainable, diversified vegetable production that includes soil fertility, weed, insect and disease control, crop planning and farm management skills. Prerequisites: PSS 021 and one 100-level PSS course, equivalent experience, or Instructor permission.

#### **PSS 212. SU: Advanced Agroecology. 0 or 4 Credits.**

An in-depth overview of research and applications in the field of agroecology, including current ecological and social dynamics in agricultural landscapes in Vermont and abroad. Prerequisites: PSS 021 or one semester ecology at the 100-level or above or Instructor permission. Cross-listed with: ENVS 212.

#### **PSS 218. Agricultural Policy and Ethics. 3 Credits.**

An examination of American agriculture and policies from various perspectives - historical, political, ecological, technological, social, economic, and ethical. Emphasis on contemporary issues, policy options, and future development. Prerequisites: CDAE 102 or PSS 212 or equivalent. Cross-listed with: CDAE 208.

#### **PSS 225. Eco Frontiers in Agroecology. 3 Credits.**

Examines recent peer-reviewed research that has the potential to transform the productivity or sustainability of agroecosystems. Students will be guided in developing, communicating, and justifying new questions that may potentially transform agroecology. Prerequisites: BIOL 001/BIOL 002 or BCOR 011/BCOR 012; and NR 103 or BCOR 102 or PSS 106 or equivalent; or Instructor permission.

#### **PSS 232. Biological Control. 3 Credits.**

Describes theory and application of biological control of insects, disease, and weeds. Discuss ecological factors that contribute to the success of classical, augmentative, and conservation approaches to biological control. Approved for Graduate credit. Prerequisite: Course in entomology, ecology, or relevant experience.

#### **PSS 238. Ecological Landscape Design. 4 Credits.**

Studio course synthesizing work from fields of landscape ecology and landscape design, exploring ecological design alternatives at multiple scales, and developing multifunctional landscape solutions. Prerequisites: Junior standing; PSS 137 or one course in ecology plus one course in design or drawing.

#### **PSS 261. Soil Morph Class & Land Use. 0 or 3 Credits.**

Field techniques that describe soil properties, formation, and classification. The principles and processes of soil genesis, land use classification systems, and land use challenges. Prerequisite: PSS 161 or Instructor permission.

#### **PSS 264. Chemistry of Soil & Water. 0 or 4 Credits.**

An environmentally oriented study of the colloidal chemistry of soil and its interfaces with roots, water, and air. Prerequisites: PSS 161, two semesters Chemistry or Instructor permission.

#### **PSS 268. Soil Ecology. 0 or 4 Credits.**

Underlying concepts and theory of modern soil ecology will be reviewed including spatial and temporal distributions, sampling methods, biogeochemical cycles, and ecological functions of soil. Prerequisites: BCOR 102 or NR 103, and PSS 161. Cross-listed with: NR 268.

#### **PSS 269. Soil/Water Pollution/Bioremed. 3 Credits.**

Examines key issues in pollution of soil and water. Topics include type of pollutants, their reactions in soil and water, pollution prevention and bioremediation. Prerequisites: PSS 161 or Instructor permission.

#### **PSS 301. Professional Skills Colloquium. 1 Credit.**

Presentation and peer review of oral and written communication. Professional development skills including technical writing, literature review, mentorship, scientific integrity, grant proposals, and job market.

#### **PSS 311. Introduction to Agroecology. 3 Credits.**

In-depth overview of research and applications in the field of agroecology, with a focus on providing the student with conceptual and analytical content. Prerequisite: Graduate standing or Instructor permission.

#### **PSS 312. Ecological Foundations of Agro. 3 Credits.**

Examines the ecological foundations of Agroecology, largely from a biophysical perspective. Over the course of three sequential modules, students will explore the fundamental principles of ecology and their application to agricultural systems and landscapes. Prerequisite: One semester biological science at the 100-level or Instructor permission.

#### **PSS 313. PAR & Transdiscipl Agroecology. 3 Credits.**

Introduces students to Participatory Action Research (PAR) in the context of agroecology, and examines how the integration of PAR and transdisciplinary approaches can serve to deepen our collective understanding of complex problems/issues. Prerequisite: PSS 311.

#### **PSS 314. Agroecol, Food Sov. & Soc Mov.. 3 Credits.**

Investigates social, political, and economic elements of the global food system from multiple perspectives, considering the ability to scale-up agroecology, and the potential intersection between agroecology, food sovereignty and government policies. Prerequisite: Graduate standing.

#### **PSS 315. Agroecology Grad Capstone. 3 Credits.**

The capstone designed for the application of newly developed knowledge and skills in a culminating experience/project that addresses an agroecological topic relevant to the individual student. Prerequisites: PSS 311, PSS 312, PSS 313, PSS 314.

#### **PSS 381. Graduate Special Topics. 1-3 Credits.**

Advanced readings and discussion of horticulture, crops, or soils research literature.

#### **PSS 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PSS 391. Master's Thesis Research. 1-18 Credits.****PSS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSS 393. Seminar Series. 1 Credit.**

Presentations of personal research by faculty, Graduate students and outside guest speakers. Attendance and oral presentations are required of Graduate students in Plant and Soil Science. Repeatable 2 times for M.S. students and 4 times for Ph.D. students.

**PSS 394. Seminar Series. 1 Credit.**

Presentations of personal research by faculty, Graduate students, and outside guest speakers. Attendance and oral presentations are required of Graduate students in Plant and Soil Science. Repeatable 2 times for M.S. students and 4 times for Ph.D. students.

**PSS 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PSS 397. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PSS 491. Doctoral Dissertation Research. 1-18 Credits.****PSS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PSYCHOLOGICAL SCIENCE (PSYS)****Courses****PSYS 211. Learning. 3 Credits.**

Analysis of theory and research on the basic learning process and behavior. Prerequisites: PSYS 053, PSYS 111.

**PSYS 212. Cognition. 3 Credits.**

Research and theories on the major areas within cognition: perception, attention, pattern recognition, memory, knowledge representations, mnemonic strategies, problem-solving and neurocognition. Prerequisites: PSYS 053 and PSYS 111.

**PSYS 213. Motivation. 3 Credits.**

Theory and research on motives, including hunger, fear, sex drive, and addiction, their influence on behavior, relationship to other psychological processes, and biological correlates. Prerequisites: PSYS 053; PSYS 111 or PSYS 115.

**PSYS 215. Physiological Psychology. 0 or 4 Credits.**

Structure and function of mammalian nervous system, emphasizing neurological correlates of sensory experience and perception. Individual laboratory experience. Prerequisites: PSYS 053; PSYS 115 or NSCI 111.

**PSYS 216. Psychopharmacology. 3 Credits.**

Effects of drugs (both medical and recreational) on behavior. Topics such as drug effects on learning, memory, motivation, perception, emotions, and aggression. Prerequisites: PSYS 053; PSYS 115 or NSCI 111.

**PSYS 218. Hormones and Behavior. 3 Credits.**

A study of the involvement of hormones in cognition, emotion, the stress response, circadian and homeostatic mechanisms that affect mental state, psychopathology, and reproductive behavior. Prerequisites: PSYS 053; PSYS 115 or NSCI 110 or NSCI 111.

**PSYS 230. Advanced Social Psychology. 3 Credits.**

In-depth discussion of select topics centering on how situations influence individuals' thoughts, feelings, and behaviors. Prerequisite: PSYS 053, PSYS 130.

**PSYS 232. Self and Social Cognition. 3 Credits.**

An advanced course in social psychology that covers theory and research on the self and social cognition. Prerequisites: PSYS 053, PSYS 130.

**PSYS 240. Organizational Psychology. 3 Credits.**

Study of the psychological impact of macro and micro features of organizations upon leadership, decision making, workforce diversity, group process, conflict, and organizational performances. Prerequisite: PSYS 053; and PSYS 111 or PSYS 130 or PSYS 150 or PSYS 170.

**PSYS 252. Emotional Devlmt & Temperament. 3 Credits.**

Development of emotion and temperament from infancy through middle childhood, including links between these topics and physiology, and context (e.g. attachment, parenting, family conflict). Prerequisites: PSYS 053 and PSYS 150.

**PSYS 254. Social Development. 3 Credits.**

Examination of theory and research concerning interpersonal development in humans from infancy through adulthood. Emphasizes relationships among language, cognition, and social development. Prerequisites: PSYS 053, PSYS 150.

**PSYS 257. Adolescence. 3 Credits.**

Analysis of current theory and research in adolescent development. Covers biological, cognitive, and social changes; family, peer, and school influences; and normative and problematic development. Prerequisites: PSYS 053, PSYS 150.

**PSYS 270. Behav Disorders of Childhood. 3 Credits.**

An overview of theory, research, and practice in developmental psychopathology from infancy through adolescence. The major disorders of social and emotional development reviewed. Prerequisites: PSYS 053; and PSYS 150 or PSYS 170.

**PSYS 271. Intro to Clinical Psychology. 3 Credits.**

Study of basic principles of interviewing, testing, assessment from life situations, and report writing. Examination of the most common approaches to psychotherapy. Prerequisites: PSYS 053, PSYS 170.

**PSYS 278. Science of Traumatic Stress. 3 Credits.**

More than 85 percent of adults in the US will experience a traumatic event, yet only a fraction of these individuals will develop conditions such as posttraumatic stress disorder. Explores why this outcome occurs and the clinical skills needed to treat this condition.

Prerequisites: PSYS 053, PSYS 170.

**PSYS 300. History of Psychology. 3 Credits.**

Review of major theoretical and empirical developments in psychology, including schools of psychology that have influenced contemporary models of psychology. Prerequisite: Psychology graduate standing only.

**PSYS 303. Seminar in Psyc Research Meth. 3 Credits.**

Topics may include but are not limited to: factor analysis, discriminant function analysis, multivariate analysis of variance, advanced experimental design, and computer application in data collection and analysis. Prerequisites: PSYS 304; Psychology graduate standing.

**PSYS 304. Adv Statistical Methods I. 3 Credits.**

Statistical methods for evaluating psychological data. Emphasizes exploring data with respect to research hypotheses. Critical study of hypothesis tests on means, chi-square, and correlational techniques. Prerequisite: Psychology or Neuroscience graduate standing.

**PSYS 305. Adv Statistical Methods II. 3 Credits.**

Continuation of PSYS 304. In-depth study of the analysis of variance and multiple regression. Further study of analysis and interpretation of data from the behavioral sciences. Prerequisites: PSYS 304; Psychology or Neuroscience graduate standing.

**PSYS 306. Analysis of Longitudinal Data. 3 Credits.**

Statistical methods for the analysis of data collected over time, with an emphasis on linear mixed models (LMMs) in applied psychological research. Prerequisites: PSYS 304, PSYS 305; Psychology or Neuroscience graduate standing.

**PSYS 307. Structural Equation Modeling. 3 Credits.**

Introduction to confirmatory factor analysis, path analysis, and structural equation methods, with an emphasis on applied psychological research. Prerequisites: PSYS 304, PSYS 305; Psychology graduate standing.

**PSYS 311. Seminar in Learning Theory. 3 Credits.**

Review and analysis of contemporary theories of associative learning. Prerequisite: Psychology or Neuroscience graduate standing; PSYS 315.

**PSYS 315. Biobehavioral Proseminar. 3 Credits.**

Advanced survey and analysis of behavioral and biological psychology, with special emphasis on learning theory and behavioral neuroscience. Prerequisite: Psychology and Neuroscience graduate standing.

**PSYS 316. Neuropsychopharmacology. 3 Credits.**

Explores the foundations of behavior by examining the role of neurotransmitters, neuromodulators, and drugs in the production of normal and abnormal behavior. Prerequisite: Psychology or Neuroscience graduate standing; PSYS 315.

**PSYS 319. Neurobio of Learning & Memory. 3 Credits.**

Exploration of the neural bases of learning and memory, using a brain systems approach, through a survey of recent journal articles. Prerequisite: Psychology or Neuroscience graduate standing; PSYS 315.

**PSYS 330. Proseminar in Exp Social Psych. 3 Credits.**

Advanced analysis of experimental social psychology, including examination of social psychological theories, methods, and key research findings. Prerequisite: Psychology graduate standing.

**PSYS 350. Developmental Proseminar. 3 Credits.**

This seminar focuses on key issues in developmental psychology, including an examination and critique of psychological theories, methods, and research in child and adolescent development. Prerequisite: Psychology graduate standing.

**PSYS 370. Child Psychopathology. 3 Credits.**

An advanced course dealing with models of classification, diagnosis, epidemiology of behavior disorders in children. Prerequisite: Psychology graduate standing.

**PSYS 371. Adult Psychopathology. 3 Credits.**

An advanced course dealing with models of classification, diagnosis, epidemiology of behavior disorders in adults. Prerequisite: Psychology graduate standing.

**PSYS 372. Child & Adolescent Psyc Assess. 0 or 3 Credits.**

Interviewing, intelligence testing, behavioral assessment, social cognition, family environments, specific disorders of childhood. Supervised assessment practicum (100 hours) in in-patient and out-patient mental health settings and schools. Prerequisite: Psychology graduate standing.

**PSYS 373. Adult Psychological Assessment. 0 or 3 Credits.**

Theories and strategies of psychological intervention. Supervised service delivery (150 hours) at University Counseling and Testing Center including individual and group therapy and crisis intervention. Prerequisite: Psychology graduate standing.

**PSYS 374. Behavior Therapy: Children. 3 Credits.**

Review of literature relating to theory, practice, research. Emphasis on the evaluation of a variety of procedures applied to behavior disorders in children. Prerequisite: PSYS 370; Psychology Graduate standing.

**PSYS 375. Adult Cognitive & Behav Thrpy. 3 Credits.**

Review of literature relating to theory, practice, research. Emphasis on the evaluation of a variety of procedures applied to behavior disorders in adults. Prerequisite: PSYS 371; Psychology Graduate standing.

**PSYS 376. Multicultural Issues Clin Psyc. 3 Credits.**

An advanced, experiential and didactic course with the following objectives: (1) to increase awareness of racial-cultural factors in clinical psychology; (2) to build knowledge of specific reference group identities-such as race, ethnicity, gender, sexual orientation, social class, and religion; and (3) to cultivate culturally-responsive practice through skill development and critical consciousness. Prerequisite: Psychology graduate standing.

**PSYS 380. Professional Affairs & Ethics. 3 Credits.**

The origins of professions and of psychology in particular. Accreditation, laws affecting psychology, organization of the profession, licensing certification, and the code of ethics for psychology. Prerequisite: Psychology graduate standing.

**PSYS 384. Intro Psych Intervention Skill. 0.5 Credits.**

Introduction to basic psychological intervention skills and the integration of these skills in the therapeutic setting. For first-year doctoral students in clinical psychology. May be repeated for credit. Prerequisite: Psychology graduate standing only.

**PSYS 385. Advanced Clinical Practicum. 0 or 1 Credits.**

Year-long, 20 hours/week supervised service delivery involving psychological intervention assessment and consultation. May be repeated for credit. Prerequisite: Psychology graduate standing.

**PSYS 386. Full Clinic Practicum Seq Seri. 1 Credit.**

All clinical students from the first through the fifth year attend monthly full clinic trainings and case presentations. Trainings include a clinic orientation, safety training, and special topics. Each vertical team has the opportunity to provide a case presentation outlining theoretical framework, case conceptualization, treatment techniques, progress, and challenges. Prerequisite: Psychology graduate standing.

**PSYS 387. Supervision & Consultation Sem. 1 Credit.**

An overview of theory and research associated with clinical supervision and consultation for health service psychology. A meta-supervision model is implemented for the supervision of junior colleagues with an emphasis on multicultural issues. Exploration of consultation in numerous settings including hospitals, schools, community-based organizations, and industry. Prerequisite: Psychology graduate standing.

**PSYS 389. Internship in Clinical Psyc. 0 Credits.**

Clinical psychology internship experience. Prerequisite: Psychology graduate standing.

**PSYS 391. Master's Thesis Research. 0.5-18 Credits.**

Research leading toward completion of the master's thesis. Prerequisite: Psychology graduate standing.

**PSYS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSYS 393. Adv Professional/Research Sem. 1-2 Credits.**

Discussion of current research and student research presentation in areas of concentration ("clusters"). Prerequisite: Psychology graduate standing.

**PSYS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSYS 395. Advanced Readings/Research. 1-6 Credits.**

Readings, with conferences, to provide graduate students with background and specialized knowledge relating to an area in which an appropriate course is not offered. Prerequisite: Psychology graduate standing.

**PSYS 396. Advanced Special Topics. 0.5-18 Credits.**

See Schedule of Courses for specific titles. Prerequisites: Psychology Graduate Standing Only; Instructor permission.

**PSYS 490. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**PSYS 491. Doctoral Dissertation Research. 1-18 Credits.**

Research leading toward completion of the doctoral dissertation. Prerequisite: Psychology graduate standing.

**PSYS 494. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PSYS 496. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PUBLIC ADMINISTRATION (PA)****Courses****PA 206. Intro Cont Public Affairs. 3 Credits.**

Contemporary policy issues including government and the economy, the role of leadership, ethical and moral issues in public policy, and other contemporary issues impacting society. Prerequisites: CDAE 100 level course.

**PA 260. Smart Resilient Communities. 3 Credits.**

Focus on social ecological systems integration framework to determine community resilience, enable smart design processes at the nexus of food, energy and water systems and learn practical skills, such as early warning systems, ubiquitous computing and interactive scenario planning techniques. Prerequisites: CDAE 102 or Graduate standing. Cross-listed with: CDAE 260.

**PA 301. Foundations of Public Admin. 3 Credits.**

Survey of major elements of management in the public and nonprofit sectors with special attention given to problems arising from political imperatives generated by a democratic society.

**PA 302. Org Theory & Behavior. 3 Credits.**

Examination of basic classical and contemporary theory, research on human relations, internal structures, environments, types, diverse workplaces, general properties of complex organizations and bureaucracies.

**PA 303. Research & Evaluation Methods. 0 or 3 Credits.**

Conceptualization, collection and analysis of primary and secondary data; interpretation, and communication of results of applied research and/or evaluation studies for decision makers. Separate lab required. Cross-listed with: CDAE 351. Prerequisites: Three hours of statistics.

**PA 305. Public and Nonprofit Budgeting. 3 Credits.**

A focus on the budget as the primary policy and planning document in public and nonprofit organizations.

**PA 306. Policy Systems. 3 Credits.**

The study and application of system-level public policy frameworks, theories and models to contemporary policy problems and solutions.

**PA 307. Administrative Ethics. 3 Credits.**

Administrative behavior with a focus on ethical dilemmas that arise in the bureaucracy. An examination of a number of moral issues and ways to resolve them.

**PA 308. Decision Making Models. 3 Credits.**

Explores and analyzes normative, descriptive and prescriptive decision making models. Focuses on systems-level thinking to impart problem-solving skills in complex decision-making contexts. Emphasis placed on imparting cutting edge skills, enabling students to design and implement multiple criteria decision analysis models.

**PA 311. Policy Analysis&Program Eval. 3 Credits.**

A seminar providing hands-on knowledge in policy analysis and program evaluation using case studies of current analysis projects and problems. Specific techniques include planning, survey administration, forecasting, cost benefit analysis, and impact assessment.

**PA 317. Systems Anly & Strategic Mgmt. 3 Credits.**

Students will be introduced to systems thinking and network dynamics with a particular focus on managing across organizational and sectoral boundaries, including public-private partnerships, intergovernmental arrangements, and strategic alliances. Tools to undertake strategic analysis and planning will be explored.

**PA 323. Non-Profit Administration. 3 Credits.**

Course reviews the history of, and managerial challenges inherent to, the non-profit sector in the United States and explores sector's relationship to the governmental and business sectors.

**PA 326. Community Economic Development. 3 Credits.**

Examines how rural and urban communities address poverty, unemployment and other economic problems through job creation and retention, workforce training and support, and other development strategies. Cross-listed with: CDAE 326.

**PA 375. Public Administration Capstone. 3 Credits.**

The Capstone is designed to provide MPA students with a summative experience that ties learning competencies to evidence drawn from their course of study. Pre/co-requisites: Core MPA courses either prior to Spring semester or simultaneously.

**PA 380. Internship. 3-6 Credits.**

Supervised administrative experience culminating in a written report.

**PA 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by faculty advisor.

**PA 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PA 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PA 395. Advanced Special Topics. 1-18 Credits.**

For advanced students within areas of expertise of the faculty. Varied course offerings. Contemporary topics. Instructor Permission.

**PA 397. Readings & Research. 1-6 Credits.**

Readings, with conferences, term paper, to provide graduate students with specialized knowledge in an area in which an appropriate course is not offered.

**PUBLIC HEALTH (PH)****Courses****PH 301. Public Health & Health Policy. 3 Credits.**

Course focuses on current public health issues, barriers to improving population health, and policy tensions between science, economics, education, politics, government, media, and public health.

**PH 302. Epidemiology I. 3 Credits.**

Epidemiology is the study of disease distribution and determinants in populations; we will define populations and estimate the distribution of health-related conditions and their determinants. Pre/co-requisites: Bachelor's degree and college-level mathematics course.

**PH 303. Biostatistics I:App Rsch in PH. 3 Credits.**

Biostatistics I (Applied Research Methods in Public Health) includes biostatistics, research designs, and qualitative approaches, and includes emphasis on evaluating research articles in public health. Pre/co-requisites: Bachelor's degree and college-level mathematics course.

**PH 304. Environmental Public Health. 3 Credits.**

Explores major areas of environmental public health (EPH), including environmental hazards, exposures, and related health outcomes, including emerging topics in environmental public health.

**PH 305. Pol,Org & Finance in Hlth Care. 3 Credits.**

This course looks at U.S. health care policies, organizational structures and financing systems and examines key concepts from economic, social, ethical, political and global perspectives.

**PH 306. Social&Behavioral Public Hlth. 3 Credits.**

This course addresses the behavioral, social and cultural factors related to individual and population health, and health disparities over the life course.

**PH 307. Epidemiology 2. 3 Credits.**

Exposure to advanced epidemiological concepts, such as effect modifications and modeling using multiple variables, related to establishing causal relationships from observational data. Prerequisite: PH 302, PH 303.

**PH 308. Environmental Public Health 2. 3 Credits.**

Students explore public health within the context of natural and human-made environments, and examine methods of practice and emerging environmental health topics. Prerequisite: PH 304.

**PH 309. Public Health Biostatistics II. 3 Credits.**

An advanced applied research methods course with the goal of helping students understand and apply multivariate regression analyses, non-parametric methods, survival analysis and advanced concepts with confounding and effect modification, and interpreting data in public health applications. Prerequisite: PH 303.

**PH 310. Public Health Law and Ethics. 3 Credits.**

Public health law examines the government's authority, at various jurisdictional levels, to improve the health of the general population within societal limits and norms. Prerequisite: Bachelor's degree.

**PH 311. Global Public Health. 3 Credits.**

This course explores global public health challenges affecting people primarily in developing or resource-constrained countries. Cultural competency concepts will be embedded. Prerequisite: Bachelor's degree.

**PH 312. Food Systems & Public Health. 3 Credits.**

This course explores food systems' influence on public health, and how technology, policy, biology, epidemiology, and historical knowledge can support a healthier food system. Prerequisite: Bachelor's degree.

**PH 314. Environmental Risk & Risk Comm. 3 Credits.**

This course explores theory, policy and techniques for environmental risk communication from the viewpoints of government, industry, special interest groups, and the general public.

**PH 315. Public Health Surveillance. 3 Credits.**

Explores surveillance of infectious and non-infectious diseases, health behaviors and population characteristics, fundamental to nearly all fields of modern public health practice. Prerequisite: PH 302.

**PH 317. Mgmt in Health Services & Med Care. 3 Credits.**

Addresses major issues and challenges faced by health services managers relating to established and evolving social, economic, and professional policies in a context of practical problem assessment and appropriate resolution.

**PH 318. Improving Health in Population. 3 Credits.**

Descriptive and chronic disease epidemiology, health determinants, and community resources will be utilized to develop strategies and interprofessional skills to improve individual and population health. Exploration of roles of health professionals in the care of populations with an emphasis on the US health care system.

**PH 321. Controversies in Health Economics. 3 Credits.**

Covers health economic concepts, principles and theories, as well as the application of these methods to a range of practical scenarios. Examines the advantages and disadvantages of various health economic techniques and health economic evaluation.

**PH 322. One Health: Zoonoses. 3 Credits.**

Zoonoses and vector-borne disease account for the majority of emerging and re-emerging diseases. Students will learn about the drivers that influence infection in animals and humans, tools used for disease monitoring and prevention, and policies and programs aimed at prevention. Cross-listed with: ASCI 322.

**PH 324. Public Health Informatics. 3 Credits.**

Public health practice relies on timely, thorough and reliable information from a variety of sources. Informatics is an emerging field that employs information technology tools and methods to address public health challenges and to improve public health outcomes.

**PH 325. Investigating Disease Outbreaks. 3 Credits.**

Investigating disease outbreaks is a fundamental responsibility of public health. This course covers field epidemiology outbreak investigation methods, working on an investigatory team, interacting with relevant agencies, and the selection and implementation of appropriate interventions.

**PH 326. Legal Issues in Health Care. 3 Credits.**

Provides an overview of the legal environment related to healthcare. Using court decisions and other law, explores medical malpractice, negligence, liability, patient rights, healthcare reform and compliance with such laws as Medicaid, Medicare, and HIPAA.

**PH 327. Climate Change & Human Health. 3 Credits.**

Global climate change is increasing extreme weather events, influencing air and water quality, and shifting vector habitats. Students will explore basic climate science, health, consequences of climate change, and public health approaches to assessment, communication, projection, mitigation, and adaptation.

**PH 328. Health in Humanitarian Crises. 3 Credits.**

Offers an in-depth view of the complexities of responding to natural and conflict related disasters. Introduces a range of topics that lay the framework for humanitarian response and will generate further learning.

**PH 330. Exploring Healthcare Systems. 3 Credits.**

Explore a healthcare system outside the USA. Common elements in all healthcare systems are required for effective and efficient delivery. Field visits, presentations, and cultural exposure are included in the program. Prerequisite: Instructor permission.

**PH 331. Climate Change Emergencies. 3 Credits.**

Floods, droughts, severe heatwaves, wildfires, and disruptions to the food supply are a few anticipated direct effects of climate change. Examines each of these public health challenges, and their potential to cause/significantly contribute to complex humanitarian emergencies, civil unrest, military conflict, and large-scale migration, as well as policy implications going forward.

**PH 332. Maternal and Child Health. 3 Credits.**

Introduces major national programs and policies that directly affect women and children in the U.S. and utilize program case studies from around the world. Provides an understanding of social determinants of health and the life course approach to analyze these programs and policies.

**PH 333. Global Mental Health. 3 Credits.**

Provides a firm grounding in what is known about mental health issues affecting global populations. Examines a wide range of issues, ranging from how mental illness is identified to innovative treatment approaches and how cultural considerations influence mental health promotion efforts.

**PH 392. Culminating Project Experience. 1-6 Credits.**

Prepares students to apply knowledge and skills in a culminating project experience that reflects research and practice needs of actual populations. Prerequisites: PH 301, PH 302, PH 303, PH 307.

**PH 393. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PH 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**PH 395. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PH 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**RADIOLOGY (RAD)****Courses****RAD 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**RAD 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**RAD 399. Human Anatomy via Radiology. 3 Credits.**

Conveys the subject of human anatomy. Rather than anatomic dissection, in-vivo anatomy will be presented through medical imaging. Prerequisites: BIOL 100-level equivalent.

**REHABILITATION & MOVEMENT SCI (RMS)****Courses****RMS 213. Biomechanics of Human Movement. 3 Credits.**

Students learn to apply kinesiology and biomechanical principles and concepts to the analysis of human movement, posture, joint structure and function, and gait. Prerequisites: ANPS 019, ANPS 020, EXSC 175; or enrollment in the Athletic Training MS program.

**RMS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**SECONDARY EDUCATION (EDSC)****Courses****EDSC 207. Development: Theory & Applctn. 3 or 4 Credits.**

Participants in this class examine adolescent developmental and learning theories. A Service Learning requirement allows students to apply understanding in the context of instructional settings. Prerequisites: EDTE 001 or EDFS 002 or instructor permission.

**EDSC 209. Practicum in Teaching. 3 or 4 Credits.**

Field-experience in secondary setting. Focus on school culture and student needs while documenting effectiveness in one-on-one teaching. Professional attributes/dispositions are critically assessed. Pre/co-requisite: EDFS 203/EDSC 207.

**EDSC 215. Reading in Secondary Schools. 3-4 Credits.**

Theory and methods of reading/writing explored in the context of literacy. Focus on reading, writing, speaking and critical thinking across disciplines. Cultural contexts explored. Pre/co-requisites: EDSC 207 and EDSC 209.

**EDSC 216. Curr,Instr&Assmt Sec Schl Tchr. 3 Credits.**

Development of methods related to secondary school teaching. Study and application of constructivist learning theory, differentiation, authentic assessment in planning. Focus on cross-disciplinary collaboration. Co-requisite: EDSC 215.

**EDSC 225. Tchg Soc Studies in Sec Schls. 3 Credits.**

Includes multiple teaching modes, questioning techniques, micro-teaching laboratory, analysis of historical content to determine students' prerequisite cognitive skills and processes for construction of historical scenarios. Prerequisite: Twelve hours of education and related areas.

**EDSC 226. Internship: Student Teaching. 12 Credits.**

Collaboration with professional teachers in design and implementation of effective instruction, with special focus on developing programs in a high school setting. Prerequisite: Senior standing in Secondary Education major; PRAXIS Core; completion of all course requirements; overall GPA of 3 point 0 or higher. Co-requisites: Special Methods course, EDSC 230.

**EDSC 227. Tchng Science in Sec Schls. 3 Credits.**

Consideration of science curricula and instructional strategies for grades 7-12. Topics may include: teaching science as problem solving, research in science teaching, affective education through science. Prerequisite: Twelve hours in education and related areas or Instructor permission.

**EDSC 230. Teaching for Results. 3 Credits.**

Analysis of planning, curriculum design, teaching, evaluation and classroom management from the perspective of research and practice. Individual tasks culminate in production of a licensure portfolio. Co-requisite: EDSC 226.

**EDSC 237. Tchng Computer Science in Sec. 3 Credits.**

Explores theories and practices of teaching, learning and assessing computer science in middle school and high school. Topics include the structure of computer science disciplines, computer science learning standards, best practices of teaching/assessing computer science, and social and ethical issues in computer science. Prerequisite: EDSC 216.

**EDSC 257. QR:Tchg Math in Sec Schls. 3 Credits.**

Contemporary secondary school mathematics curricula and instructional strategies for grades 7-12. Topics may include problem solving, research in mathematics education, use of calculators and computers, manipulatives, and evaluation. Prerequisite: Twelve hours in education and related areas or permission.

**EDSC 259. Tchng Foreign Lang in Sec Schls. 3 Credits.**

An overview of language teaching methodology. The learning/teaching process as it relates to language learning; techniques used in the teaching and testing of second language skills and culture. Prerequisite: Acceptance into licensure program.

**EDSC 390. Internship: Student Teaching. 12 Credits.**

To achieve the benefits of the licensure program including new knowledge and skills, changed attitudes and values, and the potential to become a licensed and employed school professional, UVM interns will engage in a variety of activities designed to fulfill our collective mission of providing a high-quality field-based student teaching internship experience. Prerequisites: Secondary MAT Education students; admission to Student Teaching; 3 point 0 overall GPA requirement; 3 point 0 GPA in professional courses. Co-requisites: EDSC 230. Pre/Co-requisites: Secondary MAT Education students; admission to Student Teaching; 3 point 0 overall GPA requirement; 3 point 0 professional Courses; EDML 286.

**EDSC 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDSC 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**SOCIAL WORK (SWSS)****Courses****SWSS 200. Contemporary Issues. 1-6 Credits.**

Content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Instructor Permission.

**SWSS 212. Social Work Practice I. 3 Credits.**

A comprehensive introduction to concepts and skills employed by social workers in interactions and interventions with individuals, families, and groups is provided. Prerequisite: MSW standing; or Instructor permission.

**SWSS 213. Social Work Practice II. 3 Credits.**

Knowledge and skills of social work practice with organizations and communities is emphasized. Prerequisite: Completion of SWSS 212; MSW advanced standing; or Instructor permission.

**SWSS 216. Th Found of Hum Beh&Soc Envr I. 3 Credits.**

This course introduces students to the biological, psychological, cultural/social, and economic forces that influence human behavior and their implication for social work practice. Prerequisite: MSW standing; or Instructor permission.

**SWSS 217. Th Found Hum Beh&Soc Envr II. 3 Credits.**

Focus is on theories regarding the nature and functioning of human service organizations and communities in relation to meeting human needs. Prerequisite: SWSS 216 or Instructor permission.

**SWSS 220. Soc Welfare Pol & Services I. 3 Credits.**

An introduction to history and philosophy of social work and social welfare and the structure of service programs is provided. Prerequisite: MSW standing or Instructor permission.

**SWSS 221. Soc Welfare Pol & Services II. 3 Credits.**

Focus is on the analysis of the economic, political, and social forces that influence the development and implementation of social welfare policy. Prerequisite: SWSS 220; or Instructor permission.

**SWSS 224. Child Abuse & Neglect. 3 Credits.**

An MSW foundation elective that considers child abuse and neglect from historical, cultural, sociopolitical and psychological perspectives and examines professional social work responses to them. Prerequisite: Matriculation in the foundation year of Graduate study in Social Work; or Instructor permission.

**SWSS 227. Found of Social Work Research. 3 Credits.**

An introduction to qualitative and quantitative methods of applied social research including program evaluation and the evaluation of practice and application to social work is taught. Prerequisite: MSW standing or Instructor permission.

**SWSS 280. Perspectives on Social Work. 4 Credits.**

Taking a social constructionist stance, students explore guiding concepts of the MSW curriculum and their application to social work practice, policy, human behavior and research. Pre/co-requisite: MSW standing.

**SWSS 290. Foundation Yr Field Practicum. 3-4 Credits.**

Supervised field-based learning of 15-20 hours per week. Students are placed in human service agencies and organizations and learn the purposeful application of generalist social work theory, ethics, and skills. Prerequisite: Permission of Coordinator of Field Education.

**SWSS 314. Transformative Social Work I. 3 Credits.**

Advanced practice in transformative social work will focus on developing relational, profound, and generative meanings for change across populations, fields of practice and social issues. Prerequisite: Completion of Foundation Year.

**SWSS 315. Transformative Social Work II. 3 Credits.**

Advanced practice in Transformative Social Work II will focus on practical applications across populations at risk, field of practice and social issues. Prerequisite: Completion of Foundation Year.

**SWSS 316. Integrative Appr Transform SW. 3 Credits.**

In this course students will synthesize their exploration of their area of focus in transformative social work through scholarly reading, research and classroom presentations. Prerequisite: Completion of Foundation Year.

**SWSS 320. Adv Soc Welf Policy Anyl&Prac. 3 Credits.**

In depth analysis of social welfare policy with application to children and families or health and mental health is required. There is an emphasis on the skills of the policy practitioner. Prerequisite: Completion of SWSS 220 and SWSS 221; MSW advanced standing; or Instructor permission.

**SWSS 327. Adv Social Work Research. 3 Credits.**

An analysis of social work research from methodological and theoretical perspectives is emphasized. The application of research to the student's concentration area is required. Prerequisites: Completion of SWSS 227; a basic statistics course; MSW advanced standing; or Instructor permission.

**SWSS 330. Assessment in Social Work. 3 Credits.**

An advanced MSW concentration elective that analyzes competing and complementary assessment strategies and their implications in social work in health/mental health and with children and families. Prerequisite: Completion of MSW foundation course work; or Instructor permission.



**SWSS 336. Addressing Substance Abuse SW. 3 Credits.**

In this course, students will investigate the research on the etiological and contributing factors to substance abuse, and study gender specific and culturally responsive treatment strategies, than include trauma-focused, motivational interviewing and cognitive-behavioral approaches. Prerequisites: Social Work majors, Concentration year status (completion of foundation year or having advancing standing status in the MSW program).

**SWSS 338. TSW Responses to Violence. 3 Credits.**

Considers transformative social work with adults' and adolescents' experiences of violence along a continuum from interpersonal to collective. Employs a global, poststructural/constructionist practice stance centered on human rights and social justice, safety and agency. Emphasizes collaborative practices in diverse communities. Prerequisites: Completion of all MSW foundation courses or MSW Advanced Standing status.

**SWSS 339. Practitioners' Own Stories. 3 Credits.**

Through weekly writing prompts, students reflect on connections between their graduate training and contexts for practice, considering organizing concepts of wellness and illness and normal and dysfunction, along with social categories of social difference. They focus on how their personal and professional subjectivities contribute to their observations and analyses of institutionally generated client concerns. Prerequisite: Completion of foundation year course work Masters in Social Work program.

**SWSS 340. Trans. Change in SW Orgs. 3 Credits.**

This course prepares social workers to lead transformative organizational change; change that reorients the way the organization functions through critical questioning of standing organizational discourse and practices. Topics include: futures research, change models, constructivist approaches, & social inequity and difference. Prerequisites: Completion of first year of the MSW program or Advanced Standing status in the MSW program.

**SWSS 341. Social Work with Refugees. 3 Credits.**

The historical construction of 'refugees', the discourses and practices that surround it, and the impact of that construction on the lives of people, particularly vulnerable populations are course foci. The geopolitical, economic, ecological discourses that give rise to human flight are examined within the context of social work practice. Service learning experiences are provided. Prerequisites: SWSS 212, SWSS 213, SWSS 216, SWSS 217, SWSS 220, SWSS 221, SWSS 227, SWSS 290, SWSS 290.

**SWSS 380. Prof Issues in Social Work. 2-4 Credits.**

Designed to cover selected social work issues in depth. Major emphasis on intensive and critical analysis of the literature and practice in a given area. Prerequisite: Instructor Permission.

**SWSS 390. Spec Practice Field Practicum. 3-4 Credits.**

Supervised field-based learning of 15-20 hours per week. Students are placed in human service agencies and organizations and apply advanced social work practice related to an area of specialized practice. Prerequisite: Completion of 30 Foundation MSW credit hours including SWSS 212, 213, 216, 217, 220, 221, 227, 290 (6 hours); or permission of Field Education Coordinator. Co-requisite: SWSS 314 in Fall, SWSS 315 in Spring.

**SWSS 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**SWSS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**SWSS 397. Independent Study. 1-6 Credits.**

Individual work on Social Work issue(s) selected by the student in consultation with a faculty member. Prerequisite: Instructor permission required.

**SOCIOLOGY (SOC)****Courses****SOC 216. Criminal Justice. 3 Credits.**

Analysis of social structures and processes in criminal justice arenas, the labeling of criminal offenders, and other issues related to crime, punishment, and justice. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing. Declared Law & Society minors may substitute SOC 014 for other prerequisite coursework in Sociology.

**SOC 219. D1: Race Relations. 3 Credits.**

Examination of American racial subordination in social and historical perspective. Analysis of interracial contacts, racial subcultures and social structures, and responses to racial prejudice and discrimination. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SOC 229. Family as Social Institution. 3 Credits.**

Examination of the institution of the American family in cross-cultural and historical perspective. Theories and research on family continuity, change, and institutional relationships explored. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SOC 232. Social Class & Mobility. 3 Credits.**

Comparative and historical analysis of causes, forms, and consequences of structured social inequality in societies. Examination of selected problems in contemporary stratification theory and research. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SOC 250. Sociology of Culture. 3 Credits.**

The relations of cultural forms and subjective experience to social structure and power; in-depth applications of interpretive approaches in contemporary sociology. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SOC 258. Sociology of Law. 3 Credits.**

Analysis of sociocultural structure of the legal institution and its relationships to other institutions: the social organization of the legal profession, lawmaking, and the courts. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing. Declared Law & Society minors may substitute SOC 014 for other prerequisite coursework in Sociology.

**SOC 272. D2: Soc of African Societies. 3 Credits.**

Current social, cultural, political, and economic changes occurring in African societies, including issues of development, the state and civil society, social class, ethnonationalism, and democratization. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SOC 274. Qualitative Research Methods. 3 Credits.**

Principles of qualitative research design and ethics and data collection, analysis, and presentation. Students will complete a research project over the course of the semester. Prerequisites: SOC 001; SOC 090 or SOC 100 or SOC 101; minimum Junior standing.

**SPANISH (SPAN)****Courses****SPAN 287. Early Span Narratives Americas. 3 Credits.**

Readings and analysis of late 15th and 16th century narratives. Discussion of European and Native American perspectives, religious disputes, and the "Leyenda Negra (Black Legend). Prerequisite: One course from SPAN 143, SPAN 144, SPAN 145, or SPAN 146 or Instructor permission.

**SPAN 290. Hispanic Films in Context. 3 Credits.**

Approaching film as reflection and shaper of Hispanic cultures through comparison with texts relevant to cultural context. Includes study of film terminology and analysis. Prerequisite: One course from SPAN 143, SPAN 144, SPAN 145, or SPAN 146 or Instructor permission.

**SPAN 291. Early Cultures of Spain. 3 Credits.**

A study of the Spanish cultures from earliest times through 1700, emphasizing major intellectual, political, and artistic developments. Prerequisite: One course from SPAN 143, SPAN 144, SPAN 145, or SPAN 146 or Instructor permission.

**SPECIAL EDUCATION (EDSP)****Courses****EDSP 200. Contemporary Issues. 1-3 Credits.**

Designed so that its content and structure may accommodate special issues outside the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDSP 201. D2: Foundations of Special Ed. 3 Credits.**

Examination of historical and current trends in the treatment of individuals with disabilities including effects of discrimination, advocacy, litigation, legislation and economic considerations on educational services and community inclusion. Prerequisite: Twelve hours in Education and related areas, or Instructor permission.

**EDSP 202. Severe Disabil Char&Intervent. 3 Credits.**

Physical, sensory, health, intellectual and behavioral characteristics of developmental disabilities. Educational approaches and supports from various professional disciplines to educate students with severe disabilities. Prerequisite: Permission of Instructor.

**EDSP 218. Preventing School Shootings. 3 Credits.**

Issues to be explored include historical perspectives on school safety, theories of sources of violence in schools and their merit, relationship building as an antecedent intervention, the intersection of social justice and the second amendment, and action steps to be taken to help prevent further school tragedies. Prerequisites: EDSP 005, EDSP 117, Graduate student standing, or Instructor permission.

**EDSP 224. Meeting Inst Needs/All Stdnts. 3 Credits.**

Students apply principles of learning and social development to improve academic and social skills of all individuals with a focus on those who present academic and behavioral challenges. Prerequisite: Instructor permission.

**EDSP 274. D2: Culture of Disability. 3 Credits.**

Focus on theoretical questions of how societies understand disability and its consequences for social justice, by examining the multiple determinants of the societal construction of disability. Prerequisite: One of the following: EDSP 117, CSD 101, ASL 195, Graduate standing, or by Instructor permission. Cross-listed with: CSD 274.

**EDSP 280. Assessment in Special Ed. 3 Credits.**

Course covers assessment knowledge and skills essential for special educators, including test selection, administration and scoring, and legal issues related to special education assessment. Prerequisite: Admission to Graduate Program in Special Education or permission of the Instructor.

**EDSP 290. Early Lit and Math Curriculum. 3 Credits.**

Study of curriculum and technology areas related to development, adaptation, and assessment of early literacy and mathematics instruction for elementary age students with disabilities. Prerequisite: Instructor Permission.

**EDSP 295. Laboratory Exp in Education. 1-6 Credits.**

Supervised field work designed to give students experience in specialized areas for their professional development. Prerequisite: Permission of the Coordinator of Professional Laboratory Experiences.

**EDSP 296. Laboratory Exp in Education. 1-6 Credits.**

Credit as arranged.

**EDSP 298. Special Educ Practicum. 1-6 Credits.**

Students provide direct instruction for six learners with learning disabilities, cognitive disabilities, behavior disorders, and/or multidisabilities. Prerequisite: Instructor permission.

**EDSP 299. Global Resilience Fam-Schl-Com. 3 Credits.**

Students travel outside of the continental US to gain a global perspective culturally diverse strategies for building resilience, enhancing equity, and responding to trauma and adversity. Prerequisites: EDSP 005, EDSP 117, minimum Junior standing, and Instructor permission.

**EDSP 300. Social & Emotional Interventio. 3 Credits.**

Explore evidence based practices and behavior based interventions to support struggling students to remain in the general education classroom environment. You will learn to understand the underlying function of students' behavior and ways to engage students in their classroom based instruction. The course is rooted within an MTSS framework, exploring personal, classroom, and systematic implications.

**EDSP 310. Curr & Tech Spec Ed: Literacy. 3 Credits.**

Curricular and assessment areas essential to literacy development for students with disabilities. Development, adaptation of curricula and assessment in elementary and secondary education for students with mild, moderate, and severe disabilities. Prerequisite: Special Education Graduate Student or Instructor permission.

**EDSP 311. Curr & Tech Spec Ed: Math. 0 or 3 Credits.**

Curricular and assessment areas essential to math development for students with disabilities. Development, adaptation of curricula and assessment in elementary and secondary education for students with mild, moderate, and severe disabilities. Prerequisite: Special Education Graduate Student or Instructor permission.

**EDSP 318. Behavior Analysis in Spec Ed. 3 Credits.**

Instruction for learners with disabilities emphasizing learning principles, applied behavior analysis, and research-based interventions. Interventions focus on teaching new skills as well as analyzing and addressing maladaptive behaviors. Emphasizes applying these approaches in inclusive educational environments. Prerequisite: Special Education graduate student or Instructor permission.

**EDSP 322. Intern: Triadic Model Consult. 1-6 Credits.**

Competency-based instruction in oral and written communication, consultation, and workshop level training is provided. Students apply the consultation model in an educational setting. Prerequisite: EDSP 310, EDSP 312, or Instructor permission.

**EDSP 323. Intern: Systems Development. 1-6 Credits.**

Competency-based instruction in planning for system level development and change. Students apply systems theory in an educational setting. Prerequisite: EDSP 310, EDSP 312, or Instructor permission.

**EDSP 330. The Trauma Lens. 3 Credits.**

Provides students with the theoretical foundation and conceptual frameworks that relate to building resilience for children, youth and families who have experienced trauma and adversity. For in-service and pre-service professionals in child welfare, health/mental health, and education.

**EDSP 332. Resilnce Equity&Intrprof Prac. 3 Credits.**

An inter-professional approach to trauma-informed and resiliency based approaches that aims to understand and enhance equity and well-being for children, youth, families, and their own selves. In-service and pre-service students from across professions (child welfare, health/mental, education) will build toolkit of strategies.

**EDSP 333. Trauma Informed System Change. 3 Credits.**

Focus on trauma informed system change in schools and human service organizations; designed to provide a conceptual framework addressing the strategic process of managing change that is trauma responsive and encourages collaborative learning climate for its employees. Pre/Co-requisites: EDSP 330 or EDSP 331 or EDSP 332.

**EDSP 334. Restorative&Trma Pract w/Child. 3 Credits.**

An introduction to evidence-informed, restorative and trauma-informed approaches that support the social-emotional health for school-aged children and youth who have experienced trauma and adversity. Students will gain a toolbox of knowledge, practice and skills they can apply to their direct practice with children and families. Prerequisites: EDSP 330 or EDSP 331; EDSP 332, or Instructor permission.

**EDSP 382. Teaching Internship. 3-8 Credits.**

Supervised teaching experiences on a full-time basis, with related seminars in teaching subject. Prerequisite: Permission of coordinator of Professional Laboratory Experiences.

**EDSP 387. Collaborative Consultation. 3 Credits.**

Adult development and group dynamics theory provide the knowledge base for collaborating with parents and teachers to meet the diverse needs of students with disabilities. Cross-listed with: EDLP 320.

**EDSP 390. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**EDSP 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

**EDSP 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDSP 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**EDSP 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**EDSP 496. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**STATISTICS (STAT)****Courses****STAT 200. QR: Med Biostat&Epidemiology. 3 Credits.**

Introductory design and analysis of medical studies. Epidemiological concepts, case-control and cohort studies. Clinical trials. Students evaluate statistical aspects of published health science studies. Prerequisite: STAT 111, STAT 141, STAT 143, or STAT 211.

**STAT 201. QR: Stat Computing & Data Analysis. 3 Credits.**

Fundamental data processing, code development, graphing and analysis using statistical software packages, including SAS and R. Analysis of data and interpretation of results. Project-based. Prerequisite: STAT 141 or STAT 143 or STAT 211; or STAT 111 with Instructor permission.

**STAT 211. QR: Statistical Methods I. 3 Credits.**

Fundamental concepts for data analysis and experimental design. Descriptive and inferential statistics, including classical and nonparametric methods, regression, correlation, and analysis of variance. Statistical software. Prerequisite: Minimum Junior standing or STAT 141 or STAT 143 and Instructor permission.

**STAT 221. QR: Statistical Methods II. 3 Credits.**

Multiple regression and correlation. Basic experimental design. Analysis of variance (fixed, random, and mixed models). Analysis of covariance. Computer software usage. Prerequisite: STAT 143 or STAT 211 with a grade of C or better; or STAT 141 and Instructor permission.

**STAT 223. QR: Applied Multivariate Analysis. 3 Credits.**

Multivariate normal distribution. Inference for mean vectors and covariance matrices. Multivariate analysis of variance (MANOVA), discrimination and classification, principal components, factor and cluster analysis. Prerequisite: STAT 221, matrix algebra recommended.

**STAT 224. QR: Stats for Quality & Productivity. 3 Credits.**

Statistical process control; Shewhart, cusum and other control charts; process capability studies. Total Quality Management. Acceptance, continuous, sequential sampling. Process design and improvement. Case studies. Prerequisite: STAT 141, STAT 143, or STAT 211.

**STAT 229. QR: Survival/Logistic Regression. 3 Credits.**

Models and inference for time-to-event and binary data. Censored data, life tables, Kaplan-Meier estimation, logrank tests, proportional hazards models. Logistic regression-interpretation, assessment, model building, special topics. Prerequisite: STAT 221.

**STAT 231. QR: Experimental Design. 3 Credits.**

Randomization, complete and incomplete blocks, cross-overs, Latin squares, covariance analysis, factorial experiments, confounding, fractional factorials, nesting, split plots, repeated measures, mixed models, response surface optimization. Prerequisite: STAT 221; or STAT 211 and STAT 201.

**STAT 235. QR: Categorical Data Analysis. 3 Credits.**

Measures of association and inference for categorical and ordinal data in multiway contingency tables. Log linear and logistic regression models. Prerequisite: STAT 211.

**STAT 241. QR: Statistical Inference. 3 Credits.**

Introduction to statistical theory: related probability fundamentals, derivation of statistical principles, and methodology for parameter estimation and hypothesis testing. Prerequisites: A grade of C or better in one of STAT 151, STAT 153, or STAT 251; STAT 141 or equivalent; MATH 121.

**STAT 251. QR: Probability Theory. 3 Credits.**

Distributions of random variables and functions of random variables. Expectations, stochastic independence, sampling and limiting distributions (central limit theorems). Concepts of random number generation. Prerequisite: MATH 121; STAT 151 or STAT 153 recommended.

**STAT 253. QR: Applied Time Series & Forecasting. 3 Credits.**

Autoregressive moving average (Box-Jenkins) models, autocorrelation, partial correlation, differencing for nonstationarity, computer modeling. Forecasting, seasonal or cyclic variation, transfer function and intervention analysis, spectral analysis.

**STAT 261. QR: Statistical Theory. 3 Credits.**

Point and interval estimation, hypothesis testing, and decision theory. Application of general statistical principles to areas such as nonparametric tests, sequential analysis, and linear models. Prerequisite: STAT 251.

**STAT 287. QR: Data Science I. 3 Credits.**

Data harvesting, cleaning, and summarizing; working with non-traditional, non-numeric data (social network, natural language textual data, etc.); scientific visualization using static and interactive infographics; a practical focus on real datasets, and developing good habits for rigorous and reproducible computational science; Project-based. Prerequisites: CS 020 or CS 021; STAT 141 or STAT 143 or STAT 211; CS 110 and MATH 122/124 recommended. Cross-listed with: CS 287, CSYS 287.

**STAT 288. QR: Statistical Learning. 3 Credits.**

Statistical learning methods and applications to modern problems in science, industry, and society. Topics include: linear model selection, cross-validation, lasso and ridge regression, tree-based methods, bagging and boosting, support vector machines, and unsupervised learning. Prerequisites: STAT 143, STAT 183 or STAT 211. Cross-listed with: CS 288.

**STAT 330. Bayesian Statistics. 3 Credits.**

Introduction to Bayesian inference. Posterior inference, predictive distributions, prior distribution selection. MCMC algorithms. Hierarchical models. Model checking and selection. Use of computer software. Pre/co-requisite: STAT 241 or STAT 251 or Instructor permission.

**STAT 360. Linear Models. 3 Credits.**

Theory of linear models, least squares and maximum likelihood estimation, fixed, random and mixed models, variance component estimation, introduction to generalized linear models, bootstrapping. Prerequisites: STAT 261 and knowledge of matrix algebra or Instructor permission.

**STAT 369. Applied Geostatistics. 3 Credits.**

Introduction to the theory of regionalized variables, geostatistics (kriging techniques): special topics in multivariate analysis; Applications to real data subject to spatial variation are emphasized. Prerequisites: STAT 223; CS 020 or CS 021; or Instructor permission. Cross-listed with: CE 369, CSYS 369.

**STAT 381. Statistical Research. 1-3 Credits.**

Methodologic or data analytic research culminating in oral and written reports to the faculty. Prerequisite: Instructor permission.

**STAT 385. Consulting Practicum. 1-3 Credits.**

Supervised field work in statistical consulting. Experiences may include advising UVM faculty and students or clients in applied settings such as industry and government agencies. Prerequisites: Second year Graduate standing in Statistics or Biostatistics and permission of Statistics Program Director.

**STAT 387. Data Science II. 3 Credits.**

Advanced data analysis, collection, and filtering; statistical modeling, monte carlo statistical methods, and in particular Bayesian data analysis, including necessary probabilistic background material; a practical focus on real datasets and developing good habits for rigorous and reproducible computational science. Prerequisite: STAT 287 or CS 287 or CSYS 287 or Instructor permission. Cross-listed with: CS 387, CSYS 387.

**STAT 391. Master's Thesis Research. 1-6 Credits.****STAT 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**STAT 395. Advanced Special Topics. 1-18 Credits.**

Lectures or directed readings on advanced and contemporary topics not presently included in other statistics courses. Prerequisites: As listed in schedule of courses.

**SURGERY (SURG)****Courses****SURG 200. Emergency Medicine Research I. 4 Credits.**

Lecture course with 4 hour lab. Introduction to research in Emergency Medicine with clinical exposure including shadowing EMTs, RNs, and MDs. Students will learn about research ethics, informed consent, and clinical epistemology. Prerequisites: Minimum Sophomore standing and Instructor permission; First-Year students who have prior clinical experience (e.g. EMTs) or are non-traditional students are considered on a case-by-case basis.

**SURG 201. Emergency Medicine Research II. 4 Credits.**

Advanced discussion and research training in emergency medicine with continued emergency department-based human subjects laboratory. Includes eight hours of clinical time per week helping recruit patients for ongoing research projects as well as a one hour seminar per week. Prerequisites: SURG 200 with minimum grade B; Instructor permission.

**SURG 220. Emerg. Medicine Research III. 3 Credits.**

Emergency medicine research under guidance of a faculty member, including facilitating study enrollment and implementation of research project proposed during SURG 201. Prerequisites: SURG 200, SURG 201; Instructor permission.

**SURG 302. Introduction to Flow Cytometry. 2 Credits.**

Provides basic knowledge in the theoretical and practical aspects of flow cytometry technology; combination of lecture and training in the practical use of instrumentation and analysis software.

**SURG 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**SURG 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**TRANSPORTATION RESEARCH CENTER (TRC)****Courses****TRC 395. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**WATER RESOURCES (WR)****Courses****WR 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

**WR 391. Master's Thesis Research. 1-12 Credits.**

Credit as arranged.

**WR 394. Independent Graduate Research. 1-18 Credits.**

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**WR 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**WILDLIFE & FISHERIES BIOLOGY (WFB)****Courses****WFB 232. Ichthyology. 3 Credits.**

Biology of fishes. Focus is on form and function, morphology, physiology, behavior, life history, and ecology of modern fishes. Prerequisites: BIOL 001 and BIOL 002, or BCOR 011 and BCOR 012; Junior standing. Alternate years.

**WFB 261. Fisheries Management. 3 Credits.**

Principles of fisheries management, including population assessment, analytical methods, harvest allocation models, human dimensions, policy and emerging issues. Prerequisites: BIOL 001 or BCOR 011; BIOL 002 or BCOR 012; WFB 161.

**WFB 275. Wildlife Behavior. 3 Credits.**

Behavior and social organization of game and nongame species as they pertain to population management. Prerequisites: BIOL 001 or BCOR 011, BIOL 002 or BCOR 012, NR 103 or BCOR 102.

**WFB 283. Terrestrial Wildlife Ecology. 4 Credits.**

Wildlife ecology with an emphasis on the management and conservation of species, populations, and ecosystems. Prerequisite: WFB 174, and NR 103 or BCOR 012.

**WFB 396. Advanced Special Topics. 1-18 Credits.**

See schedule of courses for specific titles.

**ACCOUNTANCY**

<http://www.uvm.edu/business/>

**OVERVIEW**

The Master of Accountancy (M.Acc.) degree is designed to equip students with the 150 hours of university-level education required to sit for the Certified Public Accountant (CPA) exam and become certified as a CPA. The curriculum prepares students to become successful professionals as auditors, tax preparers and advisors, as well as corporate, not-for-profit and governmental accountants. Graduates may also complete various other professional certifications including the Certified Management Accountant (CMA), Certified Internal Auditor (CIA), Certified Information Systems Auditors (CISA) or the Certified Fraud Examiner (CFE).

**DEGREES**

- Accountancy (M.Acc.) AMP (p. 85)
- Accountancy M.Acc. (p. 86)

**FACULTY**

**Arel, Barbara M.;** Associate Professor, Grossman School of Business; PHD, Arizona State University  
**Cats-Baril, William Lawrence;** Associate Professor, Grossman School of Business; PHD, University of Wisconsin-Madison  
**Chiang, Kevin C.;** Professor, Grossman School of Business; PHD, Louisiana State University  
**Dempsey, Stephen Jeffrey;** Associate Professor, Grossman School of Business; PHD, Virginia Polytechnic Institute and State University  
**DeWitt, Rocki-Lee;** Professor, Grossman School of Business; PHD, Columbia University  
**Do, Hung Tuan;** Associate Professor, Grossman School of Business; PHD, Purdue University  
**Glavas, Ante;** Associate Professor, Grossman School of Business; PHD, Case Western Reserve University  
**Gove, Steve;** Associate Professor, Grossman School of Business; PHD, Arizona State University  
**Hughes, Susan;** Associate Professor, Grossman School of Business; PHD, University of Cincinnati  
**Jones, David A.;** Professor, Grossman School of Business; PHD, University of Calgary  
**Lowensohn, Suzanne;** Associate Professor, Grossman School of Business; PHD, University of Miami  
**Lucas, Marilyn T.;** Associate Professor, Grossman School of Business; PHD, University of Illinois Urbana-Champaign  
**Monsen, Erik;** Associate Professor, Grossman School of Business; PHD, University of Colorado at Boulder  
**Noordewier, Thomas Gerald;** Professor, Grossman School of Business; PHD, University of Wisconsin-Madison  
**Novak, David C.;** Professor, Grossman School of Business; PHD, Virginia Polytechnic Institute and State University  
**Prevost, Andrew;** Professor, Grossman School of Business; PHD, Wayne State University

**Schnitzlein, Charles R.;** Professor, Grossman School of Business; PHD, Washington University  
**Sharma, Pramodita;** Professor, Grossman School of Business; PHD, University of Calgary  
**Sharma, Sanjay;** Dean and Professor, Grossman School of Business; PHD, University of Calgary  
**Tomas, Amy M.;** Senior Lecturer, Grossman School of Business; PHD, University of Memphis  
**Tomas III, Michael John;** Associate Professor, Grossman School of Business; PHD, Syracuse University  
**Vanden Bergh, Richard G.;** Professor, Grossman School of Business; PHD, University of California Berkeley  
**Venugopal, Srinivas;** Assistant Professor, Grossman School of Business; PHD, University of Illinois at Urbana-Champaign  
**Walberg, Glenn C.;** Associate Professor, Grossman School of Business; JD, College of William and Mary  
**Zhang, Chun;** Associate Professor, Grossman School of Business; PHD, Michigan State University

**ACCOUNTANCY (M.ACC.) AMP**

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

**OVERVIEW**

The Master of Accountancy provides a means of entry into the public accounting profession and for positions in corporate, government and not-for-profit organizations. Qualified undergraduate students who plan to earn the Master of Accountancy (M.Acc.) degree may enroll in the Accelerated Master's Program which enables UVM students to begin working on their master's degree requirements during the last semester of their undergraduate study.

**SPECIFIC REQUIREMENTS****Requirements for Admission to Graduate Studies for the Degree of Master of Accountancy**

UVM students should apply for admission to the accelerated M.Acc. program during the semester preceding their final undergraduate semester. Admission to the accelerated program requires the following:

- A declared concentration in the Grossman School of Business;
- Successful completion of Corporate Financial Reporting 1 and 2, or evidence of academic excellence in 100 and 200 level courses in their chosen concentration;
- A minimum cumulative grade point average of 3.20;
- Completion of the Graduate College application form, that must include at least one positive letter of recommendation from a faculty member who taught the applicant in a 100- or 200-level Grossman School of Business concentration course;
- A designation on the first page of the application indicating the applicant is applying for the accelerated program.
- Applicants should be clear that the courses taken for graduate credit must be in addition to the course work required for

the B.S.B.A. including all general education, foundation, concentration and theme courses.

Consistent with the M.Acc. application guidelines, GMAT scores are not required.

### Minimum Degree Requirements

Students may take up to 9 credits of graduate course work prior to the conferral of the B.S.B.A. degree. These credits will be counted in the grade point averages for both the B.S.B.A. and M.Acc. degrees. All courses to be counted toward the M.Acc. degree must be completed after Graduate College acceptance of the student in the accelerated program, be 200- or 300-level business courses, be approved by the program director and exclude any courses that are required for the undergraduate degree.

### Comprehensive Examination

M.Acc. students complete the comprehensive examination through successful completion of the capstone course, BSAD 361 Accounting Research, Regulation and Ethics.

### Requirements for Advancement to Candidacy for the Degree of Master of Accountancy

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.0 or better, including all core courses.

## ACCOUNTANCY M.ACC.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master of Accountancy program provides a means of entry into the public accounting profession and for positions in corporate, government and not-for-profit organizations.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Accountancy

To be considered by the Program Director and the Graduate Studies Committee, applicants to the Master of Accountancy must meet the following minimum requirements:

- 4-year Bachelor's degree
- 2.75 (4.00 scale) overall GPA

Students graduating from academic institutions in non-English speaking countries must demonstrate their abilities in English. A minimum TOEFL score of 90 is required for admission.

Although the GMAT (or the GRE equivalent) is not required, students with lower overall GPAs and/or students who graduated from foreign universities may submit their GMAT scores to enhance their academic credentials.

Students graduating from the University of Vermont, St. Michael's College, or an accredited U.S. institution with a major or concentration in accounting, finance, business analytics, or marketing

should consult the M.Acc. Program webpage for additional specific information.

Prerequisite Courses include:

- Microeconomics
- Principles of Financial Accounting
- Principles of Managerial Accounting
- Corporate Financial Reporting 1 (also titled Intermediate Accounting 1)
- Corporate Financial Reporting 2 (also titled Intermediate Accounting 2)

### Minimum Degree Requirements

The program requires 30 graduate credit hours made up of:

- 18 credit hours of accounting, auditing and tax knowledge;
  - 3 credit hours of CPA law;
  - 3 credit hours of Professional Communications; and
  - 6 credit hours of graduate-level business electives.
- The states and commonwealths have different requirements to sit for the CPA exam and subsequently become certified as CPAs. We encourage M.Acc. students to check the specific state or commonwealth Board of Accountancy requirements for the state or commonwealth in which they plan to work so that they meet the minimum requirements to sit for the CPA exam and become certified as CPAs.

The program emphasizes appropriate research strategies and techniques, effective business writing, and professional presentation skills. Students work closely with their academic advisor to design a course of study that best suits their prior course work.

Students who meet the prerequisite requirements can complete the M.Acc. program in one year. Spring admission is only permitted for students who plan to spend at least three semesters in the program. Students who plan to take Corporate Financial Reporting 1 and 2 during the first year of the program will likely require a minimum of three semesters and a maximum of two years to complete the program. BSAD 361 Accounting Research, Regulation and Ethics is the capstone course that must be completed in the final spring semester of study.

### Comprehensive Examination

M.Acc. students complete the comprehensive examination through successful completion of the capstone course, BSAD 361.

### Requirements for Advancement to Candidacy for the Degree of Master of Accountancy

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all required (3) courses.

## AGROECOLOGY

<http://www.uvm.edu/agroecology/learning/cgsa/>

## OVERVIEW

Agroecology is an approach that seeks to integrate ecological science with other academic disciplines and knowledge systems to guide research and action towards the sustainable transformation of our current agrifood system. The Certificate of Graduate Study in Agroecology (CGSA) is a 15-credit program that can be completed within 1 year, and the micro-Certificate of Graduate Study in Agroecology (mCGSA) is a 9-credit program that can also be completed within 1 year. The curriculum encourages students to integrate ecological, social, and economic perspectives in developing practical solutions to contemporary problems within our agrifood system. Students will join yearly cohorts to build community and expand the network among program participants. The certificate is designed so that you can live in your own food shed while learning lessons that you can apply anywhere.

More information on the Certificate is available from the ALC website.

## DEGREES

Agroecology CGS (p. 87)

Agroecology mCGS (p. 87)

## FACULTY

**Mendez, Victor E.;** Professor, Department of Plant and Soil Science; PHD, University of California Santa Cruz

## AGROECOLOGY CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

## OVERVIEW

Agroecology is an approach that seeks to integrate ecological science with other academic disciplines and knowledge systems to guide research and action towards the sustainable transformation of our current agrifood system. The Certificate of Graduate Study in Agroecology (CGSA) is a 15-credit program that can be completed within 1 year. The curriculum encourages students to integrate ecological, social, and economic perspectives in developing practical solutions to contemporary problems within our agrifood system. The fully prescribed coursework consists of an introductory residential/online hybrid course, 3 foundational online classes, and a final synthesis seminar course. Students will join yearly cohorts to build community and expand the network among program participants. The certificate is designed so that you can live in your own food shed while learning lessons that you can apply anywhere.

The Certificate of Graduate Study in Agroecology is managed by the Agroecology and Livelihoods Collaborative (ALC), within the Department of Plant and Soil Science, and is conferred by the Graduate School.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

**FOR CURRENT UVM STUDENTS:** Students currently enrolled in a UVM master's or doctoral program must complete the online UVM Graduate Application. Letters of recommendation and transcripts are not required, and an application fee waiver can be provided.

**FOR DUAL GRADUATE DEGREE/CERTIFICATE PROGRAM APPLICANTS:** Students applying at the same time for a graduate degree program and a Certificate of Graduate Study at UVM must first complete the online UVM Graduate Application for the degree program. Once accepted into the degree program applicants can then log back into the portal and choose the option to apply as a certificate student. A fee waiver will be provided by the Graduate Admissions office.

**FOR APPLICANTS TO CERTIFICATE PROGRAM:** Applicants seeking to enroll in only a Certificate of Graduate Study program must complete the online UVM Graduate Application and all associated requirements. This application will need to include official transcripts from an accredited university as well as 3 letters of recommendation. A bachelor's degree is required for admittance. Note: GRE is not required for applicants only intending to complete the CGSA.

### Minimum Degree Requirements

Students may earn the certificate either in conjunction with a UVM master's or doctoral degree, or independent of a degree.

The Certificate of Graduate Study in Agroecology requires 15 graduate credits, made up of 5 core courses. They are distributed as follows:

PSS 311	Introduction to Agroecology	3
PSS 312	Ecological Foundations of Agro	3
PSS 313	PAR & Transdiscipl Agroecology	3
PSS 314	Agroecol, Food Sov. & Soc Mov.	3
PSS 315	Agroecology Grad Capstone	3

More information on the Certificate is available from the ALC website.

## ACROECOLOGY MCGS

All students must meet the Requirements for the Certificates of Graduate Study (<https://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthecertificateofgraduatestudy/>)

## OVERVIEW

Agroecology is an approach that seeks to integrate ecological science with other academic disciplines and knowledge systems to guide research and action towards the sustainable transformation of our current agrifood system. The micro-Certificate of Graduate Study



in Agroecology (mCGSA) is a 9-credit program that focuses on the three dimensions of agroecology: science, movement and practice.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the micro-Certificate of Graduate Study

**FOR CURRENT UVM STUDENTS:** Students currently enrolled in a UVM master's or doctoral program must complete the online UVM Graduate Application. Letters of recommendation and transcripts are not required, and an application fee waiver can be provided.

**FOR DUAL GRADUATE DEGREE/CERTIFICATE PROGRAM APPLICANTS:** Students applying at the same time for a graduate degree program and a micro-Certificate of Graduate Study at UVM must first complete the online UVM Graduate Application for the degree program. Once accepted into the degree program applicants can then log back into the portal and choose the option to apply as a micro-certificate student. A fee waiver will be provided by the Graduate Admissions office.

**FOR APPLICANTS TO MICRO-CERTIFICATE PROGRAM:** Applicants seeking to enroll in only a micro-Certificate of Graduate Study program must complete the online UVM Graduate Application and all associated requirements. This application will need to include official transcripts from an accredited university as well as 3 letters of recommendation. A bachelor's degree is required for admittance. Note: GRE is not required for applicants only intending to complete the mCGSA.

### Minimum Degree Requirements

Completion of the following courses:

PSS 311	Introduction to Agroecology	3
PSS 312	Ecological Foundations of Agro	3
PSS 314	Agroecol, Food Sov. & Soc Mov.	3

## ANIMAL BIOSCIENCES

### OVERVIEW

The research program focuses on farm animal agriculture involving a combination of courses and graduate research. Areas of research interest include nutrition, metabolism, lactation, reproduction, genetics, and animal health.

An interdisciplinary program leading to the M.S. and Ph.D. degrees in Animal Biosciences is offered under the direction of a committee composed of program graduate faculty members. The goal of this interdisciplinary program is to provide advanced education and research training in mammalian physiology and endocrinology, mammary gland biology, basic and applied nutrition, animal genetics and genomics, or animal health. All graduate students will complete a common core of courses as well as specific courses to support their research programs. The program provides the flexibility necessary for students to gain competence in the area of their choice.

## DEGREES

- Animal Biosciences AMP (p. 88)
- Animal Biosciences M.S. (p. 89)
- Animal Biosciences Ph.D. (p. 90)

## FACULTY

**Barlow, John;** Associate Professor, Department of Animal and Veterinary Sciences; DVM, University of Illinois Urbana-Champaign; PHD, University of Vermont

**Dann, Heather;** Adjunct Assistant Professor, Department of Animal and Veterinary Sciences; PHD, University of Illinois Urbana-Champaign

**Etter, Andrea J.;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, Purdue University

**Freeman, Kalev;** Assistant Professor, Department of Surgery; MD, PHD, University of Colorado Boulder

**Grant, Richard;** Adjunct Professor, Department of Animal and Veterinary Sciences; PHD, Purdue University

**Greenwood, Sabrina Louise;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, University of Guelph

**Guo, Ming Ruo;** Professor, Department of Nutrition and Food Science; PHD, University College Cork

**Jetton, Thomas Lawrence;** Professor, Department of Medicine-Endocrinology; PHD, Vanderbilt University

**Kraft, Jana;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, Friedrich-Schiller-University of Jena

**McKay, Stephanie Dawn;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, University of Alberta

**Morrison, Sarah Y.;** Adjunct Assistant Professor, Department of Animal and Veterinary Science; PHD, University of Illinois, Urbana-Champaign

**Smith, Julia M.;** Research Associate Professor, Department of Animal and Veterinary Sciences; DVM, Cornell University

**Testroet, Eric;** Assistant Professor, Department of Animal Science and Veterinary Sciences; PHD, Iowa State University

**Townson, David H.;** Professor, Department of Animal and Veterinary Sciences, PHD, Ohio State University

**Van Amburgh, Michael;** Adjunct Professor, Department of Animal Science and Veterinary Science; PHD, Cornell University

**Zhao, Feng-Qi;** Professor, Department of Animal and Veterinary Sciences; PHD, University of Alberta

## ANIMAL BIOSCIENCES AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforacceleratedmastersdegreeprograms/>)

### OVERVIEW

An option for the outstanding student with an interest in a graduate degree is the Accelerated Master's Entry Program in which students commence study for their M.S. in their senior year and have the potential to obtain a B.S./M.S. in a five-year period. Accepted AMP students begin work toward their M.S. during their senior year while completing the B.S. 9 graduate level coursework credits taken in the

senior year can count toward both the B.S. and the M.S. Students MUST be admitted through the Graduate College to the M.S. as an AMP student before taking any courses that will be applied to the M.S. requirements. Students may start full-time M.S. coursework in the summer following their undergraduate graduation.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Science**

An acceptable undergraduate major in animal science, biology, or a related field.

Further details about the Accelerated Master’s Program, available for students majoring in Animal Science or Biological Science, can be obtained from the Department of Animal and Veterinary Sciences, 102 Terrill Bldg., (802) 656-0155.

**Minimum Degree Requirements**

OPTION A (THESIS)	
30 credits of study with a minimum of 15 credits in courses in animal science or related fields and a minimum of 9 credits of thesis research. Students are required to attend and participate in ASCI 301 and ASCI 302 twice during their programs. Students must also prepare a research proposal.	30
Students are expected to meet with their Graduate Studies Committee during their second and third semester, and during the final semester for their thesis defense. Students are also expected to have 1 publication ready to submit or already submitted to an appropriate scientific journal at the time of their defense. Students are also required to participate in at least 1 semester of teaching.	
OPTION B (NON-THESIS)	
30 credits of study with 24 credits in courses in animal science or related fields, and a minimum of 6 credits of literature research. Students are required to attend and participate in ASCI 301 and ASCI 302 twice during their program. Students prepare a literature review under the guidance of a mentor and studies committee. The format of the literature review is determined by the studies committee, which is composed of their research mentor and at least 2 members of UVM graduate faculty as described in the graduate college catalog requirements for the Master’s Degree. A thesis and an oral thesis defense is not required. Students submit the written literature review for evaluation by their studies committee in their last semester of study.	30

**Comprehensive Examination**

Animal Bioscience AMP students are required to pass a written comprehensive examination, an oral comprehensive examination, or both, in their field of specialization. The student’s studies committee decides the format of this exam (time and page limits, open or closed book, etc.). The comprehensive examinations are taken on the University of Vermont campus in Burlington. 1 re-examination only is permitted for any failed comprehensive examination. The comprehensive examination is not the same as the oral thesis defense, and must be passed satisfactorily before defending the thesis. The studies committee members may differ from the thesis defense committee members, but often they are the same individuals. The comprehensive exam process is completed at least 2 months prior to

the thesis defense, and preferably, prior to the start of the semester they intend to defend their thesis.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

When a student begins a graduate program, they are not yet a candidate for a graduate degree. To become a candidate for a graduate degree, the student must complete certain academic requirements to achieve the milestone of becoming a candidate for that degree. Advancement-to-candidacy signifies that the student has completed their required coursework, comprehensive exam(s) and other requirements and is ready to move forward to the thesis phase (thesis-based student) or literature research (non-thesis student).

**ANIMAL BIOSCIENCES M.S.**

All students must meet the Requirements for the Master's Degree (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthemastersdegree/>)

**OVERVIEW**

The research program focuses on farm animal agriculture involving a combination of courses and graduate research. Areas of research interest include nutrition, metabolism, lactation, reproduction, genetics, and/or animal health.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Science**

An acceptable undergraduate major in animal science, chemistry, biology, or a related field.

**Minimum Degree Requirements**

OPTION A (THESIS)	
30 credits of study with a minimum of 15 credits in courses in animal science or related fields and a minimum of 9 credits of thesis research. Students are required to attend and participate in ASCI 301 and ASCI 302 twice during their programs. Students must also prepare a research proposal.	30
Students are expected to meet with their Graduate Studies Committee during their second and third semester, and during the final semester for their thesis defense. Students are also expected to have 1 publication ready to submit or already submitted to an appropriate scientific journal at the time of their defense. Students are also required to participate in at least 1 semester of teaching.	
OPTION B (NON-THESIS)	

<p>30 credits of study with 24 credits in courses in animal science or related fields, and a minimum of 6 credits of literature research. Students are required to attend and participate in ASCI 301 and ASCI 302 twice during their program. Students prepare a literature review under the guidance of a mentor and Graduate Studies Committee. The format of the literature review is determined by the Graduate Studies Committee, which is composed of their research mentor and at least 2 members of UVM graduate faculty as described in the graduate college catalog requirements for the Master's Degree. A thesis and oral thesis defense are not required. Students submit the written literature review for evaluation by their studies committee in their last semester of study.</p>	30
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### Comprehensive Examination

Animal Bioscience M.S. students are required to pass a written comprehensive examination, an oral comprehensive examination, or both, in their field of specialization. The student's Graduate Studies Committee decides the format of this exam (time and page limits, open or closed book, etc.). The comprehensive examinations are taken on the University of Vermont campus in Burlington. 1 re-examination only is permitted for any failed comprehensive examination. The comprehensive examination is not the same as the oral thesis defense, and must be passed satisfactorily before defending the thesis. The studies committee members may differ from the thesis defense committee members, but often they are the same individuals. Usually the comprehensive exam process is completed at least 2 months prior to the thesis defense, and preferably, prior to the start of the semester they intend to defend their thesis.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

When a student begins a graduate program, they are not yet a candidate for a graduate degree. To become a candidate for a graduate degree, a student must complete certain academic requirements to achieve the milestone of becoming a candidate for that degree. Advancement-to-candidacy signifies that the student has completed their required coursework, comprehensive exam(s) and other requirements and is ready to move forward to the thesis phase (thesis-based student) or literature research (non-thesis student). Department policy requires students to advance to candidacy at least 1 semester before they can earn the degree.

## ANIMAL BIOSCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthedoctorofphilosophydegree/>)

### OVERVIEW

An interdisciplinary program leading to the Ph.D. degree in Animal Biosciences is offered under the direction of a committee composed of program graduate faculty. The goal of this interdisciplinary program is to provide advanced education and research training in nutrition, metabolism, lactation, reproduction, genetics, and/or animal health. All Ph.D. students will complete a common core of courses as well as specific courses to support their research programs.

The program provides the flexibility necessary for students to gain competence in the area of their choice.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

To be considered for admission, applicants must show promise of ability to pursue advanced study, have adequate preparation in the field, and be fluent in the English language.

Admission requires the following coursework to be completed:

- 2 semesters of chemistry to include general chemistry, organic and/or biochemistry, with labs;
- 2 semesters of biological sciences (e.g., anatomy, biology, physiology, animal sciences, botany, nutrition, food science, cellular and molecular biology, or microbiology); and
- 1 semester of math (precalculus or calculus) or statistics.

The following standards and coursework are recommended for Ph.D. applicants:

- GPA of at least 3.0 or equivalent
- 1 year of undergraduate general chemistry, with lab
- 1 year of undergraduate organic chemistry, with lab
- 1 course in biochemistry, with lab
- 1 course, with lab, in any biological science, with anatomy and/or physiology preferred
- 1 semester of math (precalculus or calculus) and statistics

### Minimum Degree Requirements

- The candidate must meet all the requirements as prescribed by the Graduate College for the degree of Doctor of Philosophy.
- Candidates are required to attend and participate in ASCI 301 (<http://catalogue.uvm.edu/search/?P=ASCI%20301>) and ASCI 302 (<http://catalogue.uvm.edu/search/?P=ASCI%20302>) for at least 2 semesters. These candidates must also participate in 1 semester of ASCI 303 (<http://catalogue.uvm.edu/search/?P=ASCI%20303>) or an equivalent alternative course in research proposal writing.
- In addition, all courses and seminars as established by the Graduate Studies Committee must be satisfactorily met. The student is expected to meet with their committee within the first 2 semesters and then at least annually until the doctoral research is completed and an acceptable dissertation written and defended.
- It is also expected that, at the time of their defense, a Ph.D. student will have at least 2 publications ready to submit, or already submitted, to an appropriate scientific journal. The specific publication expectations will be determined in consultation with the candidate's Graduate Studies Committee.
- All doctoral candidates must acquire appropriate teaching experience prior to the award of the degree. The nature and amount of teaching will be determined by the candidate's Graduate Studies Committee.

- Proficiency in a modern foreign language or computer language and programming is optional at the discretion of the graduate studies committee.

### Comprehensive Examination

The comprehensive examination will consist of both a written and oral component. The specific format of the written and oral exams will be determined in consultation with the candidate's Graduate Studies Committee. Both the written and oral exams are typically passed by the end of the third year of candidacy, but absolutely no later than 6 months before the dissertation is submitted. Should the candidate fail the examination, only 1 re-examination is permitted. Success in the comprehensive examination is prerequisite to standing for the Dissertation Defense Examination

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

When a student begins a graduate program, they are not yet a candidate for a graduate degree. To become a candidate for a graduate degree, the student must complete certain academic requirements to achieve the milestone of becoming a candidate for that degree. Advancement-to-candidacy signifies that the student has completed their required coursework, comprehensive exams and other requirements and is ready to move forward to the dissertation phase. University policy requires students to advance to candidacy 6 months before they can submit their dissertation.

## ATHLETIC TRAINING

### OVERVIEW

**This program is not currently accepting students.**

### ATHLETIC TRAINING M.S.

**This program is not currently accepting students.**

## BIOCHEMISTRY

<http://www.med.uvm.edu/biochemistry/grad> (<http://www.med.uvm.edu/biochemistry/grad/>)

### OVERVIEW

The goal of the Biochemistry Graduate Program at the University of Vermont is to prepare students for careers in science as both researchers and educators. This is accomplished by expanding knowledge of both chemistry and biochemistry, while cultivating the ability for critical analysis, creativity and independent study.

### DEGREES

- Biochemistry AMP (p. 91)
- Biochemistry M.S (p. 92).

### FACULTY

**Berger, Christopher;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Bouchard, Beth;** Assistant Professor, Department of Biochemistry; PHD, University of Vermont

**Chatterjee, Nimrat;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Baylor College of Medicine

**Doublié, Sylvie;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of North Carolina Chapel Hill

**Everse, Stephen;** Associate Professor, Department of Biochemistry; PHD, University of California San Diego

**Francklyn, Christopher;** Professor, Department of Biochemistry; PHD, University of California Santa Barbara

**Gordon, Jonathan;** Assistant Professor, Department of Biochemistry; PHD, University of Western Ontario

**Heath, Jessica;** Assistant Professor, Department of Pediatrics; Department of Biochemistry; MD, SUNY Stony Brook

**Hondal, Robert;** Associate Professor, Department of Biochemistry; PHD, Ohio State University

**Kelm, Robert;** Associate Professor, Department of Medicine-Cardiovascular; PHD, University of Vermont

**Lee, Andrea;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Wisconsin-Madison

**Lian, Jane;** Professor, Department of Biochemistry; PHD, Boston University

**Morrill, Scott;** Professor, Department of Biochemistry; PHD, University of Wisconsin-Madison

**Pederson, David;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Rochester

**Quénet, Delphine;** Assistant Professor, Department of Biochemistry; PHD; University of Strasbourg, France

**Silveira, Jay.;** Assistant Professor, Department of Biochemistry; PHD, University of Vermont

**Stein, Gary;** Professor, Department of Biochemistry; PHD, University of Vermont

**Stein, Janet;** Professor, Department of Biochemistry; PHD, Princeton University

**Tracy, Paula;** Professor, Department of Biochemistry; PHD, Syracuse University

**Tye, Coralee;** Assistant Professor; Department of Biochemistry; PHD, Western University

**Wargo, Matthew;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, Dartmouth College

## BIOCHEMISTRY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Our accelerated master's degree entry program (AMP) in Biochemistry is a thesis-based program designed to offer select UVM undergraduate science majors the opportunity to obtain both a B.S. and a M.S. in biochemistry in a total of 5 years of study. The objective of this program is to provide students both a theoretical and practical knowledge of fundamental biochemical concepts while preparing students for careers in research (academic or industrial) or increasing their competitiveness for additional graduate degrees.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Students could apply for admission into the accelerated master's in biochemistry program in the beginning of fall semester their junior year and as late as the fall semester of their senior year. Admission into this program requires the following:

- A minimum cumulative grade point average of 3.00;
- Satisfactory completion of BIOC 205 & BIOC 206;
- Completion of the Graduate College Application form;
- Agreement of a UVM Biochemistry faculty member to serve as AMP advisor (this faculty member should also write 1 of the 3 recommendation letters in support of the student's application to the Graduate College).

GRE/GMAT scores are NOT an admission requirement for the accelerated master's in biochemistry program.

Note: Students MUST be admitted through the Graduate College before taking any courses that will be applied to the master's degree requirements. Students may start full-time master's degree coursework in the summer following their undergraduate graduation.

### Minimum Degree Requirements for the Degree of Master of Science

A minimum of 30 credits (at least 17 of which must be taken from graduate courses offered by the Department of Biochemistry) and successful completion of a comprehensive exam are required for completion of the accelerated master's degree in biochemistry. Students must meet all of the requirements stipulated by the UVM Graduate College for the Master's Degree.

Students may take up to 9 credit hours of graduate-level coursework before the conferral of the B.S. that can also count toward the M.S. Students would then be expected to complete remaining master's degree requirements during a 5<sup>th</sup> year of study.

Students must complete the following courses:

BIOC 301	General Biochemistry *	3
BIOC 302	General Biochemistry *	3
BIOC 351	Proteins I: Structure&Function	3
BIOC 372	Cancer Biology	3

\*Successful completion of BIOC 205/BIOC 206 can substitute for the BIOC 301/BIOC 302 requirement for AMP students. However, these will not count towards the 30 graduate credit requirement. Therefore, BIOC 205 and BIOC 206 cannot be used as courses that will double count towards bachelor's degree and the M.S.

Note: If a physical chemistry course has not been taken previously, a student must take Physical Chemistry (CHEM 165) in their 1<sup>st</sup> year (for which they do not receive credit toward the MS degree). CHEM

162 is no longer offered, but if a student has already taken this course, it is acceptable for the Physical Chemistry requirement.

Remaining credits in the degree program should be selected from the following approved list. Special topics or other graduate courses maybe acceptable by prior approval from the Chair of the Departmental Graduate Studies Committee.

BIOC 263	Nutritional Biochemistry	3
BIOC 275	Adv Biochem of Human Disease	3
CLBI 301	Cell Biology	3
MMG 211	Prokaryotic Molecular Genetics	3
MMG 232	QR: Advanced Bioinformatics	3
MPBP 301	Human Physiology & Pharm I	4
PHRM 201	Introduction to Pharmacology	3
PHRM 272	Toxicology	3

#### Thesis Track:

At least 9 (and up to 13) credits of Master's Thesis Research (BIOC 391) are required. In addition, a written thesis and defense of this thesis must occur according to the guidelines laid out by the Graduate College.

#### Non-Thesis Track:

At least 6 (and up to 9) credits of Independent Study (BIOC 393) and 2 two credits of independent research set up as a special topics course (BIOC 395) with your mentor are required. In addition, a manuscript in the format of a review article must be submitted to the Departmental Graduate Studies Committee and a seminar on the manuscript must be presented to the Department.

### Comprehensive Examination

The comprehensive examination must be taken by the end of the 2<sup>nd</sup> semester as a matriculated graduate student for students admitted in the accelerated program. The examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both) are decided upon by the Departmental Graduate Studies Committee and will be discussed with the student well in advance of the exam. A single re-take is permitted for the comprehensive exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

## BIOCHEMISTRY M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

## OVERVIEW

The objective of this program is to provide students both a theoretical and practical knowledge of fundamental biochemical concepts while

preparing students for careers in research (academic or industrial) or increasing their competitiveness for additional graduate degrees.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An acceptable undergraduate major in biochemistry, biology, chemistry, or a related field. The general (aptitude) Graduate Record Examination (GRE) and the subject GREs are NOT required, but may be helpful to your application. Completion of the following courses may also be helpful: year-long courses in organic chemistry (equivalent to CHEM 047 / CHEM 048 or CHEM 141/ CHEM 142); physical chemistry (equivalent to CHEM 165), and physics (equivalent to PHYS 051 / PHYS 152); quantitative chemistry; mathematics (preferably through differential and integral calculus); a biological science. If a physical chemistry course has not been taken previously, a student must take Physical Chemistry (CHEM 165) in their 1<sup>st</sup> year (for which they do not receive credit toward the M.S. degree).

### Minimum Degree Requirements

A minimum of 30 credits (at least 17 of which must be taken from graduate courses offered by the Department of Biochemistry) and successful completion of a comprehensive exam are required for completion of the master's degree in biochemistry. Students must meet all of the requirements stipulated by the UVM Graduate College for the Master's Degree.

Students must complete the following courses:

BIOC 301	General Biochemistry *	3
BIOC 302	General Biochemistry *	3
BIOC 351	Proteins I: Structure&Function	3
BIOC 372	Cancer Biology	3

\*Successful completion of BIOC 205/BIOC 206 can substitute for the BIOC 301/BIOC 302 requirement for previous UVM students only. However, these will not count towards the 30 graduate credit requirement.

Remaining credits in the degree program should be selected from the following approved list. Special topics or other graduate courses maybe acceptable by prior approval from the Chair of the Departmental Graduate Studies Committee.

BIOC 263	Nutritional Biochemistry	3
BIOC 275	Adv Biochem of Human Disease	3
CLBI 301	Cell Biology	3
MMG 211	Prokaryotic Molecular Genetics	3
MMG 232	QR: Advanced Bioinformatics	3
MPBP 301	Human Physiology & Pharm I	4

PHRM 201	Introduction to Pharmacology	3
PHRM 272	Toxicology	3

Thesis Track:

At least 9 (and up to 13) credits of Master's Thesis Research (BIOC 391) are required. In addition, a written thesis and defense of this thesis must occur according to the guidelines laid out by the Graduate College.

Non-Thesis Track:

At least 6 (and up to 9) credits of Independent Study (BIOC 393) and 2 credits of independent research set up as a special topics course (BIOC 395) with your mentor are required. In addition, a manuscript in the format of a review article must be submitted to the Departmental Graduate Studies Committee and a seminar on the manuscript must be presented to the Department.

### Comprehensive Examination

The comprehensive examination must be taken by the end of the 2<sup>nd</sup> semester as a matriculated graduate student. The examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both) are decided upon by the Departmental Graduate Studies Committee and will be discussed with the student well in advance of the exam. A single re-take is permitted for the comprehensive exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

All requirements outlined in the Biochemistry Program handbook including:

- Maintain a 3.00 GPA
- Satisfactory completion of the comprehensive exam

## BIOMEDICAL ENGINEERING

### OVERVIEW

Department website: <https://www.uvm.edu/cems> (<https://www.uvm.edu/cems/>)

### OVERVIEW

The University of Vermont (UVM) offers interdisciplinary graduate programs in Biomedical Engineering that leverage core strengths in engineering and collaborations with researchers across campus, including those in UVM's Larner College of Medicine.

The M.S. in Biomedical Engineering gives students the opportunity to develop advanced engineering skills and domain expertise so that they may apply engineering methods to address problems related to human health. Students enrolled in the M.S. in BME program pursue a pursue a 2-year, personalized plan of study that includes only coursework, a project, or a research-oriented thesis. Students who complete their undergraduate studies at UVM may complete the M.S. in BME coursework in 1 year through an Accelerated Master's Program (AMP).

The Ph.D. in Biomedical Engineering is a flexible, dynamic degree that trains aspiring researchers to apply engineering techniques to the study of biological systems. Research areas include bioinstrumentation, biomechanics, biomedical imaging, biomedical systems and signal analysis, clinical engineering, digital health, implant design, rehabilitation engineering, simulation and modeling, biomaterials, tissue engineering, and biomathematics.

## DEGREES

Biomedical Engineering AMP (p. 94)

Biomedical Engineering M.S. (p. 95)

Biomedical Engineering Ph.D. (p. 95)

## FACULTY

**Bates, Jason H. T.;** Professor, Department of Medicine-Pulmonary; DSC, Canterbury University; PHD, University of Otago

**Berger, Christopher Lewis;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Beynon, Bruce David;** Professor, Department of Orthopaedics and Rehabilitation; PHD, University of Vermont

**Cipolla, Marilyn Jo;** Professor, Department of Neurological Sciences; PHD, University of Vermont

**Doiron, Amber;** Assistant Professor, Department of Electrical and Biomedical Engineering; PHD, University of Texas at Austin

**Dubief, Yves C.;** Associate Professor, Department of Mechanical Engineering; PHD, Institut National Polytechnique de Grenoble

**Fiorentino, Niccolo M.;** Assistant Professor, Department of Mechanical Engineering; PHD, University of Virginia

**Jangraw, David;** Assistant Professor, Department of Biomedical Engineering, PHD, Columbia University

**McGinnis, Ryan S.;** Assistant Professor, Department of Electrical and Biomedical Engineering; PHD, University of Michigan

**Oldinski-Floreni, Rachael Ann;** Associate Professor, Department of Mechanical Engineering; PHD, Colorado State University

**Rizzo, Donna Marie;** Professor, Department of Civil and Environmental Engineering; PHD, University of Vermont

**Spector, Peter Salem;** Professor, Department of Medicine-Cardiology; MD, Albert Einstein College of Medicine

**Warshaw, David;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Weiss, Daniel;** Professor, Department of Medicine-Pulmonary; MD, PHD, Mount Sinai School of Medicine

## BIOMEDICAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

Qualified undergraduate students who plan to earn a M.S. in biomedical engineering may enroll in the Accelerated Master's Entry Program, which enables students to begin working on the M.S. while still an undergraduate. Students typically apply to the program in the second semester of their junior year. Following acceptance by the Graduate College, students may take up to 6 graduate credits while still an undergraduate that can be counted toward both the B.S. and

the M.S. degrees. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree. The graduate credits taken prior to completion of the bachelor's must be in graded coursework only; independent study, research credits, internships and practica will not count towards the M.S. In addition, the courses taken must be approved by the student's graduate advisor.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

To apply for the program, students must be enrolled in an engineering program at the University of Vermont with a cumulative grade point average of at least 3.20 at the time of application, and must complete the CEMS Accelerated Masters Permission Form and the Graduate College application. For thesis students, the application should name a graduate faculty member who has agreed to serve as their thesis advisor. No Graduate Record Examination (GRE) is required for AMP applicants.

### Minimum Degree Requirements for the Degree of Master of Science

**Thesis-Based:** Coursework component - 24 credit hours. At least 15 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 6 credits will have BME designation and at least 6 credits will be at the 300-level. Thesis component - 6 credit hours of research conducted with BME associated faculty. Students must complete a comprehensive exam.

**Project-Based:** Coursework component - 27 credit hours. At least 18 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 9 credits will have BME designation and at least 6 credits will be at the 300-level. Project component - 3 credit hours of project conducted with BME associated faculty. Students must complete a comprehensive exam.

**Coursework Option:** 30 credit hours. At least 18 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 9 credits will have BME designation and at least 6 credits will be at the 300-level. Students must complete a comprehensive exam.

### Comprehensive Examination

**M.S. Thesis Option:** The student must orally present a proposal for their thesis research at least 3 months prior to graduation. The student's thesis committee will orally examine the student based on the student's coursework and research focus.

**M.S. Project Option:** The student must orally present a proposal for their project research approximately 3 months prior to graduation. The student's project committee will orally examine the student based on the student's coursework and project focus.

**M.S. Coursework Option:** The student must complete a written and/or oral comprehensive exam during the final semester of residence at UVM that will be based on their completed coursework. This

requirement may be waived if students achieve a B+ or better in their BME coursework.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

An accredited bachelor's degree in engineering or equivalent education.

## BIOMEDICAL ENGINEERING M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

Leveraging strong ties between the University of Vermont's College of Engineering and Mathematical Sciences and the Larner College of Medicine, the Master of Science (M.S.) in Biomedical Engineering gives students the opportunity to develop advanced engineering skills and domain expertise so that they may apply engineering methods to address problems related to human health. Students enrolled in the M.S. in BME program pursue a 2-year, personalized plan of study that includes only coursework, a project, or a research-oriented thesis

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An accredited bachelor's degree in biomedical engineering or a similar technical field. Special arrangements may be made, on an individual basis, for students who hold a bachelor's degree in other areas. No Graduate Record Examination (GRE) is required.

#### Minimum Degree Requirements

**Thesis-Based:** Coursework component - 24 credit hours. At least 15 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 6 credits will have BME designation and at least 6 credits will be at the 300-level. Thesis component - 6 credit hours of research conducted with BME associated faculty. Students must complete a comprehensive exam.

**Project-Based:** Coursework component - 27 credit hours. At least 18 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 9 credits will have BME designation and at least 6 credits will be at the 300-level. Project component - 3 credit hours of project conducted with BME associated faculty. Students must complete a comprehensive exam.

**Coursework Option:** 30 credit hours. At least 18 credit hours will come from CEE, EE, BME, ME, and/or ENGR graduate courses. At least 9 credits will have BME designation and at least 6 credits will be at the 300-level. Students must complete a comprehensive exam.

#### Comprehensive Examination

**M.S. Thesis Option:** The student must orally present a proposal for their thesis research at least 3 months prior to graduation. The student's thesis committee will orally examine the student based on the student's coursework and research focus.

**M.S. Project Option:** The student must orally present a proposal for their project approximately 3 months prior to graduation. The student's project committee will orally examine the student based on the student's coursework and project focus.

**M.S. Coursework Option:** The student must complete a written and/or oral comprehensive exam during the final semester of residence at UVM that will be based on their completed coursework. This requirement may be waived if students achieve a B+ or better in their BME coursework

### Requirements for Advancement to Candidacy for the Degree of Master of Science

An accredited bachelor's degree in engineering or equivalent education.

## BIOMEDICAL ENGINEERING PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthedoctorofphilosophydegree/>)

### OVERVIEW

The program in Biomedical Engineering is interdisciplinary and offers the Doctor of Philosophy (Ph.D.) degree. Graduate students obtain the Ph.D. degree through a program administered by the Department of Electrical and Biomedical Engineering.

Participating faculty with strong commitments to biomedical engineering research and education are from the College of Engineering and Mathematical Sciences, the College of Medicine, and other departments and colleges across campus. The extensive research facilities of the participating faculty and departments are available to all graduate students enrolled in the program and the program provides the flexibility necessary for students to gain competence in the area of their choice. Research includes: bioinstrumentation, biomechanics, biomedical imaging, biomedical systems and signal analysis, clinical engineering, digital health, implant design, rehabilitation engineering, simulation and modeling, biomaterials, tissue engineering, and biomathematics.

Students in the program are generally supported by sponsored research projects, participating departments and training grants.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Students applying for admission to the graduate program must meet the general requirements of admission of the University of Vermont Graduate College. Admission is competitive and students are selected on the basis of their scholastic preparation and intellectual capacity.

The following minimum preparation is recommended:

- Biology, Chemistry: 2 semesters each, or 4 introductory courses in the following subjects - anatomy, biology, biophysics, chemistry, physiology



- Engineering: 2 introductory courses in 1 or more of the following subjects - biomechanics, materials, mechanics, thermodynamics, electrical engineering, control theory, or fluid mechanics
- Mathematics: Calculus through differential equations, and 1 additional math/stats course
- Physics: 2 semesters of physics
- Satisfactory scores on the general Graduate Record Examination (GRE) may be presented, but are not required.

Special arrangements may be made, on an individual basis, for students who are highly prepared in one area, but less well prepared in another.

### Minimum Degree Requirements

Candidates for the degree of Doctor of Philosophy must complete 13 graduate credits of required courses including a domain-specific core course (e.g. advanced bioengineering systems, complex systems, biomaterials) human physiology and pharmacology or equivalent, and an advanced mathematics or statistics course. Additionally, candidates must complete at least 17 credits of approved technical electives, a teaching requirement, a comprehensive examination, up to 45 credits of dissertation research, and a final oral examination.

### Comprehensive Examination

The comprehensive exam for the Biomedical Engineering Ph.D. will normally be taken at the end of a candidate's fourth semester of study (typically around May of Year 2) and will consist of a written part and an oral part.

**The Written Part:** The written part of the comprehensive examination will be a report written in the form of a research grant proposal based around a research idea in the area of the candidate's dissertation work, and will comprise three Specific Aims. The first 2 aims will be focused in the area of the candidate's Ph.D. research, and will be expected to include some preliminary data and a research plan that is grounded in techniques that are well understood by the candidate. The third aim will be a "stretch aim" that extends beyond the scope of the candidate's research. In this third aim, the candidate will be expected to exhibit evidence of an ability to generate imaginative and thoughtful hypotheses, and to think laterally about how their Ph.D. research area could be developed in a new direction.

**The Oral Part:** The oral part of the comprehensive examination will be a formal seminar by the student in front of their advisory committee. The student will be asked to defend the proposal and to answer any additional questions the committee members feel appropriate after the seminar. It is expected that there will be specific questions directly associated with broad engineering and biological sciences, as well as complex systems analyses and approaches.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of the Comprehensive Examination and fulfillment of the graduate course requirements.

## BIOLOGY

<http://www.uvm.edu/~biology/>

### OVERVIEW

The Biology Graduate Program has excellent students, world-class faculty members who advise students and superb staff members. Faculty members work with students to design a set of courses, a research project and other activities that will prepare them for their career choice of:

- academic research
- medical institution research
- private sector research
- government work
- teaching at the baccalaureate level

No matter what the choice is, this program will help students to develop as research scientists who know how to write, think critically, and express themselves effectively. Faculty will also help students to network and find the right position for their next step: postdoctoral training, industry, teaching position, etc. All Biology students learn to teach undergraduates, helping to develop teaching skills which will serve them well regardless of whether teaching is their ultimate career goal. Biology graduate students are very successful and are appreciated for their contribution to undergraduate research, to the research program of the faculty, and to the quality and liveliness of the Biology Department.

The research of Biology faculty is very diverse and ranges from cell and molecular biology, through animal behavior, ecology, and evolution. Faculty and student research typically range across these disciplines and students are encouraged to seek out diverse faculty for their graduate committee to meet their particular needs.

Biology offers an Accelerated Masters Degree, a Masters Degree, a Doctor of Philosophy (Ph.D.) degree, and a Masters of Science in Teaching degree. Ph.D. applicants are given priority over M.S. applicants.

### DEGREES

- Biology AMP (p. 97)
- Biology M.S. (p. 98)
- Biology M.S.T. (p. 98)
- Biology Ph.D. (p. 98)

### FACULTY

**Ballif, Bryan A.;** Professor, Department of Biology; PHD, Harvard University

**Brody, Alison Kay;** Professor, Department of Biology; PHD, University of California Davis

**Cahan, Sara Irene;** Associate Professor, Department of Biology; PHD, Arizona State University

**Ebert, Alicia;** Associate Professor, Department of Biology; PHD, Colorado State University

**Gotelli, Nicholas J;** Professor, Department of Biology; PHD, Florida State University

**Kilpatrick, Charles William;** Professor Emeritus, Department of Biology; PHD, University of North Texas

**Lam, Ying Wai;** Research Assistant Professor, Department of Biology; PHD, Chinese University of Hong Kong

**Lockwood, Brent;** Assistant Professor, Department of Biology; PHD, Stanford University

**Marsden, J. Ellen;** Professor, Rubenstein School of Environmental and Natural Resources; PHD, Cornell University

**Martinsen, Ellen;** Adjunct Assistant Professor, Department of Biology; PHD, University of Vermont

**May-Collado, Laura J.;** Assistant Professor, Department of Biology; PHD, Florida International University

**Pespeni, Melissa H.;** Assistant Professor, Department of Biology; PHD, Stanford University

**Schall, Joseph J.;** Professor Emeritus, Department of Biology; PHD, University of Texas at Austin

**Stevens, Lori;** Professor, Department of Biology; PHD, University of Illinois-Chicago

**Stockwell, Jason Dana;** Associate Professor, Rubenstein School of Environmental and Natural Resources; PHD, University of Toronto

**Van Houten, Judith;** Professor Emerita, Department of Biology; PHD, University of California Santa Barbara

**Vigoreaux, Jim Osvaldo;** Professor, Department of Biology; Molecular Physiology and Biophysics; PHD, University of Oklahoma

## BIOLOGY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

An accelerated master's degree in biology can be earned in a shortened time by applying and being accepted in the junior year of undergraduate work. Biology, Zoology, Neuroscience or Environmental Science B.S. majors should discuss this possibility with the department's graduate program director as soon as they think they might be interested in the program. The M.S. is expected to be earned in 1 additional year following completion of the B.S. for students entering the M.S. through the AMP.

Learning goals for M.S. students are:

- Be able to execute scientific experiments, analyze and communicate experimental results orally and in writing.
- Have a working knowledge of the fundamental literature, concepts and ideas of field of study.
- Have a broad factual and conceptual knowledge of biology.

Following formal admission to the Accelerated Master's Entry Program, up to 9 credits of subsequent Biology course work approved for graduate credit taken in the junior and senior year can be counted toward the degree requirement. Courses must be selected from among:

BIOL 204	Adv Genetics Laboratory	4
BIOL 205	Adv Genetics & Proteomics Lab	4
BIOL 209	Field Zoology of Arthropods	0 or 4
BIOL 217	Mammalogy	0 or 4
BIOL 219	Compar/Func Vertebrate Anatomy	4
BIOL 223	Developmental Biology	3
BIOL 254	Population Genetics	0-4
BIOL 255	Comparative Physiology	0 or 4
BIOL 261	Neurobiology	3
BIOL 264	Community Ecology	3
BIOL 266	Neurodevelopment	3
BIOL 271	Evolution	3
BIOL 277	Sociobiology	3
BIOL 372	Cutting Edge Topics	2
BIOL 381	Special Topics (with permission)	0-4

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Master's Students

To be eligible for the Accelerated Master's Entry Program, a student must be a declared biological science, zoology, neuroscience or environmental science B.S. major, and have identified a Biology faculty sponsor. Other requirements include a GPA typically higher than 3.10 overall and 3.30 in biology courses. Following admission students are required to take at least three credits of undergraduate research with a Biology faculty member who is the intended research advisor, usually in their senior year. After graduation with the B.S. degree, the M.S. degree becomes their primary curriculum. There is no GRE requirement for applicants entering the M.S. through the AMP.

#### Minimum Degree Requirements

A total of 30 credits, 15 of which must be graded course credits are required (9 of which can also be applied to the undergraduate degree) in biology and related fields; thesis research (up to 15 credits); and successful defense of thesis. Required courses are Scientific Survival Skills and Computational Biology.

#### Comprehensive Examination

The examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both) are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam. This must take place by the end of the first semester following completion of the B.S. for students admitted under the accelerated entry program.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

All Biology M.S. students who are admitted to the Graduate College are admitted to candidacy for the degree.

## BIOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The research of Biology faculty is grouped into two clusters: Cell and Molecular Biology and Ecology-Evolution-Animal Behavior. Students will have the opportunity to mention from the outset of the application process whose research they are interested in. While faculty research interests fall into these two broad groupings, students are encouraged to consider research projects that cross disciplines.

Learning goals for the MS degree students are:

- Be able to execute scientific experiments, analyze and communicate experimental results orally and in writing.
- Have a working knowledge of the fundamental literature, concepts and ideas of field of study.
- Have a broad factual and conceptual knowledge of biology.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major in biology or its equivalent. Acceptability to the faculty member with whom the candidate wishes to do thesis research. Taking the Graduate Record Examination is not required.

#### Minimum Degree Requirements

30 total credits, fifteen of which are graded credits including: Biology Graduate Colloquia, 4 credits; 11 to 18 additional credits in biology and related fields; thesis research (8 to 15 credits) and successful defense of thesis. Required courses are Scientific Survival Skills and Computational Biology. Each candidate must participate in the teaching of at least 1 undergraduate course.

#### Comprehensive Examination

The comprehensive examination must be taken by the end of the second year. The examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both) are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science

All Biology M.S. students who are admitted to the Graduate College are admitted to candidacy for the degree.

## BIOLOGY M.S.T.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

Learning goals for MST students are:

- Be able to execute scientific experiments, analyze and communicate experimental results orally and in writing.
- Have a working knowledge of the fundamental literature, concepts and ideas of field of study.
- Have a broad factual and conceptual knowledge of biology.
- Gather knowledge of new techniques and information from laboratory and other courses potentially to use in the classroom.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science in Teaching

A bachelor's degree from an accredited institution and certification as a teacher of biology or an associated field. At least three years of secondary school teaching. Taking the Graduate Record Examination is not required.

#### Minimum Degree Requirements

30 credits of graded course work to include a selection of courses in the Departments of Plant Biology and Biology which will broaden and balance the undergraduate work in biology. Courses in 4 of the 5 following areas: anatomy; neurobiology; morphology and systematics; evolution; genetics; developmental biology; and environmental biology. Up to 12 credits of 100-level courses may be used for the above requirements where approved by the advisor and the dean. Appropriate courses in related science departments chosen with the graduate studies committee may be used to complete the required 30 credits. No thesis is required; however, each degree recipient must complete a final written examination.

#### Comprehensive Examination

The comprehensive examination must be taken by the end of the second year. The examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both) are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science in Teaching

All Biology M.S. students who are admitted to the Graduate College are admitted to candidacy for the degree.

## BIOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

## OVERVIEW

The research of Biology faculty is grouped into two clusters: Cell and Molecular Biology and Ecology-Evolution-Animal Behavior. Students will have the opportunity to mention from the outset of the application process whose research they are interested in. While faculty research interests fall into these two broad groupings, students are encouraged to consider research projects that cross disciplines.

Learning goals for the PhD degree students are:

- Be able to design and execute an independent research project, and analyze and communicate experimental results orally and in writing.
- Be proficient in analysis and visualization of experimental results.
- Be able to articulate and defend rationale and importance of research questions, study design, and analysis of results.
- Be able to communicate general and specific knowledge and importance of findings to broad audience as well as experts within sub-disciplines.
- Have a broad factual and conceptual knowledge of biology.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Satisfactory completion of: a B.A. or B.S. degree typically in the natural sciences or mathematics including courses in mathematics, statistics, chemistry, physics and biology; deficiencies in prerequisites may be made up after entering the program. Taking the Graduate Record Examination is not required.

### Minimum Degree Requirements

There are 75 required credits, of which at least 30 graded credits must be earned in graduate courses including a minimum of 6 credits of Graduate Colloquia or special seminar style courses. Required courses are Scientific Survival Skills and Computational Biology. The selection of courses will be designated for each student by the advisor and graduate studies committee. At least 20, but not more than 45, credits must be earned in dissertation research. Each candidate must participate in the teaching of at least 1 undergraduate course.

### Comprehensive Examination

The comprehensive examination must be taken by the end of the second semester of the second academic year. The format is a written proposal and oral defense of the proposal that will include examination of broad knowledge in the student's discipline. The details and format of the examination are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Passing the comprehensive exam; minimum requirement course work of 30 credits and additional courses as required by the advisor

and graduate studies committee; at least 1 academic year of graduate study at the University of Vermont.

## BIostatISTICS

<http://www.uvm.edu/~cems/mathstat/>

### OVERVIEW

The program offers a concentration in biostatistics leading to the M.S. degree.

Emphasis is placed on learning how to design studies and perform data analysis as the statistician in a research team. The curriculum takes full advantage of courses taught in the Statistics Program and includes potential experience in a variety of health, biomedical, natural resource and other research projects in the College of Medicine or other departments of UVM. This experience is designed to provide candidates with opportunities to use their academic training and work experience in defining research problems, formulating rational methods of inquiry, and gathering, analyzing, and interpreting data.

The program has close ties with the College of Medicine's Department of Medical Biostatistics and Bioinformatics, whose research activities cover the full range of studies that take place within an academic medicine environment. These include population-based health surveys of various types and evaluations of health promotion programs and professional education activities, such as community intervention studies to prevent smoking and to promote breast cancer screening. They also include clinical studies of many different interventions, bioengineering experiment design and measurement studies, statistical genetics, as well as data from other preclinical, clinical, and epidemiological studies.

Opportunities are also available for biostatistical research related to problems in agriculture and the life sciences, as well as natural resources and the environment. Opportunities could include multivariate or spatial data analyses for ongoing wildlife and water quality studies, for example. Students can gain research and consulting experience through the research requirement: a research project (STAT 381) or a thesis (STAT 391). Other opportunities for experience may arise through involvement in the Statistical Consulting Clinic (STAT 385). (See also Statistics Program and Statistical Consulting Clinic descriptions.)

### DEGREES

- Biostatistics AMP (p. 100)
- Biostatistics M.S. (p. 101)

### FACULTY

**Bagrow, James;** Assistant Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Callas, Peter W.;** Director of Biostatistics Core, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Cole, Bernard;** Professor, Department of Mathematics and Statistics; PHD, Boston University

**Jefferys, William;** Adjunct Professor, Department of Mathematics and Statistics; PHD, Yale University

**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

## BIOSTATISTICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

A master's degree in mathematics, statistics or biostatistics can be earned in a shortened time by careful planning during the junior and senior years at UVM. For example, the M.S. could be earned in just 1 additional year, because 6 credits of graduate level courses taken while an undergraduate can also be counted concurrently toward the M.S. degree requirements. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Students should discuss the possibility of an Accelerated Master's Entry Program in biostatistics with the respective program director as soon as they think they may be interested in this program. Students must declare their wish to enter the Accelerated Master's Entry Program in writing to the statistics program director (it is recommended that this happen before the end of their junior year). They would apply to the Graduate College for admission, noting their interest in the Accelerated Master's Program. They can receive concurrent undergraduate and graduate credit for 1 or 2 graduate level courses, once admitted. No graduate credit can be counted for statistics courses earned prior to admission to the graduate program.

#### Minimum Degree Requirements for the Degree of Master of Science

Option A (Thesis)		
A 30 credit program requiring 24 credits of course work. The program must include:		
STAT 200	QR: Med Biostat&Epidemiology	3
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 229	QR:Survivl/Logistic Regression	3

STAT 360	Linear Models	3
6 credits of approved thesis research		6

Option B (Non-Thesis)		
A 30 credit program requiring 27 credits of course work. The program must include:		
STAT 200	QR: Med Biostat&Epidemiology	3
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 229	QR:Survivl/Logistic Regression	3
STAT 360	Linear Models	3
3 additional course credits are required. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		3
The research project requirement is met by taking 3 credits of:		
STAT 381	Statistical Research	3
or STAT 385		Consulting Practicum

Both Options		
Under both plans, students must have or acquire a knowledge of the material in BIOS 211, attend the regular colloquium series and participate in the Statistics Student Associate Journal Club as part of their training. The comprehensive examination covers knowledge acquired in the core courses of the program. Under the non-thesis option, students will be expected to take major responsibility for a comprehensive data analysis or methodological research project, and are encouraged to present the results from the project.		

### Comprehensive Examination

A written comprehensive examination is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261. The comprehensive exams are typically held both 1 week prior to the start of the spring semester and approximately 2 weeks after the final exam in the spring semester. The student can take the exam a maximum of 2 times.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any pre-requisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.00 or greater is also required.

## BIostatistics M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The program offers a concentration in biostatistics leading to the M.S. degree.

Emphasis is placed on learning how to design studies and perform data analysis as the statistician in a research team. The curriculum takes full advantage of courses taught in the Statistics Program and includes potential experience in a variety of health, biomedical, natural resource and other research projects in the College of Medicine or other departments of UVM. This experience is designed to provide candidates with opportunities to use their academic training and work experience in defining research problems, formulating rational methods of inquiry, and gathering, analyzing, and interpreting data.

The program has close ties with the College of Medicine's Department of Medical Biostatistics and Bioinformatics, whose research activities cover the full range of studies that take place within an academic medicine environment. These include population-based health surveys of various types and evaluations of health promotion programs and professional education activities, such as community intervention studies to prevent smoking and to promote breast cancer screening. They also include clinical studies of many different interventions, bioengineering experiment design and measurement studies, statistical genetics, as well as data from other preclinical, clinical, and epidemiological studies.

Opportunities are also available for biostatistical research related to problems in agriculture and the life sciences, as well as natural resources and the environment. Opportunities could include multivariate or spatial data analyses for ongoing wildlife and water quality studies, for example. All students gain research and consulting experience through the research requirement: a research project (STAT 381) or a thesis (STAT 391). Other opportunities for experience may arise through involvement in the Statistical Consulting Clinic (STAT 385). (See also Statistics Program and Statistical Consulting Clinic descriptions.)

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major which provides a foundation for the application of statistical methodology and concepts to health and biomedical or agriculture/natural resource problems. For example, premedicine majors who have delayed their application to medical school will be well suited for the program. It is expected that candidates will have completed three semesters of calculus and a course including matrix algebra methods. Also they will have a solid introductory course in statistics (like STAT 211) and a course including undergraduate probability (like STAT 151). However, provisional admission to the program can be given prior to the completion of these mathematics and statistics requirements.

Computer programming experience is desirable. Satisfactory scores on the general (aptitude) portion of the Graduate Record Examination are required. Current undergraduate students at the University of Vermont should contact the program director for details on the Accelerated Master's Program.

#### Minimum Degree Requirements for the Degree of Master of Science

Option A (Thesis)		
A 30 credit program requiring 24 credits of course work. The program must include:		
STAT 200	QR: Med Biostat&Epidemiology	3
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 229	QR:Survivl/Logistic Regression	3
STAT 360	Linear Models	3
6 credits of approved thesis research		6

Option B (Non-Thesis)		
A 30 credit program requiring 27 credits of course work. The program must include:		
STAT 200	QR: Med Biostat&Epidemiology	3
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 229	QR:Survivl/Logistic Regression	3
STAT 360	Linear Models	3
3 additional course credits are required. STAT 229 is recommended. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		3
The research project requirement is met by taking 3 credits of:		
STAT 381	Statistical Research	3
or STAT 385	Consulting Practicum	

Both Options	
Under both plans, students must have or acquire a knowledge of the material in BIOS 211, attend the regular colloquium series and participate in the Statistics Student Associate Journal Club as part of their training. The comprehensive examination covers knowledge acquired in the core courses of the program. Under the non-thesis option, students will be expected to take major responsibility for a comprehensive data analysis or methodological research project, and are encouraged to present the results from the project.	

### Comprehensive Examination

A written comprehensive examination is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261. The comprehensive exams are typically held both 1 week prior to the start of the spring semester and approximately 2 weeks after the final exam in the spring semester. The student can take the exam a maximum of 2 times.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any pre-requisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.0 or greater is also required.

## BUSINESS ADMINISTRATION

<http://www.uvm.edu/business/>

### OVERVIEW

The Sustainable Innovation M.B.A. program at the University of Vermont is the leading program for emerging changemakers who believe business can – and must – become a force for good. The accelerated, 12 month program integrates sustainable business practices across disciplines, focusing on the tools needed to manage business today and lead through change tomorrow. Sustainable Innovation M.B.A. graduates jump back into work with the knowledge and skills they need to become change agents in field as diverse as impact investing, sustainable development, mission-driven marketing, supply chain management, nonprofit management, and other socially responsible business functions.

The program requires the successful completion of 45 credit hours, which are structured across an online asynchronous course taught in August, 4 8-week modules that each comprise multiple courses, and a 3-month summer capstone practicum project. All courses cover topics and tools for the creation of a more inclusive, resilient, and sustainable economy. Courses and other co-curricular experiences are delivered by faculty and thought leaders drawn from the Grossman School of Business, other UVM units, Vermont Law School, and the local and global business communities.

The Grossman School of Business and the Sustainable Innovation M.B.A. program are accredited by The Association to Advance Collegiate Schools of Business (AACSB).

### DEGREES

Sustainable Innovation M.B.A (p. 102).  
Sustainable Enterprise CGS (p. 104)

Sustainable Family Enterprise mCGS (p. 104)

### FACULTY

**Glavas, Ante;** Associate Professor, Grossman School of Business; PHD, Case Western Reserve University

**Jones, David A;** Professor, Grossman School of Business; PHD, University of Calgary

**Lowensohn, Suzanne;** Associate Professor, Grossman School of Business; PHD, University of Miami

**Monsen, Erik;** Associate Professor, Grossman School of Business; PHD, University of Colorado at Boulder

**Noordewier, Thomas Gerald;** Professor, Grossman School of Business; PHD, University of Wisconsin-Madison

**Schnitzlein, Charles;** Professor, Grossman School of Business; PHD, Washington University

**Sharma, Pramodita;** Professor, Grossman School of Business; PHD, University of Calgary

**Sharma, Sanjay;** Dean, Grossman School of Business; PHD, University of Calgary

**Vanden Bergh, Richard G.;** Professor, Grossman School of Business; PHD, University of California Berkeley

**Venugopal, Srinivas;** Assistant Professor, Grossman School of Business; PHD, University of Illinois at Urbana-Champaign

## SUSTAINABLE INNOVATION M.B.A.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Sustainable Innovation MBA at the University of Vermont is the leading program for emerging changemakers who believe business can – and must – become a force for good.

The accelerated, 12-month program integrates sustainable business practices across disciplines, focusing on the tools needed to manage business today and lead through change tomorrow. Sustainable Innovation MBA graduates jump back into work with the knowledge and skills they need to become change agents in fields as diverse as impact investing, sustainable development, mission-driven marketing, supply chain management, nonprofit management, and other socially responsible business functions.

The program requires the successful completion of 45 credit hours, which are structured across an online asynchronous course taught in August, 4 8-week modules that each comprise multiple courses, and a 3-month summer capstone practicum project. All courses cover topics and tools for the creation of a more inclusive, resilient, and sustainable economy. Courses and other co-curricular experiences are delivered by faculty and thought leaders drawn from the Grossman School of Business, other UVM units, Vermont Law School, and the local and global business communities.

All students take the same courses at the same time. Given the nature of this accelerated one-year M.B.A. program, students are expected to be engaged in their coursework on a full-time, in-person basis.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies the Degree of Master of Business Administration**

Admissions preference will be given to applicants who have 3 or more years of work experience in for-profit, non-profit, and/or government positions. Applicants with international exposure, and entrepreneurial and/or managerial experience are especially encouraged.

Due to the interdisciplinary nature of the program, applicants are drawn from a broad range of backgrounds and there are no particular prerequisites in regards to prior coursework or degrees. Each applicant is evaluated holistically, focusing on the applicant’s achievements and strengths as a person, which include but extend well beyond a collection of academic transcripts, test scores, and work experience.

GMAT or GRE scores are not required, but applicants are welcome to submit test scores if they feel it will strengthen their application. Applicants often submit test scores when they have a less strong academic record, or little to no quantitative coursework. Applicants for whom English is not their primary language are required to submit proof of English proficiency. The UVM Graduate College requires a minimum TOEFL score of 90, an IELTS score of 6.5, or a Duolingo score of 110. Application requirements also include 3 letters of reference and a statement of purpose.

**Minimum Degree Requirements**

To support the success of a diverse student body with varying levels of prior exposure to basic but core skills in business statistics, microeconomics, accounting, finance and spreadsheets, the program covers the cost of a required MBA Math course (www.mbamath.com). Admitted students who have paid their non-refundable deposit are invited to begin this self-paced, online, and non-credit bearing course as early as June 1 of the year in which they enroll in the program. Before the start of Module 1 in late August, each student is required to achieve 80% or higher on each MBA Math quiz, and an average quiz grade of 85% or higher. All tutorials and quizzes can be revisited and completed multiple times, and in any order. In exceptional circumstances, timeline extensions to meet these requirements can be granted at the discretion of a Program Director. Incoming students with a strong track record in these areas can submit a request to the Program Director to waive this requirement.

Required courses:

MBA 396	Advanced Special Topics (Business Fundamentals (Online, Self-Paced))	1
Financial Accounting for Sustainable Enterprises		
MODULE 1		
MBA 301	Foundations of Management	10
Business Strategy for a Sustainable World		
Finance for Innovators I		
Sustainable Brand Marketing		

Teamwork for Sustained Innovation		
Business Economics		
Cost Models for the Transformational Enterprise		
MODULE 2		
MBA 302	Bldg a Sustainable Enterprise	9
From CSR to Creating Sustainable Shared Value		
Business Sustainability and Public Policy		
Marketing Decision Making Under Uncertainty		
Leading for Sustainable Innovation		
Entrepreneurial Family Business		
MODULE 3		
MBA 303	Growth of Sust Enterprise	9
Sustainable Operations and Green Supply Chains		
Data Analytics for Sustainable Businesses		
Sustainability Toolkit I		
Crafting the Entrepreneurial Business Model		
Financing a Sustainable Venture		
Driving Sustainable Change I		
MODULE 4		
MBA 304	Focusing on Sustainability	9
Driving Sustainable Change II		
Driving Innovation from the Base of the Pyramid		
Innovation Strategy: From Idea to Market		
Accounting for a Sustainable Enterprise		
Systems Tools for Sustainability		
Sustainability Toolkit II		
MODULE 5		
MBA 305	Sus Entrepreneurship in Action	7
Law as a Framework for Entrepreneurial Business		
Practicum		

**Comprehensive Examination**

Successful completion of the summer practicum in Module 5 will be considered as fulfilling the Graduate College requirement that all Master's degree students pass a comprehensive examination in their field of specialization.



**Requirements for Advancement to Candidacy for the Degree of Master of Business Administration**

Successful completion of courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

**SUSTAINABLE ENTERPRISE CGS**

All Students must meet the Requirements for the Certificates of Graduate Study. (p. 259)

**OVERVIEW**

The Certificate of Graduate Study in Sustainable Enterprise provides a comprehensive framework for learning how enterprises can be both profitable and responsible, providing students with the business strategies, experience, professional network, and credentials to make an impact on their careers and the planet.

The Certificate of Graduate Study in Sustainable Enterprise is designed to:

- Develop students' business knowledge as they learn how sustainability issues impact business practices across organizational divisions
- Progress students' understanding of how enterprises stay competitive by incorporating triple bottom line concepts into their business strategy
- Deliver courses that fully integrate sustainability issues, similar to the Sustainable Innovation M.B.A. (SI-MBA), and draw on the knowledge and business acumen of our esteemed Grossman School of Business faculty and industry experts succeeding in their field

The fully online certificate will require 15 credits in the field of sustainable enterprise, including 4 required courses (12 credits) from 3 core enterprise content areas, including: accounting, marketing, operations, and supply chains, and 1 required course (3 credits) in a capstone course designed around leading sustainable innovation. Students can choose 1 elective course (3 credits) from a variety of topical electives, including: finance, new business models, and entrepreneurial family business. The program will offer 2 online courses each semester, with students expected to take 1 or both courses. Students may start the program in the fall, spring, or summer, so it will be possible to complete the program in 1 year.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the certificate of graduate study in sustainable enterprise**

Students are required to have earned a bachelor's degree from an accredited college or university.

**Minimum Degree Requirements**

REQUIRED COURSES		
BSAD 363	Accounting & Reporting for ESG	3
BSAD 305	Sustainable Marketing	3

BSAD 340	Green Oper. and Supply Chains	3
BSAD 395	Advanced Special Topics (Leading Sustainable Enterprise (Capstone))	3
ADDITIONAL COURSE (3 CREDITS) CHOOSE ONE COURSE FROM THE FOLLOWING:		
BSAD 338	Int Sustain New Business Model	
BSAD 335	Sustainable Family Enter I	

Additional questions may be directed to the Grossman School of Business.

**SUSTAINABLE FAMILY ENTERPRISE MCGS**

All students must meet the Requirements for the micro-Certificates of Graduate Study (CGS) (p. 259)

**OVERVIEW**

The Micro-Certificate of Graduate Study in Sustainable Enterprise offers a means for graduate students from diverse backgrounds to learn how to practically embed sustainable development issues in the most prevalent form of business organizations – the family business, thereby helping them to balance their performance on the 3P dimensions of People, Planet and Profits

The Micro-Certificate of Graduate Study in Sustainable Enterprise is designed to:

- Develop students' understanding of the best and next practices of innovative family firms in sustainable development
- Deliver courses that fully integrate sustainability issues, similar to the Sustainable Innovation M.B.A. (SI-MBA), and draw on the knowledge and business acumen of our esteemed Grossman School of Business faculty in the family enterprise field

The fully online certificate requires 9 credits in the field of sustainable family enterprise. 6 of the credits are required courses in sustainable family enterprise and students choose 1 elective course (3 credits) from a variety of topical electives, including sustainable marketing, ESG accounting and reporting, new business models and green supply chains. The program will offer 2 online courses each semester, with students expected to take 1 or both courses. Students may start the program in the fall, spring, or summer.

**SPECIFIC REQUIREMENTS**

**REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE micro-CERTIFICATE OF GRADUATE STUDY**

Students are required to have earned a bachelor's degree from an accredited college or university.

**MINIMUM DEGREE REQUIREMENTS**

Required Courses		
BSAD 335	Sustainable Family Enter I	3

BSAD 336	Sustainable Family Enter II	3
Additional Course (3 credits) Choose one from the following:		3
BSAD 305	Sustainable Marketing	
BSAD 338	Int Sustain New Business Model	
BSAD 340	Green Oper. and Supply Chains	
BSAD 363	Accounting & Reporting for ESG	

Additional questions may be directed to the Grossman School of Business.

## CELLULAR, MOLECULAR, AND BIOMEDICAL SCIENCES

<http://www.uvm.edu/cmb/>

### OVERVIEW

The Cellular, Molecular and Biomedical Sciences (CMB) program provides personalized training in a graduate-student focused, state-of-the-art research environment. Graduates are highly qualified scientists ready to take on the rigors of scientific careers in academia, industry, and government.

This interdisciplinary program is comprised of highly dedicated research faculty in 16 departments across the UVM campus. This breadth, combined with a collegial atmosphere, provides an ideal environment for studying the molecular, cellular, genetic, biophysical, and biochemical mechanisms that control organismal development and disease.

### DEGREES

- Cellular, Molecular and Biomedical Sciences M.S. (p. 106)
- Cellular, Molecular and Biomedical Sciences Ph.D. (p. 107)

### FACULTY

**Amiel, Eyal;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Dartmouth College

**Anathy, Vikas;** Associate Professor, Department of Pathology and Laboratory Medicine; PHD, Madurai Kamraj University

**Ballif, Bryan;** Professor, Department of Biology; PHD, Harvard University

**Barlow, John;** Associate Professor, Department of Animal and Veterinary Sciences; DVM, University of Illinois Urbana-Champaign; PHD, University of Vermont

**Berger, Christopher Lewis;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Bonney, Elizabeth;** Professor, Department of Obstetrics and Gynecology; MD, Stanford University

**Botten, Jason W.;** Professor, Department of Medicine-Immunobiology; PHD, University of New Mexico

**Bouchard, Beth;** Assistant Professor, Department of Biochemistry; PHD, University of Vermont

**Boyson, Jonathan;** Associate Professor, Department of Surgery; PHD, University of Wisconsin Madison

**Bruce, Emily;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Cambridge University

**Budd, Ralph Charles;** Professor, Department of Medicine-Immunobiology; MD, Weill Cornell Medical College

**Carr, Frances Eileen;** Professor, Department of Pharmacology; PHD, University of Illinois Chicago

**Chatterjee, Nimrat;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Baylor College of Medicine

**Cunniff, Brian;** Assistant Professor, Department of Pathology and Laboratory Medicine; PHD, University of Vermont

**Deming, Paula;** Associate Professor, Department of Biomedical and Health Sciences; PHD, University of North Carolina at Chapel Hill

**Diehl, Sean;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Double, Sylvie;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of North Carolina Chapel Hill

**Erdos, Benedek;** Assistant Professor, Department of Pharmacology; MD, PHD, Semmelweis University, School of Medicine, Budapest, Hungary

**Etter, Andrea;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, Purdue University

**Everse, Stephen;** Associate Professor, Department of Biochemistry; PHD, University of California San Diego

**Francklyn, Christopher;** Professor, Department of Biochemistry; PHD, University of California Santa Barbara

**Freeman, Kalev;** Assistant Professor, Department of Surgery; MD, PHD, University of Colorado Boulder

**Frietze, Seth;** Associate Professor, Department of Biomedical and Health Sciences; PHD, Harvard University

**Glass, Karen;** Associate Professor, Department of Pharmacology; PHD, University of Vermont

**Gordon, Jonathan;** Assistant Professor, Department of Biochemistry; PHD, University of Western Ontario

**Harraz, Osama F.;** Assistant Professor, Department of Pharmacology; PHD, University of Calgary

**Heath, Jessica;** Associate Professor, Department of Pediatrics; Department of Biochemistry; MD, SUNY Stony Brook

**Hondal, Robert;** Professor, Department of Biochemistry; PHD, Ohio State University

**Howe, Alan K.;** Professor, Department of Pharmacology; PHD, Northwestern University

**Huston, Christopher;** Professor, Department of Medicine-Infectious Disease; MD, Cornell University

**Irvin, Charles G.;** Professor, Department of Medicine-Pulmonary; PHD, University of Wisconsin-Madison

**Janssen-Heininger, Yvonne M.W.;** Professor, Department of Pathology and Laboratory Medicine; PHD, Maastricht University, The Netherlands

**Jetton, Thomas Lawrence;** Professor, Department of Medicine-Endocrinology; PHD, Vanderbilt University

**Kelm, Robert;** Associate Professor, Department of Medicine-Cardiovascular; PHD, University of Vermont

**Kinsey, C. Matthew;** Assistant Professor, Department of Medicine-Pulmonary, MD, Albert Einstein College of Medicine, Bronx, NY; MPH Harvard School of Public Health

**Kraft, Jana;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, Friedrich-Schiller-University of Jena

**Krementsov, Dimitry N.;** Assistant Professor, Department of Biomedical and Health Sciences, PHD, University of Vermont

**Landry, Christopher C.;** Professor, Department of Chemistry; PHD, Harvard University

**Lee, Andrea J.;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Wisconsin-Madison

**Lee, Benjamin;** Associate Professor, Department of Pediatrics; MD, Case Western Reserve University

**Li, Jianing;** Associate Professor, Department of Chemistry; PHD, Columbia University

**Lian, Jane;** Professor, Department of Biochemistry; PHD, Boston University

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**Majumdar, Dev;** Assistant Professor, Department of Surgery; PHD, University of California Los Angeles

**Martorelli Di Genova, Bruno;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Federal University of Sao Paulo

**McKay, Stephanie;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, University of Alberta

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Santa Cruz

**Morrill, Scott Walker;** Professor, Department of Biochemistry; PHD, University of Wisconsin-Madison

**Mughal, Amreen;** Assistant Professor, Department of Pharmacology; PHD, North Dakota State University

**Nallasamy, Shanmugasundaram;** Assistant Professor, Department of Obstetrics, Gynecology, and Reproductive Sciences; DVM, Tamil Nadu Veterinary and Animal Sciences University, India; PHD, University of Illinois at Urbana-Champaign

**Nelson, Mark;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Ou, Yangguang;** Assistant Professor, Department of Chemistry; PHD, University of Pittsburgh

**Pederson, David Scott;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Rochester

**Poynter, Matthew;** Professor, Department of Medicine-Pulmonary; PHD, University of Utah

**Previs, Michael;** Assistant Professor, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Quénet, Delphine;** Assistant Professor, Department of Biochemistry, PHD; University of Strasbourg, France

**Salogiannis, John;** Assistant Professor, Department of Molecular Physiology and Biophysics; PHD, Harvard University

**Schneebeli, Severin;** Associate Professor, Department of Chemistry; PHD, Columbia University

**Seward, David;** Assistant Professor, Department of Pathology and Laboratory Medicine; MD, PHD, University of Colorado Anschutz Medical Campus

**Shukla, Arti;** Professor, Department of Pathology and Laboratory Medicine; PHD, Banares Hindu University

**Shukla, Girja Shanker;** Associate Professor, Department of Surgery-Oncology; PHD, Lucknow University

**Silveira, Jay R.;** Assistant Professor, Department of Biochemistry; PHD, University of Vermont

**Spees, Jeffrey;** Professor, Department of Medicine-Cardiovascular; PHD, University of California Davis

**Stafford, James;** Assistant Professor, Department of Neurological Sciences; PHD, Oregon Health and Science University

**Stein, Gary;** Professor, Department of Biochemistry; PHD, University of Vermont

**Stein, Janet;** Professor, Department of Biochemistry; PHD, Princeton University

**Stumpff, Jason K.;** Associate Professor, Department of Molecular Physiology and Biophysics; PHD, University of Colorado

**Taatjes, Douglas Joseph;** Professor, Department of Pathology and Laboratory Medicine; PHD, University of Basel

**Testroet, Eric;** Assistant Professor, Department of Animal and Veterinary Science; PHD, Iowa State University

**Teuscher, Cory;** Professor, Department of Medicine-Immunobiology; PHD, University of New Mexico

**Thali, Markus Josef;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Zurich

**Tierney, Mary Lauretta;** Associate Professor, Department of Plant Biology; PHD, Michigan State University

**Toth, Michael;** Professor, Department of Medicine-Cardiovascular; PHD, University of Maryland Baltimore

**Trybus, Kathleen;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Chicago

**van der Vliet, Albert;** Professor, Department of Pathology and Laboratory Medicine; PHD, University of Amsterdam

**Vanegas, Juan;** Assistant Professor, Department of Physics; PHD, University of California Davis

**Ward, Gary;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of California San Diego

**Wargo, Matthew;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, Dartmouth College

**Warshaw, David;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Weiss, Daniel;** Professor, Department of Medicine-Pulmonary; MD, PHD, Mount Sinai School of Medicine

**Wellman, George;** Professor, Department of Pharmacology; PHD, University of Vermont

## CELLULAR, MOLECULAR AND BIOMEDICAL SCIENCES M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

The Cellular, Molecular and Biomedical Sciences Program only awards M.S. degrees to students who have matriculated into the Ph.D. program, and their studies committee has determined that their academic progress (research included) is not sufficient to complete a Ph.D. degree, or the student requests to leave the program prior to completion of the Ph.D. degree. These students are required to complete the minimum course and research requirements for the M.S. as defined by the Graduate College, and must defend a research-based master's thesis.

## CELLULAR, MOLECULAR AND BIOMEDICAL SCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Cellular, Molecular and Biomedical Sciences (CMB) program trains students to:

- Become scholars in their field
- Conduct hypothesis-based research in an ethically responsible manner
- Think independently, creatively, and critically
- Effectively communicate as teachers, researchers, and scholars

The curriculum of the Cellular, Molecular and Biomedical Sciences program is designed to give students fundamental and applied skills to prepare them for future positions in scientific research and related fields. The core curriculum includes course work in biochemistry, cell biology, genetics, ethics, data analysis, and scientific communications. Students also enhance their writing skills through a grant-writing course and improve their presentation skills through participation in the CMB seminar series. Students are provided with at least 2 opportunities to serve as teaching assistants, typically in undergraduate laboratory-based courses.

During the 1st year, CMB students complete 3 research rotations with potential advisors, while taking the required core course work in Cell Biology and Biochemistry. Students generally fulfill their core course and comprehensive exam requirements in year 2.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Competitive applicants typically have evidence of strong course preparation and an undergraduate GPA of 3.00 or better. Foreign applicants to the CMB Program are required to have a satisfactory score on either the TOEFL (100 or higher) or the IELTS (7.0 or better). Prior research experience and strong letters of recommendation are expected of all competitive applicants.

#### Minimum Degree Requirements

Completion of course and research credits totaling 75 credits is required for the Ph.D. Maintaining a GPA of 3.00 or better in core courses and advanced electives is required.

Required core courses for all CMB students:

BIOC 301	General Biochemistry	3
BIOC 496	Advanced Special Topics (Critical Reading and Analysis)	2
CLBI 301	Cell Biology	3
CLBI 401	Critical Reading & Analysis	2
CLBI 394	Science Communication	3

CLBI 402	Biomedical Data Analysis	2
MPBP 330	Biomedical Grantsmanship	2
Genetics Requirement:		
MMG 211	Prokaryotic Molecular Genetics	3
or MMG 233	Genetics and Genomics	
or MMG 296	Advanced Special Topics	
Ethics Requirement:		
NSCI 327	Resp Conduct in Biomed Rsch	1
or MMG 396	Advanced Special Topics	
or PBIO 395	Graduate Special Topics	

Students must complete a minimum of 20 research credits (CLBI 491) and 30 course credits, and an additional 25 course or research credits. Once students have earned 75 credits, they register for continuous registration GRAD 901, GRAD 902 or GRAD 903, as appropriate.

Additional program requirements include service as a graduate teaching assistant (GTA) twice during the 1<sup>st</sup> two years, weekly attendance at the CMB seminar series, annual presentation of research progress within the CMB seminar program starting in the second year, and annual meetings with the student's dissertation studies committee beginning in the 2<sup>nd</sup> year.

### Comprehensive Examination

The comprehensive examination is a tool to evaluate the progress of each student and ensure that they are prepared to proceed toward the doctorate degree. All parts of the qualifying examination will be evaluated in a manner to avoid bias and maintain uniformity of assessment. The examination will determine whether the candidate:

1. Has acquired an adequate academic background through required course work and electives
2. Can analyze and interpret data and scientific ideas
3. Can apply logical thought to synthesize diverse facts and concepts
4. Understands and meets the intellectual demands of the degree program

The comprehensive examination is structured to provide assessment in oral and written formats. The 2 phases of the exam occur at distinct times during training, and both must be satisfactorily completed to advance to doctoral candidacy.

Phase I is an oral examination that tests students on their ability to synthesize and integrate scientific knowledge learned from first-year laboratory rotations, CMB seminar and core courses. The oral exam must be completed by June 30 of the 1<sup>st</sup> year. Phase II is a written grant proposal based on the student's thesis research project that must be completed by August 31 of the 2<sup>nd</sup> year. The Phase II exam will provide the student with a detailed plan for conducting their dissertation research. The comprehensive exam is organized and conducted by the CMB Education Committee.

## Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Maintain a 3.00 GPA and successful completion of the comprehensive exam, as outlined in the CMB Program Handbook.

## CHEMISTRY

<http://www.uvm.edu/~chem/>

### OVERVIEW

The Chemistry Department currently offers graduate programs leading to either the M.S. or Ph.D. in analytical, biological, inorganic, organic, or physical chemistry. In recent years about eight students per year have received the Ph.D. In the Chemistry Department, courses are offered in inorganic chemistry, organometallic chemistry, physical inorganic chemistry, synthetic organic chemistry, physical organic chemistry, heterocyclic chemistry, advanced analytical chemistry, optical spectroscopy, mass spectrometry, electrochemistry, thermodynamics, quantum chemistry, and polymer chemistry.

Upon arrival, new graduate students in Chemistry take examinations in analytical, inorganic, organic, and physical chemistry in order to place students properly in the graduate curriculum. The exams are nationally standardized by the American Chemical Society, and national norms are used. Appropriate course work and didactic opportunities are in place to strengthen any student weakness that may appear from the exams.

Early in the fall semester faculty present a series of short talks that describe their research interests. New graduate students attend these talks and then discuss specific research interests with individual faculty members. After this process, students normally make a decision regarding their research direction and particular advisor around the end of November of the first year. Detailed information about the degree requirements of the program can be found via the Graduate Program link of the Chemistry Department's website.

### DEGREES

- Chemistry AMP (p. 108)
- Chemistry M.S. (p. 109)
- Chemistry Ph.D. (p. 110)

### FACULTY

**Brewer, Matthias;** Professor, Department of Chemistry; PHD, University of Wisconsin-Madison

**Hondal, Robert J.;** Associate Professor, Department of Biochemistry; PHD, Ohio State University

**Landry, Christopher C.;** Professor, Department of Chemistry; PHD, Harvard University

**Lee, Andrea J.;** Research Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Wisconsin-Madison

**Li, Jianing;** Associate Professor, Department of Chemistry; PHD, Columbia University

**Liptak, Matthew D.;** Associate Professor, Department of Chemistry; PHD, University of Wisconsin-Madison

**Madalengoitia, Jose S.;** Associate Professor, Department of Chemistry; PHD, University of Virginia

**Matthews, Dwight E.;** Professor Emeritus, Department of Chemistry; PHD, Indiana University Bloomington

**Ou, Yangguang;** Assistant Professor, Department of Chemistry, PHD, University of Pittsburgh

**Petrucci, Giuseppe A.;** Professor, Department of Chemistry; PHD, University of Florida

**Punihaole, David;** Assistant Professor, Department of Chemistry, PHD, University of Pittsburgh

**Ruggiero, Michael T.;** Assistant Professor, Department of Chemistry; PHD, Syracuse University

**Schneebeli, Severin;** Associate Professor, Department of Chemistry; PHD, Columbia University

**Waterman, Rory;** Professor, Department of Chemistry; PHD, University of Chicago

## CHEMISTRY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Qualified undergraduate students who plan to earn a M.S. in Chemistry may enroll in the Accelerated Master's Entry Program (AMP), which enables students to begin working on the M.S. while still an undergraduate. Students apply to the program in the second semester of their junior year or the first semester of their senior year. Upon admission to the program by the Graduate College, students will choose 9 credits of graduate approved courses that can be taken while still an undergraduate.

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE FOR ACCELERATED STUDENTS

Students must apply for the Accelerated Master's Entry Program (AMP) during spring semester of their junior year. Students interested in the AMP can request information in writing from the Chemistry department. Recommendation for admission will be based upon the student's prior academic record with particular attention paid to performance in upper-division 200-level Chemistry courses. Following formal Graduate College admission to the Accelerated Master's Program, up to 9 credits of approved graduate course work may be taken that may be counted toward both the undergraduate and graduate degree requirements. Generally, AMP students begin research by or during the summer prior to their senior year; however, this research is not eligible for graduate credit.

### MINIMUM DEGREE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

The above prerequisites for admission must be supplemented in either of the following two ways:

OPTION A (THESIS)	
Completion of twelve credits of CHEM 391 and submission of a satisfactory thesis; and completion of at least thirty credits of graduate work (courses and Master's Thesis Research).	

OPTION B (NON-THESIS)	
Completion of six credits of CHEM 395; and completion of at least thirty credits of graduate work (courses and Literature Research Project).	

M.S. students should decide at the beginning of their program whether they will pursue Option A or Option B and inform the Department of Chemistry and the Graduate College of their decisions.

### COMPREHENSIVE EXAMINATION

In the Chemistry Department, the Comprehensive Examination for the Master's degree consists of completion of the following three parts:

(1) Passing of the (entrance) qualifying-examinations requirement within the first year, and successful completion of the coursework requirement. The qualifying examinations establish a broad knowledge base in all major areas of chemistry, while the latter requirement is constructed to add breadth to the students' knowledge base in specific areas of chemistry not directly related to their research area.

(2) Successful completion of the Advancement to Candidacy exam (CHEM 380). This course consists of the preparation of a 5-page dossier of research accomplishments, and an oral examination on its contents, which serves as a comprehensive review of the student's fundamental understanding of chemistry.

(3) Completion of a total of 2 credits of Current Topics (CHEM 318). This course consists of a review of 1 major article from the current literature (and supporting supplementary articles). The oral presentation is followed by an examination of the student's understanding of the crucial information in that paper by faculty in the student's major area.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Proficiency in 3 areas of chemistry evidenced by the qualifying examinations or completion of designated courses at this university		
1 semester of residence		
CHEM 318	Current Topics in Chemistry (Must be Taken Twice)	1
CHEM 379	Intro to Graduate Research	1
CHEM 380	Chemical Investigations	1
CHEM 381	Grad Seminar	1
At least 15 credits of formal graded course work including:		15
6 credits of graduate level courses in the chemical field of specialization		
9 credits of graduate-level chemistry courses not in the area of specialization		
Maintenance of an overall point-hour ratio of 3.00		

## CHEMISTRY M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

An M.S. degree in chemistry prepares students for careers in chemical sciences, biomedical sciences, catalysis, energy, environment, or materials science as well as other professional fields that apply strong research skills or basic chemical understanding. For a description of research by chemical subdivision, please refer to the Chemistry Ph.D. topic in this catalogue.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major in an appropriate field, minimally with course work in the four classic subdisciplines of chemistry (analytical, inorganic, organic, and physical). This is most commonly satisfied with a B.A., B.S., or equivalent degree in chemistry. Applicants with prior research experience are preferred.

#### Minimum Degree Requirements

The above prerequisites for admission to candidacy must be supplemented in either of the following two ways:

OPTION A (THESIS)	
Completion of 12 credits of CHEM 391 and submission of a satisfactory thesis; and completion of at least 30 credits of graduate work (courses and Master's Thesis Research).	
OPTION B (NON-THESIS)	
Completion of 6 credits of CHEM 395; and completion of at least 30 credits of graduate work (courses and Literature Research Project).	

M.S. students should decide at the beginning of their program whether they will pursue Option A or Option B and inform the Department of Chemistry and the Graduate College of their decisions.

### Comprehensive Examination

In the Chemistry Department, the Comprehensive Examination for the Master's degree consists of completion of the following three parts:

(1) Passing of the (entrance) qualifying-examinations requirement within the first year, and successful completion of the coursework requirement. The qualifying examinations establish a broad knowledge base in all major areas of chemistry, while the latter requirement is constructed to add breadth to the students' knowledge base in specific areas of chemistry not directly related to their research area.

(2) Successful completion of the Advancement to Candidacy exam (CHEM 380). This course consists of the preparation of a 5-page dossier of research accomplishments, and an oral examination on its

contents, which serves as a comprehensive review of the student's fundamental understanding of chemistry.

(3) Completion of a total of 2 credits of Current Topics (CHEM 318). This course consists of a review of 1 major article from the current literature (and supporting supplementary articles).

The oral presentation is followed by an examination of the student's understanding of the crucial information in that paper by faculty in the student's major area.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Proficiency in 3 areas of chemistry evidenced by the qualifying examinations or completion of designated courses at this university		
1 semester of residence		
CHEM 318	Current Topics in Chemistry (Must be taken twice)	1
CHEM 379	Intro to Graduate Research	1
CHEM 380	Chemical Investigations	1
CHEM 381	Grad Seminar	1
At least 15 credits of formal graded course work including:		15
6 credits of graduate level courses in the chemical field of specialization		
9 credits of graduate-level chemistry courses not in the area of specialization		
Maintenance of an overall GPA of 3.00		

## CHEMISTRY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

A Ph.D. degree in chemistry prepares students for careers in chemical sciences and related disciplines including biomedical sciences, biotechnology, catalysis, energy, environment, materials science, or nanotechnology. Individuals having earned a Ph.D. in chemistry at UVM have gone on to careers in academics, the chemical industry, and national research laboratories. Graduate study at UVM is research intensive, and a description of research by chemical subdivision follows.

Analytical chemistry involves developing and applying instrumentation and chemical methods to solve problems across a range of chemistries and scientific disciplines. The department currently has 3 research foci: 1) development of innovative methods and instruments to study the formation and chemistry of organic aerosols in the atmosphere. This work bridges the gap between analytical chemistry and atmospheric science, contributing to the understanding of the impact of aerosols on global climate through direct scattering of solar radiation and the formation of ice and water clouds; 2) developing new chemical imaging methods to study biological processes. This work will enable direct imaging of the

structural dynamics and interactions of biomolecules and lead to new insights into protein folding dynamics in cells, understanding the molecular origins of neurodegenerative diseases, and aide in the rational design of new nanoparticle drug delivery vehicles; and, 3) development of a suite of electrochemical sensors and sampling/separation techniques to make quantitative measurements of various neurochemicals in the brain. This work will enable elucidate underlying mechanisms of various neuropsychiatric (i.e. PTSD, depression, etc.) and neurodevelopmental disorders (i.e. autism spectrum) to reveal more efficacious treatments.

Biological chemistry is an interdisciplinary area that incorporates organic, analytical, physical, and inorganic chemistry into biological research and has several focus areas. One focus area integrates physical chemistry with biochemistry and utilizes single molecule fluorescence microscopy to investigate how DNA repair enzymes recognize oxidatively damaged DNA bases. A second focus area is the study of antioxidant enzymes, peptides, nucleic acid, and vitamin-like small molecules that contain sulfur and selenium. Here the tools of organic, physical, and analytical chemistry are used for synthesis, characterization, and determination of the mechanism of action of both small molecules and macromolecules. Several other bioanalytical, bioinorganic, bioorganic, and biophysical research opportunities exist within the program as noted above and below.

Inorganic chemistry at UVM involves the study of main-group elements and transition metals in a variety of contexts, with applications in catalysis, energy, environment, and medicine. One example is the synthesis and characterization of inorganic particles, which can be functionalized for broad applications in heterogeneous catalysis, targeted drug delivery, and biological imaging. A second focus area employs biochemical, spectroscopic, and computational tools to elucidate and manipulate the enzymatic mechanisms of metalloproteins. Finally, a third example is the design of metal-based catalysts for chemical bond formation, which can be applied to the preparation of useful small molecules and novel polymeric materials.

Current research in organic chemistry includes the development of novel synthetic methodologies to prepare oxygen- and nitrogen-containing heterocyclic compounds, new ring fragmentation reactions and their applications in synthesis, development of efficient and stereoselective tandem/cascade reaction sequences, natural products, mechanistic studies of organic chemical reactions, development of 1,3-diaza-Claisen rearrangements and applications toward the synthesis of guanidine-containing natural products, and studies in bioorganic chemistry. Additional projects involve the methodological development of syntheses for  $\pi$ -conjugated small molecules, molecular cages, non-planar aromatics, and polymeric systems as functional materials with applications ranging from mesoscale synthesis to renewable energy harvesting and storage.

Physical chemistry research areas include two major areas of focus. The first area is the development of multiscale modeling approaches to understand complex chemical systems, with the aims of elucidating the critical structure-mechanism-function relationships of chemical and biological compounds and providing rational guides to help drug discovery and materials design. The second area is the use of low-frequency vibrational spectroscopies, combined with quantum

mechanical calculations, to understand how collective atomic motions are related to bulk material properties, with the aim of harnessing these vibrations to selectively drive processes related to mechanochemistry of energy storage materials, pharmaceutical stability, biomolecular function, and semiconducting potential.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

An undergraduate major in an appropriate field, minimally with course work in the 4 classic subdisciplines of chemistry (analytical, inorganic, organic, and physical). This is most commonly satisfied with a B.A., B.S., or equivalent degree in chemistry. Applicants with prior research experience are preferred.

### Minimum Degree Requirements

CHEM 379	Intro to Graduate Research	1
CHEM 381	Grad Seminar	1
CHEM 484	Advanced Topics in Chemistry	2
CHEM 487	Research Problem Conception	1
CHEM 488	Research Problem Solution	1
Current Topics in Chemistry (CHEM 318) must be taken at least 3 times		3-5
Between 20 and 45 credits hours of Doctoral Dissertation Research (CHEM 491)		20-45
Demonstration of basic competence in four fields of chemistry (analytical, inorganic, organic, and physical) through the biannual qualifying examinations or completion of prescribed courses at the University of Vermont		
1 year of teaching		
1 year of residence		
At least 18 credits of formal course work including:		
9 credits of graduate level courses in the chemical field of specialization		
9-12 credits of graduate-level chemistry courses not in the area of specialization		
Maintenance of an overall grade point average of 3.00		

### Comprehensive Examination

In the Chemistry Department, the Comprehensive Examination for the Doctorate degree consists of completion of the following three parts:

(1) Passing of the (entrance) qualifying-examinations requirement within the first year, and successful completion of the coursework requirement. The qualifying examinations establish a broad knowledge base in all major areas of chemistry, while the latter requirement is constructed to add breadth to the students' knowledge

base in specific areas of chemistry not directly related to their research area.

(2) Successful completion of the Advancement to Candidacy exam (CHEM 484). This course consists of the preparation of an end-of-second-year, 15-page dossier of research accomplishments, and an oral examination on its contents, which serves as a comprehensive review of the student's fundamental understanding of chemistry.

(3) Completion of a total of 3 credits of Current Topics (CHEM 318). This course consists of a review of one major article from the current literature (and supporting supplementary articles). The oral presentation is followed by an examination of the student's understanding of the crucial information in that paper by faculty in the student's major area

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

It is expected that a student will ordinarily complete the following requirements for admission to candidacy by the end of the second year of residence:

CHEM 379	Intro to Graduate Research	1
CHEM 380	Chemical Investigations	1
CHEM 381	Grad Seminar	1
CHEM 484	Advanced Topics in Chemistry (present and defend proposed dissertation topic)	2
Current Topics in Chemistry (CHEM 318) must be taken 3 times		3
Demonstration of basic competence in 4 fields of chemistry (analytical, inorganic, organic, and physical) through the biannual qualifying examinations or completion of prescribed courses at the University of Vermont		
1 year of teaching		
1 year of residence		
At least 18 credits of formal course work including:		18
9 credits of graduate level courses in the chemical field of specialization		
9 credits of graduate-level chemistry courses not in the area of specialization		
Maintenance of an overall GPA of 3.00		

## CIVIL AND ENVIRONMENTAL ENGINEERING

<http://www.uvm.edu/~cems/soe/>

### OVERVIEW

Graduate programs in Civil and Environmental Engineering (CEE) that lead to the master of science and doctor of philosophy degrees are offered. The curricular and research programs emphasize engineering related to environmental and hydrological processes,



sustainable transportation systems, materials, and geotechnical, geoenvironmental and structural engineering.

Research in the department addresses critical issues facing the world related to sustainability and energy; infrastructure systems; climate change, hazard mitigation and adaptation; and environmental and public health. A wide range of research methods are employed from state-of-the-art laboratory and field testing to sensing to computational modeling to artificial intelligence. Example projects include groundwater contamination modeling and remediation, environmental restoration and ecological engineering, hydrological processes, air pollution related health effects, sustainable materials, soil and structural dynamics, geo-energy, and sustainable transportation systems.

CEE graduate students can concurrently pursue certificates of graduate study in Complex Systems, Ecological Economics, and Community Resilience & Planning, among others.

## DEGREES

- Civil and Environmental Engineering AMP (p. 112)
- Civil and Environmental Engineering M.S. (p. 113)
- Civil and Environmental Engineering Ph.D. (p. 114)

## FACULTY

**Aultman-Hall, Lisa M.;** Professor, Department of Civil and Environmental Engineering; PHD, McMaster University

**Badireddy, Appala Raju;** Assistant Professor, Department of Civil and Environmental Engineering; PHD, University of Houston

**Bombliès, Arne;** Associate Professor, Department of Civil and Environmental Engineering; PHD, Massachusetts Institute of Technology

**Dewoolkar, Mandar M.;** Professor, Department of Civil and Environmental Engineering; PHD, University of Colorado Boulder

**Garcia, Luis;** Professor, Department of Civil and Environmental Engineering; PHD, University of Colorado Boulder

**Ghazanfari, Ehsan;** Associate Professor, Department of Civil and Environmental Engineering; PHD, Lehigh University

**Hamshaw, Scott;** Research Assistant Professor, Department of Civil and Environmental Engineering; Ph.D, University of Vermont

**Hernandez, Eric M.;** Associate Professor, Department of Civil and Environmental Engineering; PHD, Northeastern University

**Holmén, Britt A.;** Professor Emerita, Department of Civil and Environmental Engineering; PHD, Massachusetts Institute of Technology

**Pinder, George Francis;** Professor, Department of Civil and Environmental Engineering; PHD, University of Illinois Urbana-Champaign

**Rizzo, Donna Marie;** Professor, Department of Civil and Environmental Engineering; PHD, University of Vermont

**Rowangould, Dana;** Research Assistant Professor, Department of Civil and Environmental Engineering; PHD, University of California, Davis

**Scarborough, Matthew;** Assistant Professor, Department of Civil and Environmental Engineering; PHD, University of Wisconsin-Madison

**Tan, Ting;** Associate Professor, Department of Civil and Environmental Engineering; PHD, Princeton University

**Underwood, Kristen L.;** Research Assistant Professor, Department of Civil and Environmental Engineering; PHD, University of Vermont

## CIVIL AND ENVIRONMENTAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Qualified undergraduate students who plan to earn a M.S. in civil and environmental engineering may enroll in the Accelerated Master's Entry Program, which enables students to begin working on the M.S. while still an undergraduate. Applications are typically completed in the second semester of the junior year, but must be completed at least 1 month prior to the semester in which the student wishes to take courses that will double-count for both B.S. and M.S. degrees so that there is enough time to be admitted to the Graduate College before coursework that will double count is taken. Upon entering the program, students may take up to 6 graduate credits while completing the undergraduate degree that can be counted toward both the B.S. and the M.S. degrees. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree. These credits must be earned after the student has been accepted into the Graduate College, and are subject to approval of the student's graduate advisor. Students pursuing an M.S. degree in civil and environmental engineering may choose either a thesis, project, or non-thesis based program.

To apply to the program, students should have a cumulative grade point average of at least 3.20 at the time of application (some exceptions may be made, if warranted), must submit a letter of application to the graduate program coordinator naming a faculty member who has agreed to serve as their graduate advisor and list the courses proposed for graduate credit. Applicants must also complete the Graduate College application. GRE scores are not required for AMP students.

#### Minimum Degree Requirements

The requirements for advancement to candidacy are as follows:

THESIS OPTION	
Total Minimum Credits (including 6-9 credits of CE 391)	30
Oral Comprehensive Examination	
Completion and Defense of a Thesis	
NON-THESIS OPTION #1	
Total Minimum Credits (including 3-6 credits of CE 392)	30

Oral Comprehensive Examination	
Completion of a Research Report	
NON-THESIS OPTION #2	
Total Minimum Credits	30
Written Comprehensive Examination	

Students must declare which option they intend to pursue at the beginning of their program, any changes must be done in coordination with the academic advisor and Graduate Program Director.

All M.S. students must complete a minimum of 6 credits in advanced statistics, mathematics or numerical/computational methods, and a minimum of 9 credits in Civil and Environmental Engineering (CE) coursework.

**Comprehensive Examination**

A comprehensive examination is required of all M.S. students. For thesis option students this generally takes the form of an oral examination with the Studies Committee and often focuses around the basic principles behind the thesis research. This should generally take place in the semester preceding the thesis defense.

For non-thesis option students, the required format is either a written report or a written examination consisting of 3 topics related to the student's course of study. This usually takes place in the last semester of the program.

The examination may be retaken once if the student does not pass it on the first attempt.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

Specific course work may be required of those who lack a sufficiently strong engineering background.

**CIVIL AND ENVIRONMENTAL ENGINEERING M.S.**

All students must meet the Requirements for the Master's Degree (p. 260)

**OVERVIEW**

A graduate program in Civil and Environmental Engineering (CEE) that leads to the master of science degree is offered. The curricular and research programs emphasize engineering related to environmental and hydrological processes, sustainable transportation systems, materials, and geotechnical, geoenvironmental and structural engineering.

Research in the department addresses critical issues facing the world related to sustainability and energy; infrastructure systems; climate change, hazard mitigation and adaptation; and environmental and public health. A wide range of research methods are employed from state-of-the-art laboratory and field testing to sensing to computational modeling to artificial intelligence.

Example projects include groundwater contamination modeling and remediation, environmental restoration and ecological engineering, hydrological processes, air pollution related health effects, sustainable materials, soil and structural dynamics, geo-energy, and sustainable transportation systems.

CEE graduate students can concurrently pursue certificates of graduate study in Complex Systems, Ecological Economics, and Community Resilience & Planning, among others.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Science**

All applicants must have an undergraduate degree from a recognized university. A B.S. in engineering is preferred, but applicants with a B.S. in 1 of the sciences are often accepted. The latter, however, should have a minimum of the following mathematics and science course work prior to admission: calculus through differential equations (UVM's MATH 271 equivalent), calculus-based physics (UVM's PHYS 031 equivalent), and chemistry (UVM's CHEM 031 equivalent). Applicants without a B.S. degree in civil or environmental engineering may be asked to complete additional undergraduate coursework of up to 9 credits. Specific course work may be required of those who lack a sufficiently strong engineering background. Satisfactory scores on the Graduate Record Examination (GRE) general are also required. GRE is waived for graduates of the University of Vermont. International students whose native language is not English or who have not received their education in English are required to submit satisfactory results from the TOEFL, IELTS or DuoLingo examination.

**Minimum Degree Requirements**

The requirements for advancement to candidacy are as follows:

THESIS OPTION	
Total Minimum Credits (including 6-9 credits of CE 391)	30
Oral Comprehensive Examination	
Completion and Defense of a Thesis	
NON-THESIS OPTION #1	
Total Minimum Credits (including 3-6 credits of CE 392)	30
Oral Comprehensive Examination	
Completion of a Research Report	
NON-THESIS OPTION #2	
Total Minimum Credits (Restricted to Course Credits Only)	30
Written Comprehensive Examination	

Students must declare which option they intend to pursue at the beginning of their program, any changes must be done in coordination with the academic advisor and Graduate Program Director.

All MS students must complete a minimum of 6 credits in advanced statistics, mathematics or numerical/computational methods, and a minimum of 9 credits in Civil and Environmental Engineering (CE) coursework.

### Comprehensive Examination

A comprehensive examination is required of all M.S. students. For thesis option students this generally takes the form of an oral examination with the Studies Committee and often focuses around the basic principles behind the thesis research. This should generally take place in the semester preceding the thesis defense.

For non-thesis option students, the required format is either a written report or a written examination consisting of 3 topics related to the student's course of study. This usually takes place in the last semester of the program.

The examination may be retaken once if the student does not pass it on the first attempt.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Specific course work may be required of those who lack a sufficiently strong engineering background.

## CIVIL AND ENVIRONMENTAL ENGINEERING PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

A graduate program in Civil and Environmental Engineering (CEE) that leads to the doctor of philosophy degree is offered. The curricular and research programs emphasize engineering related to environmental and hydrological processes, sustainable transportation systems, materials, and geotechnical, geoenvironmental and structural engineering.

Research in the department addresses critical issues facing the world related to sustainability and energy; infrastructure systems; climate change, hazard mitigation and adaptation; and environmental and public health. A wide range of research methods are employed from state-of-the-art laboratory and field testing to sensing to computational modeling to artificial intelligence. Example projects include groundwater contamination modeling and remediation, environmental restoration and ecological engineering, hydrological processes, air pollution related health effects, sustainable materials, soil and structural dynamics, geo-energy, and sustainable transportation systems.

CEE graduate students can concurrently pursue certificates of graduate study in Complex Systems, Ecological Economics, and Community Resilience & Planning, among others.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A M.S. or B.S. degree in engineering is preferred, but applicants with a M.S. or B.S. in 1 of the sciences are often accepted. The latter, however, should have a minimum of the following mathematics and science course work prior to admission: calculus through differential equations (UVM's MATH 271 equivalent), calculus-based physics (UVM's PHYS 031 equivalent), and chemistry (UVM's CHEM 031 equivalent). Specific course work may be required of those who lack a sufficiently strong engineering background. Satisfactory academic performance as measured by grades and scores on the Graduate Record Exam are required. GRE is waived for graduates of the University of Vermont. Applicants whose native language is not English or who have not received their education in English must present satisfactory results from the TOEFL, IELTS or Duolingo examination.

### Minimum Requirements for the Degree of Doctor of Philosophy

In addition to advancement to candidacy, the student must:

- Present at least 75 credits in approved course work and research (including those required for advancement to candidacy), of which at least 35 credits are in research, at least 30 credits are in coursework, 15 of which must be graded at UVM. A minimum of 15 credits of coursework (taken at UVM or transferred or a combination) must be in Civil and Environmental Engineering (CE).
- Write and successfully defend an acceptable dissertation
- Gain significant teaching experience

### Comprehensive Examination

A comprehensive examination is required of all Ph.D. students and should be completed by the end of their second year in the doctoral program when they have taken at least 24 credits of graduate coursework in different topical areas. Some or all of the 24 credits required may be transferred in from their Masters degree if desired.

The comprehensive examination, successful proposal presentation, and 1 year of residency at UVM are needed for advancement to candidacy.

The comprehensive examination covers 5 courses, from 2 topical areas are described below.

Area 1. 3 topics from the following:

1. Advanced Mathematical Methods
2. Advanced Statistical Methods
3. Probabilistic Methods
4. Numerical Methods
5. Computational Modeling
6. Optional Area subject to approval by Studies Committee

Area 2. 2 topics from Civil and Environmental Engineering

5 members of the Comprehensive Examination Committee will test the student in 5 appropriate topics selected from the previous list. Each faculty member will be responsible for 1 of the 5 topics. The students and their Advisor select and recommend to the Graduate Program Director the Comprehensive Examination Committee.

The examination takes place in 2 days and covers a written part (day 1) and an oral part (day 2). The written part typically consists of questions prepared by each member of the Comprehensive Examination Committee on their respective topic. The oral examination is usually given 2 days after the written examination and it tests the candidate's ability to present a cogent defense of the written examination. The examination may be retaken once if the student does not pass it on the first attempt.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

It is ordinarily expected that a student will complete the following requirements for advancement to candidacy prior to the end of the second year in the program:

- 1 year of residency at UVM
- At least 12 credits of research
- At least 15 credits of course work at the graduate level acceptable to the student's graduate studies committee
- Satisfactory performance on a comprehensive examination that includes a written part and an oral part
- Satisfactory record of performance in courses and in teaching and research assignments

## CLINICAL AND TRANSLATIONAL SCIENCE

<http://med.uvm.edu/medicine/gimr/ctseducation/overview>  
(<http://med.uvm.edu/medicine/gimr/ctseducation/overview/>)

### OVERVIEW

Clinical and Translational Science (CTS) is a framework that helps us understand and develop new approaches to improving human health by linking basic biology, clinical medicine and community health. CTS students learn to design, execute and report studies of how biologic and non-biologic aspects of health care interact to influence individuals and populations. The programs provide individuals with diverse backgrounds the opportunity to work with faculty from many disciplines and offer an Educational and Career Development Program to prepare them for roles as important and productive contributors to CTS.

### DEGREES

- Clinical and Translational Science CGS (p. 115)
- Clinical and Translational Science M.S. (p. 116)
- Clinical and Translational Science Ph.D. (p. 117)

## FACULTY

**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Colgate, Ross;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Kennedy, Amanda G.;** Professor, Department of Medicine-General Internal Medicine Research; PHARMMD, Northeastern University

**Littenberg, Benjamin;** Professor, Department of Medicine-General Internal Medicine; MD, Case Western Reserve University

**MacLean, Charles Duncan;** Professor, Department of Medicine-General Internal Medicine Research; MD, McGill University

**Pinckney, Richard G.;** Associate Professor, Department of Medicine-General Internal Medicine; MD, SUNY Buffalo

**Rubin, Alan Saul;** Associate Professor Emeritus, Department of Medicine-General Internal Medicine; MD, New York University

**van Eeghen, Constance O.;** Assistant Professor, Department of Medicine-General Internal Medicine; DRPH, University of North Carolina Chapel Hill

## CLINICAL AND TRANSLATIONAL SCIENCE CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

### OVERVIEW

The Certificate in CTS (Clinical and Translational Science) is designed for biomedical scientists, health care professionals, and scholars in other fields (e.g., ethics, business, engineering, law) who are seeking to broaden their horizons in clinical and translational research.

More information on the certificate is available on the General Internal Medicine Research website.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

U.S. Baccalaureate degree or an equivalent international degree

4 semesters of college-level science highly recommended

2 semesters of college-level mathematics or statistics highly recommended

2 semesters of college level English composition or equivalent

#### Minimum Degree Requirements

Students are expected to complete 18 credits of core coursework and participate in the weekly Seminar in CTS.

Required Courses:		
CTS 301	Design Clin&Translational Res	3
CTS 307	Cell to Society	3

CTS 310	Conduct Clin&Translational Res	3
CTS 315	Report Clin&Translational Res	3
CTS 320	Analyze Clin&Translational Res	3
CTS 325	Multi Analysis Clin&Trans Res	3

## CLINICAL AND TRANSLATIONAL SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

#### Concentration in Investigation

This program is designed to effectively and efficiently transform doctoral level professionals drawn from the large array of disciplines contributing to health into successful independent clinical and translational science investigators.

#### Concentration in Research Management (not currently offered)

This program is designed for individuals who have an interest in becoming research coordinators, patient advocates, research administrators, study nurses and other science professionals.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

##### CONCENTRATION IN INVESTIGATION

Applicants should have a doctoral-level degree, expertise in their specialty and some general research experience

4 semesters of college-level science highly recommended

2 semesters of college-level mathematics or statistics highly recommended

2 semesters of college-level English composition or equivalent

Interviews with appointed faculty are required

##### CONCENTRATION IN RESEARCH MANAGEMENT

(Not currently accepting applications)

U.S. Baccalaureate degree or an equivalent international degree

4 semesters of college-level science highly recommended

2 semesters of college-level mathematics or statistics highly recommended

2 semesters of college-level English composition or equivalent

Interviews with appointed faculty are required

Applicants holding a degree from an unaccredited institution and International applicants should consult additional Graduate College Admission requirements

### Minimum Degree Requirements

#### CONCENTRATION IN INVESTIGATION

The Master's in CTS (Investigation) is a 30 credit degree that includes 18 credits of core course work, 6 credits of electives, and 6 credits of supervised research. Individuals must also participate in the weekly Seminar in CTS, successfully pass a comprehensive exam, and successfully complete and publicly defend a thesis.

Required Courses (Investigation Track):		
CTS 301	Design Clin&Translational Res	3
CTS 320	Analyze Clin&Translational Res	3
CTS 307	Cell to Society	3
CTS 310	Conduct Clin&Translational Res	3
CTS 325	Multi Analysis Clin&Trans Res	3
CTS 315	Report Clin&Translational Res	3

#### CONCENTRATION IN RESEARCH MANAGEMENT

The Master's in CTS (Research Management) is a 30-credit degree that includes 21 credits of core course work, 3 credits of electives, and 6 credits of a supervised research internship. Individuals must also participate in the Seminar in CTS and successfully pass a comprehensive exam.

Required Courses (Research Management Track):		
CTS 301	Design Clin&Translational Res	3
CTS 307	Cell to Society	3
CTS 310	Conduct Clin&Translational Res	3
CTS 315	Report Clin&Translational Res	3
CTS 320	Analyze Clin&Translational Res	3
CTS 392	Master's Research Internship	1-6
CTS 308 and CTS 309 are not offered in academic year 2021-22		

### Comprehensive Examination

The comprehensive exam is a required component for both concentrations of the M.S. program. The goal of the comprehensive exam is to determine whether the student's depth and breadth of knowledge and ability to integrate information is within a scope expected as part of a master's program in clinical and translational science (CTS).

The written exam has 2 parts. The 1<sup>st</sup> part is writing a 1-2 page NIH-style project summary of a grant protocol. The 2<sup>nd</sup> part requires an analysis of an existing dataset using the concepts learned in the core courses

The oral exam requires students to meet with their Comprehensive Exam Committee to answer questions related to the written exam and concepts taught as part of the CTS core courses.

The comprehensive exam should be completed within 6 months of finishing the CTS core courses.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Students must have completed all required courses including 15 graded credits and maintain an overall minimum grade point average of 3.00. Successful completion of oral and written comprehensive exam required.

## CLINICAL AND TRANSLATIONAL SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Ph.D. in CTS is designed for individuals who wish to become full-fledged independent investigators in CTS.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

U.S. Baccalaureate degree or an equivalent international degree

4 semesters of college-level science highly recommended

2 semesters of college-level mathematics or statistics highly recommended

2 semesters of college level English composition or equivalent

Interviews with appointed faculty are required

Students applying to the Ph.D. in CTS must have a source of funding and a Key CTS research mentor<sup>1</sup> willing to provide a letter of support as part of the application

Applicants holding a degree from an unaccredited institution and international applicants should consult additional Graduate College Admission requirements.

<sup>1</sup> Co-mentoring with faculty from other programs is allowed and often desirable but must involve CTS Faculty in all aspects of student research. This requirement is also applicable to CTS students in M.S. program wishing to transfer to Ph.D.

#### Minimum Degree Requirements

The Ph.D. in CTS is a 75-credit degree which includes 18 credit hours of core courses, at least 12 credits of elective courses, and a minimum of 20 credits of supervised research. Individuals must also participate in the weekly Seminar in CTS, complete a teaching requirement, successfully pass a comprehensive exam, and successfully complete and publicly defend a dissertation.

Required Courses:		
CTS 301	Design Clin&Translational Res	3
CTS 307	Cell to Society	3
CTS 320	Analyze Clin&Translational Res	3
CTS 310	Conduct Clin&Translational Res	3
CTS 325	Multi Analysis Clin&Trans Res	3
CTS 315	Report Clin&Translational Res	3

### Comprehensive Examination

The overall goal of the comprehensive exam is to determine whether the student's depth and breadth of knowledge and ability to integrate information is such that he or she should be advanced to candidacy for the Ph.D. The written exam involves writing a grant proposal in the style of a NIH Small Research Grant (R03) using the concepts learned in the core courses. The oral exam requires students to meet with the Comprehensive Exam Committee to answer questions related to the written exam and concepts taught as part of the CTS core courses. The comprehensive exam should be completed within 6 months of finishing the CTS core courses.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Students must have completed all required courses including 15 graded credits and maintain an overall minimum grade point average of 3.00. Successful completion of oral and written comprehensive exam required.

## COMMUNICATION SCIENCES AND DISORDERS

<http://www.uvm.edu/~cnhs/csd/>

### OVERVIEW

The Master of Science degree program in Communication Sciences and Disorders is designed to provide in-depth knowledge and skills in the areas required for a career in speech-language pathology. The course of study provides students with the academic background and clinical opportunities required in preparation for their Clinical Fellowship and ultimately the Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP), allowing them to pursue a satisfying and rewarding career in health care, medicine, education, or research.

The master's degree educational program in speech-language pathology at the University of Vermont has been re-accredited for the period 2021 - 2029 by the Council on Academic Accreditation in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2200 Research Boulevard #310, Rockville, MD, 20850; Phone: (800) 498-2071 or (301) 296-5700.

The Department of Communication Sciences and Disorders includes the Eleanor M. Luse Center for Communication: Speech, Language, and Hearing. This is an active clinic providing speech-language and audiology services to the community. It also serves as a key practicum

site for students throughout their graduate studies. All students are supervised by clinically certified members of the faculty of the Eleanor M. Luse Center and affiliated practicum sites.

The CSD faculty conduct research in areas such as speech and language development, speech sound disorders and apraxia of speech, fluency and stuttering, autism and theory of mind, brain injury and cognitive-communication disorders. Many opportunities are available for graduate students who wish to become involved in faculty research projects.

## DEGREES

- Communication Sciences and Disorders M.S. (p. 118)

## FACULTY

**Adams, Elizabeth;** Clinical Associate Professor, Department of Communication Sciences and Disorders; Au.D., CCC-A, A.T. Still University

**Bauerly, Kim R.;** Assistant Professor, Department of Communication Sciences and Disorders; PHD, University of Toronto

**Cannizzaro, Michael S.;** Associate Professor, Department of Communication Sciences and Disorders; Ph.D., University of Connecticut

**Coderre, Emily;** Assistant Professor, Department of Communication Sciences and Disorders; Ph.D.; University of Nottingham

**Cote, Sharon;** Clinical Assistant Professor, Department of Communication Science and Disorders; M.S., CCC-SLP, Boston University

**Hutchins, Tiffany L.;** Assistant Professor, Department of Communication Sciences and Disorders; Ph.D., University of South Florida

**Kazenski, Danra;** Clinical Assistant Professor, Department of Communication Sciences and Disorders; Ph.D., University of Vermont

**Prelock, Patricia A.;** Provost and Senior Vice President; Professor, Department of Communication Sciences and Disorders; Ph.D., University of Pittsburgh

**Velleman, Shelley L.;** Professor & Chair, Department of Communication Sciences and Disorders; Ph.D., University of Texas Austin

**Walberg, Julia;** Clinical Educator, Department of Communication Sciences and Disorders; M.S., CCC-SLP, The University of District of Columbia

## COMMUNICATION SCIENCES AND DISORDERS M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master of Science degree program in Communication Sciences and Disorders is designed to provide in-depth knowledge and skills in the areas required for a career in speech-language pathology. The course of study provides students with the academic background

and clinical opportunities required in preparation for their Clinical Fellowship and ultimately the Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP), allowing them to pursue a satisfying and rewarding career in health care, medicine, education, or research.

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The Department of Communication Sciences and Disorders includes the Eleanor M. Luse Center for Communication: Speech, Language, and Hearing. This is an active clinic providing speech-language and audiology services to the community. It also serves as a key practicum site for students throughout their graduate studies. All students are supervised by clinically certified members of the faculty of the Eleanor M. Luse Center and affiliated practicum sites.

The CSD faculty conduct research in areas such as speech and language development, speech sound disorders and apraxia of speech, fluency and stuttering, autism and theory of mind, brain injury and cognitive-communication disorders. Many opportunities are available for graduate students who wish to become involved in faculty research projects.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Baccalaureate degree from an accredited institution; satisfactory performance on the general (aptitude) Graduate Record Examination. Completion of courses equivalent to:

CSD 023	Linguistics for Clinicians	3
or LING 080	Introduction to Linguistics	
CSD 094	Dev of Spoken Language	3
CSD 101	Speech & Hearing Science	0 or 4
CSD 022	Introduction to Phonetics	3
or LING 165	Phonetic Theory and Practice	
CSD 281	Intro Cognitive Neuroscience (or an equivalent Human Neuroanatomy course)	3
College Level Statistics		3

Applicants must complete all of the above prerequisite courses before entering the program. Students are also required to complete 25 observation hours obtained according to guidelines provided by the American Speech-Language-Hearing Association. Students must complete these 25 observation hours before they begin their graduate program. Additionally, the American Speech-Language-Hearing Association Standard III-A for certification requires evidence of

previous course work in the biological sciences, physical sciences (i.e. physics or chemistry), statistics, and the social/behavioral sciences.

**Minimum Degree Requirements**

All students are required to complete mandatory course work in pursuit of the M.S. in Communication Sciences and Disorders. This course work includes content areas met by the following CSD courses:

CSD 271	Introduction to Audiology (if not previously taken)	3
CSD 272	Hearing Rehabilitation (if not previously taken)	3
CSD 313	Augmentative Communication	3
CSD 320	Clinic Preparation&Management	3
CSD 321	Clinic Practicum Study 1	1
CSD 322	Clinic Practicum Study 2	2
CSD 323	Clinic Practicum Study 3	3
CSD 324	Clinic Practicum Study 4	2
CSD 325	Clinic Practicum Study 5	3
CSD 326	Clinic Practicum Study Winter 6 (optional)	1
CSD 327	School Based Issues for SLPs	1
CSD 332	Assmt & Treatmt of Stuttering	3
CSD 340	Spch Snd Disorders in Children	3
CSD 341	Language Disorders	3
CSD 342	Seminar Lang/Lrng Disabilities	3
CSD 350	Swallowing Disorders	3
CSD 351	Neurogenic Comm. Disorders 1	3
CSD 352	Voice Disorders	3
CSD 353	Neurogenic Comm. Disorders 2	3
NH 399	Fundamentals Critical Inquiry	3
Masters thesis (CSD 362), research project (CSD 363), or non-thesis sequence of courses focusing on clinical systematic reviews (CSD 361 and 363)		3-6
Total Credits		47-58

In total, 48-56 credits of graduate course work are required for the non-thesis track and 51-59 credits of graduate course work for students who write a thesis. Equivalent graduate-level course work, up to nine credits, may be waived if approved by the graduate program coordinator, reducing the total number of in-residence credits needed for completion of the program.

OPTION A (THESIS)	
The student will complete 45-53 credits of graduate-level courses and six additional credits (CSD 362) for conducting the research leading to an M.S. thesis	
OPTION B (NON-THESIS)	
Students choosing the non-thesis option will complete 45-53 credits required for the degree, including at least three credits of non-thesis research (CSD 361 and/or CSD 363 – research project or Systematic Reviews course)	

**Comprehensive Examination**

The portfolio is used by this department as an alternative form of Comprehensive Examination; it provides a rich demonstration of the students’ achievements in their course of study. Each student’s portfolio includes a set of four reflective essays as well as academic and clinical artifacts selected by the student to reflect growth in specific areas of academic and clinical knowledge and skills required by the American Speech-Language-Hearing Association and the Vermont Department of Education. Other aspects of growth to be demonstrated include increasing rigor in critical thinking and methods of inquiry for research and its application.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

Students will be admitted to candidacy when the following criteria have been met:

- A minimum of 375 hours of supervised clinical practicum.
- 25 hours of guided clinical observation.
- 36 graduate credits and completion of a written comprehensive examination in the form of a portfolio.

**COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS**

<https://www.uvm.edu/cals/cdae> (<https://www.uvm.edu/cals/cdae/>)

**OVERVIEW**

The Department of Community Development and Applied Economics (CDAE) supports sustainable local and international community development through interdisciplinary research, education, and outreach that serves the public interest. CDAE offers a Master of Science degree in Community Development and Applied Economics. Expertise among the CDAE faculty advisors includes economics (both ecological and neoclassical), rural sociology, food systems, applied econometrics, agricultural economics, policy and governance, consumer affairs, renewable energy, and community entrepreneurship. CDAE's research and outreach is both global (e.g. Agroecology, Farmer Livelihoods and Ecosystem Services in Brazil's Atlantic Forest) and local (e.g., dairy farming and farmers' markets in Vermont) and graduate students benefit from close affiliation with other research institutions at the University of Vermont and beyond.



## DEGREES

- Community Development and Applied Economics AMP (p. 120)
- Community Development and Applied Economics M.S (p. 121). (<http://catalogue.uvm.edu/graduate/commdevelopment/graduate/commdevelopment/communitydevelopmentandappliedeconomicsms/>)
- Community Resilience and Planning CGS (p. 122)

## FACULTY

**Baker, Daniel H.;** Associate Professor, Department of Community Development and Applied Economics; PHD, University of Vermont

**Conner, David S.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Farley, Joshua C.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Heiss, Sarah Noel;** Associate Professor, Department of Community Development and Applied Economics; PHD, Ohio University

**Koliba, Christopher J.;** Professor, Department of Community Development and Applied Economics; PHD, Syracuse University

**Kolodinsky, Jane Marie;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**McMahon, Edward;** Adjunct Associate Professor, Department of Community Development and Applied Economics; EDD, University of Vermont

**McRae, Glenn;** Adjunct Lecturer, Department of Community Development and Applied Economics; PHD, Union Institute and University

**Reynolds, Travis;** Assistant Professor, Department of Community Development and Applied Economics, PHD, University of Washington

**Shrum, Trisha R.;** Assistant Professor; Department of Community Development and Applied Economics; PHD, Harvard University – John F. Kennedy School of Government

**Sun, Tao;** Associate Professor, Department of Community Development and Applied Economics; PHD, University of Minnesota Twin Cities

**Tobin, Daniel;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Pennsylvania State University

**Wang, Qingbin;** Professor, Department of Community Development and Applied Economics; PHD, Iowa State University

**Zia, Asim;** Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (<http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforacceleratedmastersdegreepgrams/>)

### Overview

The Accelerated Master's Entry Program in Community Development and Applied Economics (AMP-CDAE) offers

University of Vermont students the opportunity to secure a sound undergraduate and graduate program of study in 5 rather than a minimum of 6 years. The program closely integrates both programs of study, and enhances competitiveness in a marketplace stressing broad undergraduate and focused graduate education. The AMP-CDAE welcomes students majoring in one of CDAE's undergraduate majors, as well as related majors such as environmental studies, food systems, and other social science disciplines. Application to the program is typically made during a student's junior year.

## SPECIFIC REQUIREMENTS

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE

The Accelerated Master's Entry Program requires that students fulfill the same entrance requirements as for all candidates for the Master of Science in Community Development and Applied Economics and be accepted in order to matriculate and advance to candidacy. The following criteria must be met to gain admission to the AMP-CDAE program:

- A cumulative grade point average of 3.0 at the beginning of the second semester the candidate's junior year
- 3 letters of recommendation attesting to the candidate's academic performance
- A strong motivation and academic potential for graduate work articulated in a statement of purpose

Required academic prerequisites include course work in microeconomics and calculus, equivalent to UVM courses EC 012 Principles of Microeconomics and MATH 019 Fundamentals of Calculus I. Other courses, including non-UVM courses or a CLEP exam, may be considered.

Completed applications will be reviewed in the month of May and a formal decision on admission will be rendered by the CDAE faculty by no later than May 15 of each year to afford potential new AMP-CDAE students the opportunity to enroll in Summer Session.

Following formal Graduate College admission to the Accelerated Master's Program, up to 9 credits of approved graduate course work may be taken that may be counted toward both the undergraduate and graduate degree requirements.

### MINIMUM DEGREE REQUIREMENTS

The degree requires a total of 36 credits, of which 27 to thirty are from advanced courses in CDAE and other related fields, plus a minimum of 6 credits of thesis research. A written comprehensive examination and an oral defense of a thesis are also required. A student's thesis research is often an integral part of faculty-led, ongoing research projects in CDAE.

Students in the graduate program must have a 3.00 grade point average to remain a degree candidate. A student may be dismissed from the Graduate College if two or more grades below a "B" are received.

Five courses and graduate research seminars are required:

CDAE 351	Research & Evaluation Methods	3
CDAE 354	Advanced Microeconomics	3
CDAE 392	Graduate Seminars	1
Approved statistics/research course		3
CDAE 326	Community Economic Development	3
CDAE 359	Applied Econometrics	3
CDAE 391	Master's Thesis Research	6+

### COMPREHENSIVE EXAMINATION

A written examination must be completed by the student's third semester of full-time enrollment.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Successful completion of any prerequisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.00 or greater is also required.

### COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS M.S.

All students must meet the Requirements for the Master's Degree (p. 260).

### OVERVIEW

The Department of Community Development and Applied Economics (CDAE) supports sustainable local and international community development through interdisciplinary research, education, and outreach that serves the public interest. CDAE offers a Master of Science degree in Community Development and Applied Economics. Expertise among the CDAE faculty advisors includes economics (both ecological and neoclassical), rural sociology, food systems, applied econometrics, agricultural economics, policy and governance, consumer affairs, renewable energy, and community entrepreneurship. CDAE's research and outreach is both global (e.g. Agroecology, Farmer Livelihoods and Ecosystem Services in Brazil's Atlantic Forest) and local (e.g., dairy farming and farmers' markets in Vermont) and graduate students benefit from close affiliation with other research institutions at the University of Vermont and beyond.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Required academic prerequisites include course work in microeconomics and calculus, equivalent to UVM courses EC 012 Principles of Microeconomics and MATH 019 Fundamentals of Calculus I. Other courses, including non-UVM courses or a CLEP exam, may be considered. Admission may be granted without these prerequisites, in which case you must compete

them with a grade of C or better in your first semester in the graduate program.

- GPA = 3.00 or equivalent from bachelor's degree.
- Completion of an acceptable Calculus and Microeconomics course by the end of the first semester of enrollment.
- Graduate Record Examination (GRE) scores are optional.
- Three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing the M.S. in CDAE.
- Resume or Curriculum Vitae
- To be considered for funding, applicants are invited to submit (i) a writing sample, (ii) evidence of research experience (e.g., term papers, class projects, research reports and/or other descriptions of past research experience from academic or professional lives) and/or GRE scores.
- For international students whose native language is not English or who have not completed undergraduate degrees in English, scores from the Test of English as a Foreign Language (TOEFL), the English Language Testing System (IELTS), or Duolingo must be submitted.

### Minimum Degree Requirements

The degree requires a total of 36 credits, of which 27 to 30 are from advanced courses in CDAE and other related fields, plus a minimum of 6 credits of thesis research. A written comprehensive examination and an oral defense of a thesis are also required. A student's thesis research is often an integral part of faculty-led, ongoing research projects in CDAE.

Students in the graduate program must have a 3.00 grade point average to remain a degree candidate. A student may be dismissed from the Graduate College if 2 or more grades below a "B" are received.

Five courses and graduate research seminars are required:

CDAE 351	Research & Evaluation Methods	3
CDAE 354	Advanced Microeconomics	3
CDAE 392	Graduate Seminars (1 credit per semester, taken 3 semesters)	1
Approved statistics/research course		3
CDAE 326	Community Economic Development	3
CDAE 359	Applied Econometrics	3
CDAE 391	Master's Thesis Research	6+

### Comprehensive Examination

A written examination must be completed by the student's third semester of full-time enrollment.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any prerequisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.00 or greater is also required.

## COMMUNITY RESILIENCE AND PLANNING CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

### OVERVIEW

The 18-credit Certificate of Graduate Studies in Community Resilience and Planning (CRP) provides masters, doctoral and certificate of graduate study-only students with the skills and knowledge needed to lead and guide communities through periods of change brought on by natural, economic, social and political shocks and disruptions. Students completing this certificate will develop a deep understanding of the current threats and opportunities facing communities within Vermont, the United States, and across the globe. With a core set of courses designed to provide students with a survey of the community resilience and sustainability field, a foundation in community economic development and research methods, and a capstone experience focusing on system dynamics and strategic management and planning, the CRP prepares students with the tools needed to lead and assist communities through times of crisis and transition.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

- Undergraduate transcripts showing completion of bachelor's degree.
- Resume or Curriculum Vitae.
- Evidence of at least 1 college level course in statistics.
- Matriculated students in existing masters or doctoral programs will be required to have their program advisor sign off.
- There are no GRE requirements for acceptance into this certificate program.
- International students must meet UVM's minimum English proficiency requirements.

#### Minimum Degree Requirements

18 Credits including the following:

Core Courses:		
CDAE 260	Smart Resilient Communities	3
PA 317	Systems Anly & Strategic Mgmt	3
CDAE 326	Community Economic Development	3
CDAE 351	Research & Evaluation Methods	3

In consultation with their adviser, students will select 2 electives from a list of Domains of Application courses and Methods courses	6
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## COMPLEX SYSTEMS AND DATA SCIENCE

<https://www.uvm.edu/cems> (<https://www.uvm.edu/cems/>)

### OVERVIEW

The College of Engineering and Mathematical Sciences provides an educational program in Complex Systems and Data Science (CSDS) that includes education offerings at three levels:

1. A 5 course Graduate Certificate in Complex Systems that may be taken by any graduate student at UVM to augment their degree.
2. An MS in CSDS which is a 2-year degree with optional disciplinary tracks, and which UVM undergraduates may initiate through an Accelerated Master's Program.
3. A PhD in CSDS which will allow students to fully develop a deep portfolio of published research, thereby opening the door to high level research positions in, for example, government, industry, or academia.

The educational program naturally complements UVM's undergraduate degree in Data Science but also thematically connects with many fields across the university.

The program's overall goal is to help students become protean data scientists with eminently transferable skills. Students are provided with a broad training in computational and theoretical techniques for (1) describing and understanding complex natural and sociotechnical systems, enabling them to then, as possible, (2) predict, control, manage, and create such systems. Students will be trained in: Industry standard methods of data acquisition, storage, manipulation, and curation; visualization techniques, with a focus on building high quality web-based applications; finding complex patterns and correlations through, for example, machine learning and data mining; powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques; combining the formulation of mechanistic models (e.g., toy physics models) with genetic programming.

### DEGREES

Complex Systems and Data Science AMP (p. 123)

Complex Systems and Data Science CGS (p. 124)

Complex Systems and Data Science M.S. (p. 124)

Complex Systems and Data Science Ph.D. (p. 125)

### FACULTY

**Allgaier, Nicholas**; Assistant Professor, Department of Psychiatry; Ph.D., University of Vermont

**Bagrow, James**; Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Bongard, Joshua C.;** Professor, Department of Computer Science; PHD, University of Zurich

**Danforth, Chris;** Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park

**Dodds, Peter Sheridan;** Professor, Department of Computer Science; PHD, Massachusetts Institute of Technology

**Galford, Gillian Laura;** Research Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, Brown University

**Garavan, Hugh P.;** Professor, Department of Psychiatry; PHD, Bowling Green State University

**Hébert-Dufresne, Laurent;** Assistant Professor, Department of Computer Science; PHD, Université Laval, Québec, Canada

**Mahoney, John Matthew;** Assistant Professor, Department of Neurological Sciences; PHD, Dartmouth College

**Niles, Meredith;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, University of California-Davis

**Pespeni, Melissa H.;** Assistant Professor, Department of Biology; PHD, Stanford University

**Price, Matthew;** Associate Professor, Department of Psychological Science; PHD, Georgia State University

**Ricketts, Taylor H.;** Professor, Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**Young, Jean-Gabriel;** Research Assistant Professor, Department of Computer Science, PHD, Université Laval

## COMPLEX SYSTEMS AND DATA SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The accelerated M.S. in Complex Systems and Data Science (CSDS) is a five year degree coupled with a relevant bachelor's degree with optional disciplinary tracks. Our central goal is to help students become protean data scientists with eminently transferable skills. We provide students with a broad training in computational and theoretical techniques for (1) describing and understanding complex natural and sociotechnical systems, enabling them to then, as possible, (2) predict, control, manage, and create such systems. Students will be trained in: Industry standard methods of data acquisition, storage, manipulation, and curation; Visualization techniques, with a focus on building high quality web-based applications; Finding complex patterns and correlations through, for example, machine learning and data mining; Powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques; Combining the formulation of mechanistic models (e.g., toy physics models) with genetic programming.

## SPECIFIC REQUIREMENTS

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE FOR ACCELERATED STUDENTS

To be eligible for the Accelerated Master's Entry Program, a student must be a declared computer science, mathematics, or statistics B.S. major, and have identified a Complex Systems faculty sponsor. Students need to apply early (before the second semester of their junior year) to have time to plan two graduate level courses that can be used toward both their bachelor's and graduate (M.S.) degree. These credits must be taken after formal admission to the graduate program. Other requirements include a GPA typically higher than 3.0 overall. All students must meet the Graduate college requirements for the Accelerated Master's Degree Programs. There is no GRE requirement.

### MINIMUM DEGREE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

A total of 30 credits, distributed as shown below:

COMMON CORE (4 COURSES)		12
CSYS 300	Principles of Complex Systems (Include individual and/or team projects)	3
or MATH 300	Principles of Complex Systems	
CSYS 302	Modeling Complex Systems (Include individual and/or team projects)	3
or CS 302	Modeling Complex Systems	
STAT 287	QR: Data Science I (Include individual and/or team projects)	3
STAT 387	Data Science II (Include individual and/or team projects)	3
ELECTIVES		9
6 credits of Complex Systems and/or Data Science Electives		
3 credits of an advisor approved course		
PATH SPECIFIC		9
Coursework only: 9 credits of either additional Complex Systems and Data Science courses or an elective path (Biomedical Systems, Distributed Systems, Energy Systems, Environmental Systems, Evolutionary Robotics, Policy Systems, or Self-designed named disciplinary path (requires approval of the CSDS advisor))		
Coursework and project: 3 to 6 credits of project (CSYS 392) plus additional 3 to 6 credits of course work		
Coursework and thesis: 6 to 9 credits of thesis research (CSYS 391) plus additional 3 credits of course work if needed.		

Threaded throughout their courses, a desired central outcome of each Master's student's training will be their development of a data-intensive, high design portfolio of interactive online visualizations. Students will have many opportunities to work with faculty, researchers, institutions, and corporations, on meaningful, important real-world data sets, drawn from engineering systems, neuroscience,

society through the lens of social media, and more. Beyond being a key training mechanism, we envisage these portfolios—in the manner of, for example, a traditional engineering design or artist’s set of works—will be instrumental in students achieving outstanding positions in their chosen fields.

### comprehensive exam

Receiving an A- or above in at least two of the four core courses and a B+ or above in the other two core courses meets the comprehensive exam requirement. If students do not meet this standard, they must demonstrate mastery of the material in which they have not proved to have satisfactory knowledge by one of three possible routes: an oral exam, a written exam, or a paper. The exact format will be decided upon by the Curriculum Committee in consultation with the student. The Curriculum Committee will also designate three relevant faculty who will create the exam and or specify the format and content area of the paper and assess the student’s performance.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Successful completion of the comprehensive exam and all required coursework.

## COMPLEX SYSTEMS AND DATA SCIENCE CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

### OVERVIEW

In complex physical, biological, social and engineered systems, the self-organizing dynamics of interacting entities (be they molecules, cells, genes, bacteria, plants, birds, humans, nanobots, electrical substations, etc.) give rise to emergent system properties (such as consciousness, cancer, global warming, societies, etc.). Fortunately, many essential properties of such systems may be studied, modeled and understood using similar approaches, regardless of the application domain. Learning these cutting-edge complex systems approaches can help students move to the forefront of their field and stand out when competing in a tough job market.

The Certificate in Complex Systems may be earned either in conjunction with or independent of a UVM graduate degree program. In the latter case, credits earned with a grade of B or better may transfer into a graduate degree program following completion of the certificate. All policies regarding transfer credit apply.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of certificate of graduate study

A Bachelor’s degree and prior coursework in calculus, statistics, and computer programming (in any language, but prior Matlab and Python is helpful) are the minimum prerequisites. Linear algebra is recommended but not required. Specific electives may have additional prerequisites.

### Minimum Degree Requirements

The Certificate of Graduate Study in Complex Systems requires a total of 15 credits, distributed as shown below:

CSYS/MATH 300	Principles of Complex Systems	3
CSYS/CS 302	Modeling Complex Systems	3
STAT/CS 287	QR: Data Science I	3
Complex Systems and Data Science Electives		6
6 credits of approved Complex Systems and/or Data Science Electives taken at the graduate level. These include all courses at the 200 (approved for graduate credit) or 300 level with a CSYS prefix, many courses with a CS, Math, or Stat prefix, and miscellaneous relevant domain-specific courses in areas such as engineering, public administration, biology, plant biology, physics, etc. All electives must be approved by the graduate coordinator.		

## COMPLEX SYSTEMS AND DATA SCIENCE M.S.

All students must meet the Requirements for the Master’s Degree (p. 260)

### OVERVIEW

The M.S. in Complex Systems and Data Science is a 2-year degree with optional disciplinary tracks. UVM undergraduates may incorporate the degree as part of an Accelerated Master’s Program. Our central goal is to help students become protean data scientists with eminently transferable skills (read: super powers). We provide students with a broad training in computational and theoretical techniques for (1) describing and understanding complex natural and sociotechnical systems, enabling them to then, as possible, (2) predict, control, manage, and create such systems. Students will be trained in: industry standard methods of data acquisition, storage, manipulation, and curation; visualization techniques, with a focus on building high quality web-based applications; finding complex patterns and correlations through, for example, machine learning and data mining; powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques; and combining the formulation of mechanistic models (e.g., toy physics models) with genetic programming.

### SPECIFIC REQUIREMENTS

#### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE

The program serves students from a wide variety of backgrounds and therefore deliberately keep the prerequisites to a minimum. Students must have a Bachelor’s degree in a relevant field and prior coursework or be able to establish competency in calculus, computer programming, data structures, linear algebra, and probability and statistics. Please note that some electives have additional prerequisites. General GRE scores are not required.

We offer 3 courses for students who may be lacking in these prerequisites:

1. CS 124 Data Structures
2. MATH 122 Applied Linear Algebra, and
3. STAT 211 Statistical Methods I

Note that at most one of CS 124 or MATH 122 may be taken for graduate credit (pending completion of a Permission to take a 100/200 Level Course for Graduate Credit Form at least 1 month before the semester in which the course is taken).

### MINIMUM DEGREE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

A total of 30 credits, distributed as shown below:

Common Core (4 courses)		12
CSYS 300	Principles of Complex Systems (Include individual and/or team projects)	3
or MATH 300	Principles of Complex Systems	
CSYS 302	Modeling Complex Systems (Include individual and/or team projects)	3
or CS 302	Modeling Complex Systems	
STAT 287	QR: Data Science I (Include individual and/or team projects)	3
STAT 387	Data Science II (Include individual and/or team projects)	3
Electives		9
6 credits of Complex Systems and/or Data Science Electives		
3 credits of an advisor approved course		
Path Specific		9
The degree program can be completed with one of three options:		
Coursework only: 9 credits of either additional Complex Systems and Data Science courses or an elective path (Biomedical Systems, Distributed Systems, Energy Systems, Environmental Systems, Evolutionary Robotics, Policy Systems, or Self-designed named disciplinary path (requires approval of the CSDS advisor))		
Coursework and project: 3 to 6 credits of project (CSYS 392) plus additional 3 to 6 credits of course work		
Coursework and thesis: 6 to 9 credits of thesis research (CSYS 391) plus additional 3 credits of course work if needed.		

Threaded throughout the coursework, a desired central outcome of each Master's student's training will be their development of a data-intensive, high design portfolio of interactive online visualizations. Students will have many opportunities to work with faculty, researchers, institutions, and corporations, on meaningful, important real-world data sets, drawn from engineering systems, neuroscience, society through the lens of social media, and more. Beyond being a key training mechanism, we envisage these portfolios—in the manner of, for example, a traditional engineering design or artist's set of works

—will be instrumental in students achieving outstanding positions in their chosen fields.

### Comprehensive Exam

Receiving an A- or above in at least two of the four core courses and a B+ or above in the other two core courses meets the comprehensive exam requirement. If students do not meet this standard, they must demonstrate mastery of the material in which they have not proved to have satisfactory knowledge by one of three possible routes: an oral exam, a written exam, or a paper. The exact format will be decided upon by the Curriculum Committee in consultation with the student. The Curriculum Committee will also designate three relevant faculty who will create the exam and/or specify the format and content area of the paper and assess the student's performance.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Successful completion of the comprehensive exam and all required coursework.

## COMPLEX SYSTEMS AND DATA SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Ph.D. in Complex Systems and Data Science provides a pan-disciplinary academic training for graduate students working on complex systems problems across all quantitative sciences. While the Ph.D. resides in the College of Engineering and Mathematical Sciences (CEMS), thereby providing a strong computational and theoretical training, the program's scope is science-wide, encompassing natural, artificial, and sociotechnical systems. Depending on their chosen area of focus, students will work within and across research groups (potentially outside of CEMS) and be strongly connected with other students through co-location and regular student-led meetings and events. Students will be expected to generate and defend a scientifically important and socially meaningful body of work generally resulting in a minimum of three peer-reviewed journal papers and a dissertation. All students will receive a core training in empirical, computational, and theoretical methods for (1) describing and understanding complex systems thereby enabling them to, where possible, (2) predict, control, manage, and create such systems. Coursework will share a common core with the allied program Masters in Complex Systems and Data Science which include: (a) data acquisition, storage, manipulation, and curation; visualization techniques including state-of-the-art approaches to building high quality web-based applications; (b) finding complex patterns and correlations through, for example, machine learning; and (c) powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A Bachelor's degree and preferably a Master's degree in a relevant field and prior coursework in computer programming, calculus, linear algebra, probability, and statistics. Training in relevant aspects of physics (e.g., statistical mechanics) will be beneficial but not required. Applicants lacking one or more of these prerequisite areas may be accepted provisionally and will be required to complete an approved program of supplementary work within their first year of study. GRE scores are not required. Applicants will be evaluated based on their potential for excellence in research, as judged from their academic background, test scores, relevant experience and letters of recommendation. Students who are most likely to succeed and thrive in the program will be admitted.

Applicants whose native language is not English or whose formal education has been conducted in a language other than English must have a Test of English as a Second Language (TOEFL) score of 90 (Internet-based test) or above or an International English Language Testing System (IELTS) score of 6.5 or above or a Duolingo score of 110 or above. To be considered for financial assistantship from the university, applicants must have an iBT TOEFL score of 100, an IELTS score of 7.0 or a Duolingo score of 120 above.

The student's Studies Committee (see below) may recommend to the Dean of the Graduate College that a student be dismissed from the program if they receive two or more grades below a B (3.00), a designation of U in Dissertation Research, or if the Studies Committee deems that they are not making satisfactory progress towards their degree requirements (for which they must be able to provide sufficient documentation).

## MINIMUM DEGREE REQUIREMENTS

### Minimum Degree Requirements

The P.h.D. has 5 milestones:

1. Completion of coursework
2. The comprehensive exams
3. The dissertation proposal
4. At least 2 published or accepted peer-reviewed publications prior to defending their dissertation, with a third at least in peer-review. These publications must be deemed of sufficient breadth, depth, and quality by their Graduate Studies Committee
5. The written dissertation and oral defense of the dissertation

### COURSEWORK:

A minimum of 75 credits of graduate study must be approved by the students graduate studies committee and successfully completed. All students must take a minimum of 30 credits of research and 30 credits of graduate coursework, of which at least 15 must be graded and may not count towards a Master's degree (only courses with grades of B- or above are counted towards this minimum requirement and students with two grades below B are eligible for dismissal). Students may transfer credits for other universities or within UVM following

standard UVM policies. Students will need to earn a minimum 3.0 GPA to graduate.

### CORE COURSES (3 CREDITS EACH):

CS 287	QR: Data Science I	3
or STAT 287	QR: Data Science I	
CSYS 300	Principles of Complex Systems	3
or MATH 300	Principles of Complex Systems	
CSYS 302	Modeling Complex Systems	3
or CS 302	Modeling Complex Systems	
CS 387	Data Science II	3
or STAT 387	Data Science II	

Students will meet their course requirements by selecting appropriate coursework under the guidance of their studies committees. It is anticipated that most students would choose a subset of courses from a variety of complex systems and data science electives, including but not limited to:

### COMPLEX SYSTEMS AND DATA SCIENCE ELECTIVES (3 CREDITS EACH):

Dissertation Research Credits		3 or 6 credits per semester
CSYS 303	Complex Networks	3
or MATH 303	Complex Networks	
CSYS 266	QR:Chaos,Fractals&Dynamcal Syst	3
or MATH 266	QR:Chaos,Fractals&Dynamcal Syst	
CSYS 352	Evolutionary Computation	3
or CS 352	Evolutionary Computation	
CSYS 369	Applied Geostatistics	3
or STAT 369	Applied Geostatistics	
or CE 369	Applied Geostatistics	
CS 204	QR: Database Systems	3
CS 254	QR: Machine Learning	3
CS 228	Human-Computer Interaction	3
STAT 330	Bayesian Statistics	3
STAT 235	QR: Categorical Data Analysis	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 229	QR:Survivl/Logistic Regression	3

Other advanced Complex Systems and Data Science electives approved by the PhD in Complex Systems and Data Science Curriculum Committee (including special topics)	
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Students who do not make satisfactory progress toward their PhD dissertation will be offered the opportunity to switch to the MS program, provided they meet the standards for the MS.

Elective Tracks for the PhD in CSDS match those provided for the MS in CSDS:

CSDS: Energy Systems  
 CSDS: Policy Systems  
 CSDS: Biomedical Systems  
 CSDS: Evolutionary Robotics  
 CSDS: Environmental Systems  
 CSDS: Transportation Systems  
 CSDS: Distributed Systems Track  
 CSDS: Self-designed named disciplinary track (requires approval of the CSDS curriculum committee)

### CONCENTRATION TRACK ELECTIVES:

Track Electives are considered relatively flexible and may be updated on a semester by semester basis, based on current course offerings and content and availability and may include special topics. See the Center's website for current offerings. Track electives applied toward the MS in CSDS must be approved by the CSDS graduate coordinator.

### Comprehensive Examination

Students will be tested via an extensive oral examination involving three faculty, one of whom should be their advisor. Material will cover the four core courses and/or curriculum committee approved content.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of the comprehensive exam and all required coursework.

## COMPUTER SCIENCE

<http://www.uvm.edu/~cems/cs/>

### OVERVIEW

The Department of Computer Science offers 3 graduate programs through the Graduate College: an Accelerated Master's Program (AMP) that enables strong undergraduate students to complete computer science Bachelor's and Master's degrees in 5 years; a Master's Program (M.S.) in computer science with course work-only, project, and thesis options; and an interdisciplinary Ph.D. program that offers study in both traditional and cross-disciplinary areas of computing. The Department also participates in the Transdisciplinary Certificate of Graduate Study in Complex Systems, and the Master's and Ph.D. degrees in Complex Systems & Data Science.

## DEGREES

- Computer Science AMP (p. 128)
- Computer Science M.S. (p. 129)
- Computer Science Ph.D. (p. 130)

## FACULTY

**Bagrow, James;** Assistant Professor, Department of Mathematics and Statistics; PHD, Clarkson University  
**Beckage, Brian;** Professor, Department of Plant Biology; PHD, Duke University  
**Bongard, Joshua C.;** Professor, Department of Computer Science; PHD, University of Zurich  
**Cheney, Nicholas A.;** Research Assistant Professor, Department of Computer Science; PHD, Cornell University  
**Clemins, Patrick J.;** Adjunct Assistant Professor, Department of Computer Science; PHD, Marquette University  
**Cockrell, R. Chase;** Assistant Professor, Department of Surgery; PHD, Iowa State University  
**Danforth, Chris;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park  
**Darais, David;** Assistant Professor, Department of Computer Science; PHD, University of Maryland  
**Dodds, Peter Sheridan;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology  
**Eppstein, Margaret Jean;** Professor Emerita, Department of Computer Science; PHD, University of Vermont  
**Hébert-Dufresne, Laurent;** Assistant Professor, Department of Computer Science; PHD, Université Laval, Québec, Canada  
**Hibbeler, Jason;** Professor of the Practice, Department of Computer Science; PHD, University of Illinois at Urbana-Champaign  
**Hines, Paul D.;** Associate Professor, Department of Electrical and Biomedical Engineering; PHD, Carnegie Mellon University  
**Lee, Byung S.;** Professor, Department of Computer Science; PHD, Stanford University  
**Li, Dawei ;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Shanghai Jiao Tong University  
**Ling, Alan Chi;** Associate Professor, Department of Computer Science; PHD, University of Waterloo  
**Near, Joseph P.;** Assistant Professor, Department of Computer Science; PHD, Massachusetts Institute of Technology  
**Pinder, George Francis;** Professor, Department of Civil and Environmental Engineering; PHD, University of Illinois Urbana-Champaign  
**Rizzo, Donna Marie;** Professor, Department of Civil and Environmental Engineering; PHD, University of Vermont  
**Skalka, Christian Edward;** Associate Professor, Department of Computer Science; PHD, Johns Hopkins University  
**Young, Jean-Gabriel;** Assistant Professor, Department of Computer Science, PHD, Université Laval  
**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle  
**Zia, Asim;** Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology



## COMPUTER SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Entry Program (AMP) in computer science allows students with strong ability and motivation to complete a bachelor's degree at UVM and a master's degree at UVM in computer science within 5 years.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Master's Students

Students enrolled in any undergraduate bachelor's degree program at UVM are eligible to apply for the computer science AMP. Following formal admission by the Graduate College to the Accelerated Master's Program, students may count up to 6 graduate level course work credits toward both the bachelor's and master's degrees. Another 3 graduate credits can be counted towards the master's degree while an undergraduate but cannot count towards the bachelor's degree.

Although the bachelor's degree need not be in computer science, applicants must have at least a 3.2 GPA and demonstrate that they have taken the following prerequisite courses, or have equivalent knowledge:

2 courses that treat systematic program development in a high-level language, for example:		
CS 021	QR: Computer Programming I	3
CS 110	QR: Intermediate Programming	4
1 course in computer system organization, for example:		
CS 121	QR: Computer Organization	3
1 course in data structures, for example:		
CS 124	QR: Data Struc & Algorithms	3
1 course in computability and complexity, for example:		
CS 125	QR: Computability & Complexity	3
2 courses in differential and integral calculus, for example:		
MATH 021	QR: Calculus I	4
MATH 022	QR: Calculus II	4
1 course in linear algebra:		
MATH 122	QR: Applied Linear Algebra	3
Coursework in probability and statistics, for example:		
STAT 143	QR: Statistics for Engineering	3
STAT 151	QR: Applied Probability	3

Undergraduates interested in the AMP should discuss this option with the College of Engineering & Mathematical Sciences Graduate Coordinator prior to any semester in which they wish to take courses that will apply to the master's degree.

There is no GRE requirement for AMP students.

#### Minimum Degree Requirements

Option A (Thesis)	
30 credits, including a minimum of 21 credits of approved course work, and a minimum of 6 credits of thesis research (CS 391)	30
Option B (Project)	
30 credits, including a minimum of 24 credits of approved course work, and a minimum of 3 credits of project research (CS 392)	30
Option C (Non-Thesis)	
30 credits of approved course work	30
All Options	
Students in all options must take, or have completed the equivalent of, CS 224 Algorithm Design & Analysis (students who took CS 224 at UVM for undergraduate credit with a grade of B+ or higher may substitute this core course with an appropriate alternative course) and 3 other core Computer Science Courses, to be determined in consultation with and approval of the student's graduate advisor and the CS graduate coordinator, depending on a student's background and interests.	
Pass comprehensive exams covering material from the 4 approved core courses.	
Fulfill the credit requirement with approved graduate-level course work in computer science or related areas. (Only courses with grades of B- or above are counted towards course work requirements and students with 2 grades below B are eligible for dismissal.)	

#### Comprehensive Examination

Receiving a grade of A- or better in all courses constitutes successfully completing the comprehensive examination in that area.

Students who receive a grade of B+ or lower in any of their courses, or students who took CS 224 at UVM (whether for undergraduate or graduate credit) and received a grade of B+ or lower, must pass an oral comprehensive exam in that area. In this event, the Graduate Coordinator will form an exam committee for the oral exam(s). Each student who needs to take 1 or more comprehensive oral exam(s) should arrange a single date for all required oral exam(s) with the examiner(s) and then inform the Graduate Coordinator of the exam date. It is strongly recommended that the examination is completed during the academic year, unless all examiners voluntarily agree to give the exam on a date during the break.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science

Passing of the comprehensive exam.

## COMPUTER SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The M.S. program in Computer Science offers thesis, project, and course work only options. Acceptance into thesis or project options is conditional upon the student finding an eligible advisor who agrees to supervise the thesis or project. Please see the Department of Computer Science website for current research interests of the department's faculty.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A bachelor's degree in computer science or a related discipline, and satisfactory scores on the Graduate Record Examination general (aptitude) section are required for admission. Students should also demonstrate that they have taken the following courses or have equivalent knowledge:

2 courses that treat systematic program development in a high-level language, for example:		
CS 021	QR: Computer Programming I	3
CS 110	QR: Intermediate Programming	4
1 course in computer system organization, for example:		
CS 121	QR: Computer Organization	3
1 course in data structures, for example:		
CS 124	QR: Data Struc & Algorithms	3
1 course in computability and complexity, for example:		
CS 125	QR: Computability & Complexity	3
2 courses in differential and integral calculus, for example:		
MATH 021	QR: Calculus I	4
MATH 022	QR: Calculus II	4
1 course in linear algebra:		
MATH 122	QR: Applied Linear Algebra	3
Coursework in probability and statistics, for example:		
STAT 143	QR: Statistics for Engineering	3
STAT 151	QR: Applied Probability	3

Applicants who have strong academic records but lack 1 or more of these prerequisites may be accepted provisionally. Provisionally accepted students will be required to complete an approved program of remedial work within their first year of study.

Applicants whose native language is not English or whose formal education has been conducted in a language other than English

must have a Test of English as a Second Language (TOEFL) score of 90 (Internet-based test) or above or an International English Language Testing System (IELTS) score of 6.5 or above. To be considered for financial assistantship from the university, applicants must have an iBT TOEFL score of 100 or an IELTS score of 7.0 or above.

### Minimum Degree Requirements

Option A (Thesis)	
30 credits, including a minimum of 21 credits of approved course work, and a minimum of 6 credits of thesis research (CS 391)	30
Option B (Project)	
30 credits, including a minimum of 24 credits of approved course work, and a minimum of 3 credits of project research (CS 392)	30
Option C (Non-Thesis)	
30 credits of approved course work	30
All Options	
Students in all options must take, or have completed the equivalent of, CS 224 Algorithm Design & Analysis (students who took CS 224 at UVM for undergraduate credit with a grade of B+ or higher may substitute this core course with an appropriate alternative course) and 3 other core Computer Science Courses, to be determined in consultation with and approval of the student's graduate advisor and the CS graduate coordinator, depending on a student's background and interests	
Pass comprehensive exams covering material from the 4 approved core courses	
Fulfill the credit requirement with approved graduate-level course work in computer science or related areas. (Only courses with grades of B- or above are counted towards course work requirements and students with 2 grades below B are eligible for dismissal.)	

### Comprehensive Examination

Receiving a grade of A- or better in all courses constitutes successfully completing the comprehensive examination in that area.

Students who receive a grade of B+ or lower in any of their courses, or students who took CS 224 at UVM (whether for undergraduate or graduate credit) and received a grade of B+ or lower, must pass an oral comprehensive exam in that area. In this event, the Graduate Coordinator will form an exam committee for the oral exam(s). Each student who needs to take 1 or more comprehensive oral exam(s) should arrange a single date for all required oral exam(s) with the examiner(s) and then inform the Graduate Coordinator of the exam date. It is strongly recommended that the examination is completed during the academic year, unless all examiners voluntarily agree to give the exam on a date during the break.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Passing of the comprehensive examination.

## COMPUTER SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The interdisciplinary Ph.D. program in computer science offers study in both traditional and cross-disciplinary areas in computing. Please see the departmental website for current research interests of the department's faculty.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A Bachelor's degree and satisfactory scores on the Graduate Record Examination (GRE) general section are required of all applicants. Applicants will be evaluated based on their potential for excellence in research, as judged from their academic background, test scores, relevant experience and letters of recommendation. We admit students who we believe are most likely to succeed and thrive in the program.

No students are admitted unless a computer science graduate advisor has agreed to supervise them; thus, all applicants are strongly encouraged to contact potential advisors as soon as they have applied. All eligible graduate advisors are listed on the departmental website, along with their research areas and links to their websites.

Applicants who have strong academic records in a discipline other than computer science and lack an acceptable computer science background (normally including courses in Data Structures (e.g. CS 124), Computer Organization (e.g., CS 121), and Intro to Computability and Complexity (e.g., CS 125)) may be accepted provisionally. Provisionally accepted students will be required to complete an approved program of remedial work within their first year of study.

Applicants whose native language is not English or whose formal education has been conducted in a language other than English must have a Test of English as a Second Language (TOEFL) score of 90 (Internet-based test) or above or an International English Language Testing System (IELTS) score of 6.5 or above. To be considered for financial assistantship from the university, applicants must have an iBT TOEFL score of 100 or an IELTS score of 7.0 or above.

#### Minimum Requirements for the Degree of Doctor of Philosophy

A minimum of 75 credits of graduate study must be approved by the graduate studies committee and successfully completed. All students must take a minimum of 30 credits of research and 30 credits of course work, of which at least 15 must be graded and may not count towards a master's degree (only courses with grades of B- or above are counted towards this minimum requirement and students with two grades below B are eligible for dismissal).

A student's doctoral program consists of:

- gaining a sound breadth of knowledge in computer science, primarily through course work
- gaining appropriate depth in a specific research area and posing an appropriate original research problem
- completing the research and documenting that research in a dissertation

The completion of these stages is marked by:

- the comprehensive exam demonstrates breadth of knowledge in computer science
- the dissertation proposal describes the current state-of-the-art in a particular research area and the particular research problem the student proposes to tackle
- the written dissertation and oral defense document the original research

Beyond research and course work, the student must gain appropriate experience, to the satisfaction of their graduate studies committee, in teaching, programming, and communicating technical ideas, both orally and in writing. The student must have at least 2 peer-reviewed publications accepted prior to defending their dissertation.

#### Comprehensive Examination

All students enrolled in the UVM CS Ph.D. program must pass the Ph.D. comprehensive exams, regardless of whether they received their M.S. degree at UVM. The Ph.D. comprehensive exams comprises a written component and an oral component. The written exam is given in the area of Algorithms. In the case that the student's performance is not satisfactory in this written exam, an optional follow-up oral exam may be called for by examiners. The examiners are Computer Science graduate faculty members appointed by the Graduate Coordinator. The oral exam is a single-session exam, and aims to examine a student's breadth of knowledge in selected topical areas. The topical areas and examiners on this oral exam committee will be determined by each student's Studies Committee, with approval by the Graduate Coordinator. The specific policy on the oral examination procedure is administered by the Graduate Coordinator.

On the first try, the examination committee will award students one of the following 3 outcomes to the exam:

1. Pass at the Ph.D. level
2. Pass at the M.S. level with opportunity for at most 1 retake (to try for a Ph.D. level pass)
3. Fail with opportunity for at most 1 retake

If a student retakes the comprehensive exam, the examination committee will award students one of the following 3 outcomes to the retake:

1. Pass at the Ph.D. level
2. Pass at the M.S. level without further opportunity to retake at the Ph.D. level
3. Fail without opportunity for retake at the Ph.D. level

Ph.D. students who pass their Ph.D. comprehensive exams at the M.S. level but not at the Ph.D. level may, if desired, complete any

remaining requirements to complete an M.S., but are not allowed to advance to candidacy for the Ph.D.

Written comprehensive exams are given by the Graduate Committee twice a year, in May and January. Each student's Studies Committee will approve an appropriate timeframe of oral exams for a given student based on their individual circumstances. It is then up to the student to schedule their exams within the agreed-upon timeframe. While individual circumstances may vary, normal expectations are as follows:

- Ph.D. students are normally expected to take oral exams by the end of their second year of full-time Ph.D. graduate study (part-time students may take longer).
- A student who needs to retake their oral exams is expected to do so within 6 months of their first attempt.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Before advancing to candidacy, the student must:

- Demonstrate satisfactory performance in a schedule of courses of at least 15 credits of graduate course work at UVM, as approved by the student's graduate studies committee
- Pass a comprehensive exam in areas approved by the student's graduate studies committee, including a written component
- Successfully propose a dissertation topic in a public presentation
- Pass an oral exam before the student's graduate studies committee in a closed session following the dissertation proposal

## COUNSELING

<https://www.uvm.edu/cess/dlds> (<https://www.uvm.edu/cess/dlds/counseling/>)

### OVERVIEW

The mission of the Counseling Program at the University of Vermont is to prepare students to work as counseling professionals in culturally and socially diverse school, mental health, and community settings and to act as facilitators of personal and social change.

In the Counseling Program, students have the option to enroll in a 60-credit-hour School Counseling Program, a 60-credit-hour Clinical Mental Health Counseling program or a Dual Program option consisting of 76 credits. Program requirements include 700 hours of practicum and internship in a field setting for the clinical mental health and school counseling programs. Dual students need to complete both the clinical mental health and school counseling internship requirements.

The Clinical Mental Health and School Counseling programs of the UVM Counseling Program are accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP), the national accrediting body for counselor education programs.

The specific composition of a student's program, designed with the assistance of a faculty advisor, is based on university, college, and

program requirements in accordance with licensure and accreditation standards. Learning experiences consist of a balance between theory and supervised practice.

In addition to the general application procedures, a resume and a group interview are required of each qualified applicant. For a more detailed description of the program visit the Graduate Counseling website, or contact:

University of Vermont  
Graduate Counseling Program  
101A Mann Hall  
208 Colchester Avenue  
Burlington, VT 05405-1757  
(802) 656-3888  
email: [cslgprog@uvm.edu](mailto:cslgprog@uvm.edu)

### DEGREES

- Counseling AMP (p. 131)
- Counseling M.S. (p. 132)

### FACULTY

**Okech, Jane E.;** Professor; Department of Counseling, Human Development and Family Science; PHD, Idaho State University  
**Smith, Lance C.;** Associate Professor; Department of Counseling, Human Development and Family Science; PHD, Syracuse University  
**Welkowitz, Julie A.;** Senior Lecturer; Department of Counseling, Human Development and Family Science; PHD, University of Vermont

## COUNSELING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Counseling AMP is offered for the School Counseling Program only. This accelerated master's degree entry program (AMP) is designed to offer select UVM undergraduates from multiple disciplines the opportunity to obtain their bachelor's degree while beginning their M.S. in Counseling, School Counseling program, during their senior year. The mission of the Counseling Program at the University of Vermont is to prepare students to work as counseling professionals in culturally and socially diverse school, settings and to act as facilitators of personal and social change. The Counseling degree, School Counseling track, is a 60 credit hour program, including 700-hours of practicum and internship in a school setting. Following admission to the Graduate College, students enrolled in the AMP can take up to 9 credits of graduate-level courses completed during their senior undergraduate year that will count towards both a bachelor's degree and the M.S. Students in the AMP would then be expected to complete remaining M.S. requirements during a fifth and sixth year of study. Full-time graduate student status will start the fall after their undergraduate graduation and will be expected to be maintained until completion of their M.S.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Students must apply for admission into the accelerated Master's in counseling program in the beginning of spring semester their junior year. Admission into AMP program will be determined, based upon the following:

- A minimum cumulative grade point average of 3.25
- Completion of the Graduate College Application form that must include at least two letters of recommendation from UVM faculty members.

Students **MUST** be admitted through the Graduate College before taking any courses that will be applied to the master's degree requirements. Students will start AMP degree coursework during fall of their senior year. While not required for admission, applicants are strongly encouraged to take CNSL 101 The Helping Relationship during the spring of their junior year.

### Minimum Degree Requirements for the Degree of Master of Science

A minimum of 60 credit hours for the School Counseling program is required. Students must also meet the UVM Graduate College requirements for the Master's Degree (p. 260).

### ACCELERATED MASTERS PROGRAM COURSES

The 9 credits of course work for the AMP that will be taken during the student's undergraduate senior year should be selected from the following list:

FALL COURSES		
CNSL 374	Counseling Theory & Practice	3
CNSL 320	Dev. Perspectives in CNSLNG	3
SPRING COURSES		
CNSL 340	Development Guidance in Schls	3

Additional Courses to be taken post-bachelor's:

SCHOOL COUNSELING		
CNSL 350	Prof Issues in Counseling	3
CNSL 375	Lab Experience in Counseling	3
CNSL 363	Counseling Practicum	3
CNSL 377	Diversity & Intersectionality	3
CNSL 381	Counsel/Career&Lifestyle Dev	3
CNSL 341	Diagnosis in School Counseling	1
CNSL 392	Group Counseling Experience	1
CNSL 300	Research Methods in Counseling	3

CNSL 394	Special Topics in Counseling (Leadership for Transformational SC)	3
CNSL 344	Modalities: Counsel Child & Ad	3
CNSL 389	Counseling Internship ((School Counseling))	6
CNSL 393	Adv Group: Theory and Practice	3
CNSL 388	Family and Couples Counseling	3
CNSL 342	Assessment in School CNSLNG	1
CNSL 376	Addictions Counseling	3
Special Topics in School Counseling		9

### Comprehensive Examination

All students are required to successfully complete a comprehensive evaluation at the end of their studies in the UVM Counseling Program. The Level I Licensure Portfolio serves as the comprehensive evaluative tool for students in the School Counseling Program.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

At least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## COUNSELING M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

There are 2 tracks of study in the Graduate Counseling Program: the school counseling program (60 credits) and the clinical mental health program (60 credits). Students may elect to enroll in both programs - the Dual option, which is 76 credits. The Graduate Counseling Program (both programs) is accredited by the Council for the Accreditation of Counseling and Related Educational Programs (CACREP). The school counseling program meets the requirements set by the State of Vermont Department of Education for preparing school counselors (K-12) for licensure in Vermont, and the clinical mental health counseling program meets the academic requirements set by the Vermont Board of Allied Mental Health Practitioners for preparing clinical mental health counselors for licensure in Vermont.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Submit the following (below) to the University of Vermont Graduate Admissions Office. Please be advised that the UVM Graduate College uses an online admissions process. Applications received by January 15 will be considered for the following Fall matriculation.

- Graduate Application Form: Available on-line from the Graduate College
- Statement of Purpose: The Statement of Purpose will be reviewed for clarity of expression, grammatical construction, and insight

regarding the applicant's reasons for pursuing study in the Counseling Program.

- **3 Letters of Recommendation:** Letters written by individuals who have a professional relationship with the applicant and who are well acquainted with the applicant's accomplishments and potential for becoming an effective counselor are considered valid letters of recommendation. At least one of these letters should be from an academic advisor or instructor. Please do not include letters written by personal friends or acquaintances.
- **Official College Transcripts:** An official college transcript of course work (undergraduate and graduate) should be submitted from every college and/or university attended.
- **Professional Resume:** An up-to-date resume that attests to the applicant's education, work, and volunteer experience should be included in the application packet. Work experience in counseling or in a related field is highly desired.
- **Test of English as a Foreign Language (TOEFL):** Applicants whose native or first language is not English must submit TOEFL (or IELTS) test scores for admission. Minimum acceptable scores for admission may be found on the Graduate College Admissions website.

After an initial review of applications, qualified applicants will be invited to participate in a group interview. The applicant will be interviewed with a small group of others who are also applying to the Counseling Program. The group interview is critical in the application process. Faculty will be looking for evidence of candidates' self-awareness, awareness of social and cultural issues, ability to communicate with others, and interest and commitment to the profession of counseling. The interview will also offer candidates an opportunity to receive information about the Counseling Program at UVM and meet other students applying to the program.

**Minimum Degree Requirements**

The Graduate Counseling Program offers 2 specialty programs: school counseling and clinical mental health counseling. Students may also select the Dual option which includes preparation in both specialty programs. 60 credits are required for completion of the school counseling program, 60 credits are required for the clinical mental health counseling program, and 76 credits are required for the Dual option. Successful completion of the program is based on the demonstration of appropriate knowledge, relevant skills, and personal characteristics, as well as the accumulation of credits.

School Counseling Program Course Requirements		
CNSL 375	Lab Experience in Counseling	3
CNSL 320	Dev. Perspectives in CNSLNG	3
CNSL 350	Prof Issues in Counseling	3
CNSL 374	Counseling Theory & Practice	3
CNSL 363	Counseling Practicum	3
CNSL 340	Development Guidance in Schls	3
CNSL 377	Diversity & Intersectionality	3

CNSL 392	Group Counseling Experience	1
CNSL 300	Research Methods in Counseling	3
CNSL 341	Diagnosis in School Counseling	1
CNSL 342	Assessment in School CNSLNG	1
CNSL 389	Counseling Internship (Taken twice for 6 credits total)	6
CNSL 393	Adv Group:Theory and Practice	3
CNSL 344	Modalities: Counsel Child & Ad	3
CNSL 388	Family and Couples Counseling	3
CNSL 381	Counsel/Career&Lifestyle Dev	3
CNSL 376	Addictions Counseling	3
CNSL 394	Special Topics in Counseling (Leadership for Transformational SC)	3
Special Topics in Counseling		9
<b>Total Credits</b>		<b>60</b>

Clinical Mental Health Program Course Requirements		
CNSL 375	Lab Experience in Counseling	3
CNSL 320	Dev. Perspectives in CNSLNG	3
CNSL 350	Prof Issues in Counseling	3
CNSL 374	Counseling Theory & Practice	3
CNSL 363	Counseling Practicum	3
CNSL 361	Practice of Mental Hlth Cnslng	3
CNSL 345	Diagnosis in CMH Counseling	3
CNSL 377	Diversity & Intersectionality	3
CNSL 392	Group Counseling Experience	1
CNSL 300	Research Methods in Counseling	3
or EDFS 209	Intro to Research Methods	
CNSL 387	Therapeutic Psychopharmacology	3
CNSL 389	Counseling Internship (Taken more than once; 6 credits required)	6
CNSL 393	Adv Group:Theory and Practice	3
CNSL 344	Modalities: Counsel Child & Ad	3
CNSL 388	Family and Couples Counseling	3
CNSL 352	Assessment in CMH Counseling	3
CNSL 376	Addictions Counseling	3
CNSL 381	Counsel/Career&Lifestyle Dev	3

Counseling Elective	5
<b>Total Credits</b>	<b>60</b>

Dual Option Program Course Requirements		
CNSL 375	Lab Experience in Counseling	3
CNSL 320	Dev. Perspectives in CNSLNG	3
CNSL 350	Prof Issues in Counseling	3
CNSL 374	Counseling Theory & Practice	3
CNSL 363	Counseling Practicum	3
CNSL 361	Practice of Mental Hlth Cnsng	3
CNSL 345	Diagnosis in CMH Counseling	3
CNSL 377	Diversity & Intersectionality	3
CNSL 392	Group Counseling Experience	1
CNSL 300	Research Methods in Counseling	3
or EDFS 209	Intro to Research Methods	
CNSL 387	Therapeutic Psychopharmacology	3
CNSL 389	Counseling Internship (4 semesters; 12 credits required)	12
CNSL 393	Adv Group: Theory and Practice	3
CNSL 344	Modalities: Counsel Child & Ad	3
CNSL 388	Family and Couples Counseling	3
CNSL 352	Assessment in CMH Counseling	3
CNSL 376	Addictions Counseling	3
CNSL 340	Development Guidance in Schls	3
CNSL 381	Counsel/Career&Lifestyle Dev	3
CNSL 394	Special Topics in Counseling (Leadership for Transformational SC)	3
Special Topics in School Counseling		9
<b>Total Credits</b>		<b>76</b>

### Comprehensive Examination

The comprehensive exam for the Graduate Counseling program consists of the oral defense examination for the clinical mental health program and the Vermont Level I Licensure Portfolio for the school counseling program. They must be taken and turned in by the end of the student's last semester in the program.

The oral examination is designed to be a final assessment of a student's knowledge of fundamental elements of clinical mental health practice. The exam process requires a written submission as well as a digital video recording of a clinical session. A standard format for the oral exam is adhered to by the orals committee and communicated in advance to the students in oral and written format.

The Vermont Level I Licensure Portfolio required by the Vermont Agency of Education is designed to be a comprehensive assessment of a student's knowledge and engagement in School Counseling practice. A standard format for the portfolio is adhered to by the portfolio reviewers and communicated in advance to the student in oral and written format.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## CURRICULUM AND INSTRUCTION

<https://www.uvm.edu/cess/doe> (<https://www.uvm.edu/cess/doe/>)

### OVERVIEW

There are three different types of Graduate Programs for Curriculum and Instruction:

Curriculum and Instruction, MAT:

The Master of Arts in Teaching program for middle level and secondary teachers is designed for those students who aspire to earn both a Master's Degree and a license to teach in public middle or secondary schools. Students will prepare for licensure to teach in grades five through nine or seven through twelve in one summer and academic year.

Curriculum and Instruction, MEd:

The Master's Degree in Curriculum and Instruction is designed to advance curriculum design for innovative educators with attention to research methods to advance practice. Additional emphasis is placed on advancing understanding of curriculum theory and practice, collaboration across school and community contexts, and responsive design to ensure optimal development of the whole child.

Curriculum and Instruction, Accelerated Masters Program (AMP):

The Accelerated Master's Program leading to an M.A. in Teaching for middle level and secondary is designed for those students who aspire to earn both a master's degree and a license to teach in public middle or secondary schools. Students will prepare for licensure to teach in grades five through nine or seven through twelve in one summer and academic year.

UVM students who are in their third year of study for a Bachelor's degree may apply to the Accelerated Master of Arts in Teaching program. These students, when accepted, may complete nine credits of graduate level coursework, six of which may be counted toward both the minimum requirements for the Master of Arts degree, as well as toward the undergraduate degree. Qualified candidates will need a major or its equivalent in an approved licensing endorsement

## DEGREES

- Curriculum and Instruction M.A.T. AMP (p. 135)
- Curriculum and Instruction M.A.T. (p. 136)
- Curriculum and Instruction M.Ed. (p. 137)

## FACULTY

**Carthew, Jessica;** Assistant Professor, Department of Education; PHD, University of Maryland  
**Garnett, Bernice Raveche;** Associate Professor, Department of Education; SCD, Harvard University  
**Haines, Shana;** Associate Professor, Department of Education; PHD, University of Kansas  
**Jiron, Haley Woodside;** Associate Professor, Department of Education; PHD, SUNY Albany  
**Jorgenson, Simon;** Assistant Professor, Department of Education; PHD, University of Cincinnati  
**Kervick, Colby T.;** Assistant Professor, Department of Education; EDD, University of Vermont  
**Neumann, Maureen Doyle;** Professor, Department of Education; PHD, University of Washington  
**Reyes, Cynthia;** Associate Professor, Department of Education; PHD, University of Illinois at Chicago  
**Shepherd, Katharine;** Professor, Department of Education; EDD, University of Vermont  
**Smith, Carmen Petrick;** Associate Professor, Department of Education; PHD, University of Texas-Austin  
**Toolin, Regina;** Associate Professor, Department of Education; PHD, University of Wisconsin-Madison  
**Walls, Leon;** Associate Professor, Department of Education; PHD, Purdue University

## CURRICULUM AND INSTRUCTION M.A.T. AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Entry Program leading to an M.A. in Teaching for middle level and secondary is designed for those students who aspire to earn both a master's degree and a license to teach in public middle or secondary schools. Students will prepare for licensure to teach in grades five through nine or seven through twelve in one summer and academic year.

UVM students who are in their third year of study for a Bachelor's degree may apply to the Accelerated Master of Arts in Teaching Program. Following acceptance by the Graduate College, these students may complete 9 credits of graduate-level course work, that may be counted toward both the minimum requirements for the M.A.T. as well as toward the undergraduate degree. Qualified candidates will need a major or its equivalent in an approved licensing area.

Requests for further information and application instructions may be obtained by contacting the Middle Level or Secondary Education Program; 411 Waterman Building, (802) 656-1411.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Arts in Teaching

All applicants to the Accelerated Master's Program in Curriculum and Instruction must meet the following entrance criteria:

For Middle Level Education, a minor or its equivalent in one of the following areas:

- English, Science, Social Studies or Mathematics.

For Secondary Education, a major or its equivalent in a state-approved licensing area:

- Sciences: Earth Science, Biology, Chemistry, Physics
- Social Studies: Geography, History, Political Science, Economics
- English, Mathematics, French, German, Latin, Spanish, or Computer Science

For both Middle Level and Secondary Education:

- A minimum overall grade point average of 3.00 in a State-approved licensing area (see above)
- A demonstrated commitment to working with young people

### Minimum Degree Requirements

AMP students may use up to 9 credits of graduate level courses taken at UVM toward both the bachelor's and M.A.T. Some programs specify the courses that must be taken; for other programs it is determined individually. In all cases, students must be admitted by the Graduate College before taking any courses that will apply to the master's degree, i.e., all courses used for the master's degree must be taken after formal admission to the AMP program.

The M.A.T. program has two tracks: Middle Level Education and Secondary Level Education.

Degree requirements for a Master of Arts in Teaching in Secondary Education are as follows:

Students enrolled in the M.A.T. in Secondary Education are required to complete a 31-credit program in education course work that will prepare them to teach in grades 7-12. In addition, some students may be required to complete additional content related course work to fulfill content requirements for licensure. Secondary students pursuing an endorsement at the secondary level in World Languages must also complete the Oral Proficiency Interview (OPI) and score at the Advanced Low level.

EDSC 207	Development:Theory & Applctn	3
EDSC 209	Practicum in Teaching	4
EDSC 215	Reading in Secondary Schools	3
EDSC 216	Curr,Instr&Assmt Sec Schl Tchr	3



EDSC 226	Internship: Student Teaching	9
EDSC 230	Teaching for Results	3
EDSP 201	D2:Foundations of Special Ed	3
One of the following teaching methods courses:		3
EDSC 227	Tchg Science in Sec Schls	
EDSC 257	QR:Tchg Math in Sec Schls	
EDSC 240	Teach English:Secondary School	
EDSC 225	Tchg Soc Studies in Sec Schls	
EDSC 259	Tchg Foreign Lang in Sec Schls	
EDSC 237	Tching Computer Science in Sec	3
Total Program Credit Requirements		31

Degree requirements for a M.A.T. in Middle Level Education are as follows:

Students enrolled in the M.A.T. in Middle Level Teacher Education are required to complete a 33-36 credit program in education course work that will prepare them to teach math, English/language arts, Social Studies or Science in grades 5-9. Some students may be required to complete additional course work to fulfill content endorsement requirements for licensure.

EDML 207	Adoles Lrng&Beh&Cog Perspect	3
EDSS 200	Contemporary Issues (Social Justice Education)	3
EDSP 201	D2:Foundations of Special Ed	3
EDML 260	Teaching Young Adolescents	3-6
EDML 261	Mid Lev Teaching Practicum II	3
EDML 270	Middle School Org & Pedagogy	3-6
EDML 285	Middle Level Student Teaching	9
EDML 286	Internship Support Seminar	3
Content Methods Course		3

### Comprehensive Examination

For both tracks, the comprehensive examination is the satisfactory completion of the Vermont Licensure Portfolio (or its equivalent) submitted near the end of course work.

### Requirements for Advancement to Candidacy for the Degree of Master of Arts in Teaching

Successful completion of any prerequisite courses, and at least 12 graded graduate credits with a 3.00 or better, including all core courses.

## CURRICULUM AND INSTRUCTION M.A.T.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master of Arts in Teaching program for middle level and secondary teachers is designed for those students who aspire to earn both a master's degree and a license to teach in public middle or secondary schools. The program welcomes students from all colleges and universities who have completed at least an undergraduate degree (BS and BA) in arts and sciences, agriculture or natural resources, who have completed majors in topics such as English, social sciences (history, political science, economics or geography), science, mathematics, computer science and/or foreign languages (French, Spanish, Latin and Greek). Students will prepare for licensure to teach in grades 5-9 for the middle level program or 7-12 for the secondary program in 1 or 2 summers and 1 academic year.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Arts in Teaching

Applications to both Master of Arts in Teaching pathways (Middle Level and Secondary Level) are reviewed on a rolling basis.

All applicants to the Secondary Education Licensure Masters Preparation Program must meet the following entrance criteria:

- A demonstrated commitment to working with young people.
- A major or its equivalent in a State-approved licensing area (see below).
- A minimum overall grade point average of 3.00 in undergraduate coursework as well as a 3.00 in the State-approved licensing area (major).

State-Approved Licensing Areas:

Sciences: Biological Science, Chemistry, Earth Science, Physics  
 Social Studies: Geography, History, Political Science, Economics  
 English  
 Mathematics  
 French  
 German  
 Latin  
 Spanish  
 Computer Science

All applicants to the Middle Level Teacher Education Program must meet the following general entrance criteria:

- A demonstrated commitment to working with young people
- A minimum of 18 credit hours in one of the following areas:  
 English, Science, Social Studies, or Mathematics

- A minimum overall grade point average of 3.00 in a State-approved licensing area (English, Science, Social Studies, or Mathematics)

Requests for further information and application instructions may be obtained by contacting the Middle Level or Secondary Education coordinator, 405A Waterman Building, (802) 656-1411.

**Minimum Degree Requirements**

The Master of Arts in Teaching program has two tracks: Middle Level Education and Secondary Level Education.

Degree requirements for a Master of Arts in Teaching in Secondary Education are as follows:

Students enrolled in the M.A.T. in Secondary Education are required to complete a 31-credit program in education course work and an internship that will prepare them to teach in grades 7-12. In addition, some students may be required to complete additional content related course work to fulfill content requirements for State of Vermont licensure. Students pursuing an endorsement at the secondary level in World Languages must also complete the Oral Proficiency Interview (OPI) and score at the Advanced Low level.

EDSC 207	Development:Theory & Applctn	3
EDSC 209	Practicum in Teaching	4
EDSC 215	Reading in Secondary Schools	3
EDSC 216	Curr,Instr&Assmt Sec Schl Tchr	3
EDSC 226	Internship: Student Teaching	9
EDSC 230	Teaching for Results	3
EDSP 201	D2:Foundations of Special Ed	3
One of the following teaching methods courses:		3
EDSC 227	Tchg Science in Sec Schls	
EDSC 257	QR:Tchg Math in Sec Schls	
EDSC 240	Teach English:Secondary School	
EDSC 225	Tchg Soc Studies in Sec Schls	
EDSC 259	Tchg Foreign Lang in Sec Schls	
EDSC 237	Tching Computer Science in Sec	
Total Program Credit Requirements		31

In addition, M.A.T. students will take 2 required teaching exams for licensure: Praxis Core and Praxis II Content Exams and successfully complete the Vermont Licensure Portfolio.

Degree requirements for a Master of Arts in Teaching in Middle Level Education are as follows:

Students enrolled in the M.A.T. in Middle Level Teacher Education are required to complete a 30-credit program in education course work with an additional subject methods course to prepare them to teach math, English/Language Arts, Social Studies or Science

in grades 5-9. Students seeking more than one content area endorsement will be required to complete additional methods courses.

EDML 207	Adoles Lrng&Beh&Cog Perspect	3
EDSS 200	Contemporary Issues (Social Justice Education)	3
EDSP 201	D2:Foundations of Special Ed	3
EDML 260	Teaching Young Adolescents	3-6
EDML 261	Mid Lev Teaching Practicum II	3
EDML 270	Middle School Org & Pedagogy	3-6
EDML 285	Middle Level Student Teaching	9
EDML 286	Internship Support Seminar	3
Content Methods Course(s)		3-6
Total Program Credit Requirements		33

**Comprehensive Examination**

Both the Middle Level and Secondary Education Comprehensive Examinations include satisfactory completion of the Vermont Licensure Portfolio (or its equivalent) submitted near the end of program course work.

**Requirements for Advancement to Candidacy for the Degree of Master of Arts in Teaching**

Successful completion of any prerequisite courses, and at least 12 graded graduate credits with a 3.00 or better, including all core courses.

**CURRICULUM AND INSTRUCTION M.ED.**

All students must meet the Requirements for the Master of Education Degree (p. 261)

**OVERVIEW**

The Master's Degree in Curriculum and Instruction is designed to advance curriculum design for innovative educators with attention to research methods to advance practice. Additional emphasis is placed on advancing understanding of curriculum theory and practice, collaboration across school and community contexts, and responsive design to ensure optimal development of the whole child.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Education**

Applicants must submit the following:

- Statement of purpose
- 3 formal letters of recommendation (in addition to the online letter of recommendation cover sheet)
- Official transcripts from all institutions attended
- Resume
- Any other items required by the Graduate College

### Minimum Degree Requirements

10 3-credit courses are required. Those courses must include 4 concentration courses (detailed below) and 6 courses within a specialization; all at the graduate level or with Graduate College approval.

EDFS 209	Intro to Research Methods (or other research course)	3
EDLP 320	Collaborative Consultation (or other course that advances understanding across school and community contexts)	3
EDCI 331	Society, Stress and the Brain (or other course on responsive design)	3
Curriculum course		3

Specialization areas include: Educational Technology; Library Media; Reading and Literacy; and Resiliency-Based Approaches

### Comprehensive Examination

Students will develop an e-portfolio to highlight their learning and work from the ten courses they took as part of their M.Ed. coursework. They will then present that e-portfolio to a small group of faculty.

### Requirements for Advancement to Candidacy for the Degree of Master of Education

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## DIETETICS

<http://www.uvm.edu/nfs/>

### OVERVIEW

The Master of Science in Dietetics (MSD) Program, housed in the Department of Nutrition and Food Sciences under the College of Agriculture and Life Sciences at the University of Vermont, is a 30-hour graduate credit degree that includes didactic coursework, a graduate capstone project, and supervised practice experience culminating in student eligibility to write the exam for Registered Dietitian Nutritionist.

The mission of the MSD is to prepare and educate graduate students who will successfully function as entry-level Registered Dietitian Nutritionist with specialized knowledge of and ability to apply the principles of sustainable food systems across all professional practice settings. Students will also develop competence in research methodology. Students will take graduate level courses throughout the University of Vermont as well as advanced nutrition courses offered in the Department of Nutrition and Food Sciences. For more information about the program, please visit the MSD website.

For the core MSD courses (NFS 310, NFS 311, NFS 312), there is a weekly mandatory online synchronous class meeting. During the

supervised practice experience semesters, NFS 311 and NFS 312 class meetings are held every Monday.

The Master of Science in Dietetics is accredited by:

Accreditation Council for Education and Dietetics (ACEND)  
120 South Riverside Plaza, Suite 2190  
Chicago, IL 60606-6995  
800-877-1600, extension 5400

More information about ACEND and the Academy of Nutrition and Dietetics is available on their websites.

Following completion of the supervised practice experience and all requirements for the MSD, students will be issued a verification statement of completion of the program and will be eligible to write the exam for Registered Exam for Dietitians.

### DEGREES

- Dietetics M.S.D. (p. 138)

### FACULTY

**Trubek, Amy B.;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pennsylvania

### DIETETICS M.S.D.

All students must meet the Requirements for the Master's Degree (p. 260).

### OVERVIEW

The Master of Science in Dietetics (M.S.D.) Program, housed in the Department of Nutrition and Food Sciences under the College of Agriculture and Life Sciences at the University of Vermont, is a 30-hour graduate credit degree that includes didactic coursework, a graduate capstone project, and supervised practice experience culminating in student eligibility to write the exam for Registered Dietitian Nutritionist.

The mission of the M.S.D. is to prepare and educate graduate students who will successfully function as an entry-level Registered Dietitian Nutritionist with specialized knowledge of and ability to apply the principles of sustainable food systems across all professional practice settings. Students will also develop competence in research methodology. Students will take graduate level courses throughout the University of Vermont as well as advanced nutrition courses offered in the Department of Nutrition and Food Sciences. For more information about the program, please visit the MSD website.

For the core MSD courses (NFS 310, NFS 311, NFS 312), there is a weekly mandatory online synchronous class meeting. During the supervised practice experience semesters, NFS 311 and NFS 312 class meetings are held every Monday.

The Master of Science in Dietetics is accredited by:

Accreditation Council for Education and Dietetics (ACEND)  
120 South Riverside Plaza, Suite 2190  
Chicago, IL 60606-6995

800-877-1600, extension 5400

More information about ACEND and the Academy of Nutrition and Dietetics is available at their websites.

Following completion of the supervised practice experience and all requirements for the M.S.D., students will be issued a verification statement of completion of the program and will be eligible to write the exam for Registration Exam for Dietitians.

## SPECIFIC REQUIREMENTS

### Requirements for Admission for the Degree of Master of Science in Dietetics

Minimum GPA of 3.00 in college-level courses with an overall science GPA of 2.50 in required courses with no required science grade less than 2.00. The application deadline is May 1st. For prerequisite admission requirements, please visit the MSD webpage.

### DIDACTIC CURRICULUM

The M.S.D. Program is designed for students who have completed a Didactic Program in Dietetics and have obtained a verification statement from an accredited program (these students would also be eligible to apply for any dietetic internship). Other students without a verification statement may apply following completion of prerequisite coursework (see the MSD webpage).

### Minimum Degree Requirements for the Degree of Master of Science in Dietetics

Satisfactory completion of 30 credits of graduate-level courses including research methods, statistics, healthcare policy, food systems, ethics, and dietetics practice in addition to all supervised practice requirements. This includes 12 credits of the following required NFS courses:

NFS 310	MSD Journal Club	2
NFS 311	Supervised Practice I	4
NFS 312	Supervised Practice II	4
NFS 392	Evidence-based Practice Prjct	2

The MSD program director will advise on the remaining courses that should be taken to fulfill the 30-credit requirement.

### SUPERVISED PRACTICE EXPERIENCES

The supervised practice portion of the curriculum is integrated with graduate course work. During the 2 semesters of supervised practice experience, NFS 311 Dietetics Practice I and NFS 312 Dietetics Practice II are coordinated whereby 2 hours of synchronous class time are held each Monday, and the remainder of the week (Tuesday – Friday) is spent in supervised practice settings (for a total of at least 32 hours/week).

Between NFS 311 and NFS 312 (at least 150 hours) and the 38 weeks of supervised practice (1216 hours) the M.S.D. Program exceeds the 1200-hour requirement established by the Accreditation Council for Education in Nutrition and Dietetics (ACEND).

The program also includes approximately 40 hours of mandatory campus-based orientation to the M.S.D. Program and supervised practice experience. All students will complete 15 weeks in clinical rotations, 7 weeks in foodservice management rotations, and 14 weeks in community rotations, including 2 weeks in a school nutrition program. After completing all rotations, students will select a rotation of their choice for further skill and knowledge development (staff relief). The staff relief rotation must be a minimum of 2 weeks but it can be longer if a student desires and the preceptor agrees.

### COMMUNITY HEALTH AND NUTRITION CONCENTRATION

The M.S.D. Program will prepare entry-level dietetics practitioners with a concentration in community health and nutrition. Students will be prepared to incorporate, promote and support the principles of sustainable food systems across all areas of professional practice.

The sustainable food system thread will be embedded in the curriculum and highlighted throughout the supervised practice experiences. Another priority of the M.S.D. Program is to develop entry-level RDN practitioners with advanced knowledge of food and nutrition assistance programs and supportive services available in communities, and skills in providing seamless nutrition care for all individuals, including patients/clients transitioning from the inpatient/rehab setting to their homes.

### GRADUATION COMPLETION REQUIREMENTS

M.S.D. students must successfully complete all coursework, the comprehensive exam, supervised practice rotations, and the capstone project in order to receive the M.S.D. degree and verification statement of eligibility to write the exam for Registered Dietitian Nutritionists.

### Comprehensive Examination

Candidates will prepare a written comprehensive exam that will test their ability to develop systems based solutions to practice problems in all areas of dietetic practice.

### Requirements for Advancement to Candidacy for the Degree of Master of Science in Dietetics

Completion of requirements as outlined in program description.

## ECOLOGICAL ECONOMICS

<http://www.uvm.edu/giee/>

### OVERVIEW

Ecological Economics examines the relationships between ecological and economic systems while working to solve humanity's environmental challenges. It is based on the understanding that the economy is a subsystem of a larger ecological life support system, and it strives to create an ecologically sustainable, socially equitable, and economically efficient future. The certificate is a problem-based, interdisciplinary program focused on developing a practical framework for integrating economic and ecological systems. Students will acquire a theoretical and pragmatic basis to carry these skills into the world of practice.

**DEGREES**

- Ecological Economics CGS (p. 140)

**FACULTY**

**Erickson, Jon;** Professor, Gund Institute; PHD, Cornell University  
**Farley, Joshua C.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University  
**Ricketts, Taylor H.;** Professor, Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**ECOLOGICAL ECONOMICS CGS**

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

**OVERVIEW**

Ecological Economics examines the relationships between ecological and economic systems while working to solve humanity's environmental challenges. It is based on the understanding that the economy is a subsystem of a larger ecological life support system, and it strives to create an ecologically sustainable, socially equitable, and economically efficient future. The certificate is a problem-based, interdisciplinary program focused on developing a practical framework for integrating economic and ecological systems. Students will acquire a theoretical and pragmatic basis to carry these skills into the world of practice.

The Ecological Economics Certificate of Graduate Study is managed jointly by the Rubenstein School and the Gund Institute, and is conferred by the Graduate School.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Certificate of Graduate Study in Ecological Economics**

**FOR CURRENT UVM STUDENTS:** Students currently enrolled in a graduate program must complete the online UVM Graduate Application.

**FOR DUAL GRADUATE DEGREE/CERTIFICATE PROGRAM APPLICANTS:** Students applying at the same time for a graduate degree program and a Certificate of Graduate Study at UVM must first complete the online UVM Graduate Application for the degree program. Once accepted into the degree program applicants can then log back into the portal and choose the option to apply as a certificate student. A fee waiver will be provided by the Graduate Admissions office.

**FOR APPLICANTS TO THE CERTIFICATE PROGRAM:** Applicants seeking to enroll in only a Certificate of Graduate Study program must complete the online UVM Graduate Application and all associated requirements. Note: You must have completed an advanced degree (Master's, Ph.D., or J.D.) to apply for just the certificate and the GRE is not required.

**Minimum Degree Requirements**

Students may earn the certificate either in conjunction with a UVM master's or doctoral degree, or independent of a degree.

The Certificate of Graduate Study in Ecological Economics requires 15-16 credits, including 3 core courses and 2 approved electives. Students must also demonstrate competency in 4 areas: Natural Science, Social Science, Management, and Quantitative Methods. 2 of the competencies must be satisfied through 2 elective courses (6 credits) at UVM. The remaining 2 competencies may be satisfied through additional electives, through appropriate prior graduate course work, or through life experience.

The Certificate of Graduate Study in Ecological Economics requires 15-16 graduate credits that must be taken at UVM. They are distributed as follows<sup>1</sup>.

3 core courses (9-10 credits total) must be taken at UVM while enrolled in the program:		
NR 341	Ecological Economic Theory	3
PSS 212	SU: Advanced Agroecology	4
Students may substitute this course with a 3 credit Ecological Economics Practice course		3
PA 308	Decision Making Models	3
Below are examples of courses that could be taken to meet the 4 competencies. At least 6 credits toward competencies must be taken at UVM while enrolled in the program		
Natural Science:		
BIOL 264	Community Ecology	
NR 280	Stream Ecology	
Social Science:		
CDAE 354	Advanced Microeconomics	
FS 345	Food Systems, Soc & Policy	
PA 311	Policy Analysis&Program Eval	
Management:		
PA 317	Systems Anly & Strategic Mgmt	
Quantitative Methods:		
NR 242	Adv Geospatial Techniques	
STAT 211	QR: Statistical Methods I	

<sup>1</sup> The 15 credits that need to be taken at UVM may be earned either in conjunction with or independent of a UVM graduate degree program.

More information on the Certificate is available from the Gund Institute website.

## EDUCATION FOR SUSTAINABILITY

<https://www.uvm.edu/cess/doi>

### OVERVIEW

To accelerate transformative societal response to the interconnected environmental, social, and economic challenges of our time, the University of Vermont and the Shelburne Farms (<https://shelburnefarms.org/efs-certificates/>) Institute for Sustainable Schools established a partnership to offer 2 certificates of graduate study in Education for Sustainability (EFS). Each certificate program is designed for practicing preK-12, post-secondary, and informal educators as well as those working in museum education, outdoor education, parks and recreation activities, and other fields where natural and built environments are part of the curriculum. Grounded in action research, transformative education, and youth leadership, the EFS coursework prepares educators to empower learners in making positive changes in their communities while shifting societies to improve the quality of life for current and for future generations.

### DEGREES

Education for Sustainability CGS (p. 141)

Education for Sustainability mCGS (p. 141)

### FACULTY

**Jorgenson, Simon**; Assistant Professor, Department of Education; PHD, University of Cincinnati

**Poleman, Walter Mallery**; Senior Lecturer, Rubenstein School of Environment and Natural Resources; MS, University of Vermont

**Toolin, Regina**; Associate Professor, Department of Education; PHD, University of Wisconsin-Madison

## EDUCATION FOR SUSTAINABILITY CGS

All students must meet the Requirements for the Certificates of Graduate Study (CGS) (p. 259)

### OVERVIEW

The 18-credit Certificate of Graduate Study in Education for Sustainability (EFS) provides preK-12, postsecondary, and informal educators as well as those working in museum education, outdoor education, parks and recreation—and other fields where natural and built environments are part of the curriculum—with the knowledge and skills to empower learners in making positive changes in their communities while shifting societies to improve the quality of life for current and for future generations. Designed in partnership with the Shelburne Farms Institute for Sustainable Schools, this certificate features an innovative co-teaching arrangement and scholarship opportunities to reduce costs for graduate students. Students completing this certificate will develop a strong practical and theoretical foundation in action research, transformative education, youth leadership, and education for sustainability. Elective courses provide an opportunity for students to deepen their understanding of EFS in the context of food systems, agroecology, community development, and participatory research methods.

## SPECIFIC REQUIREMENTS

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE CERTIFICATE OF GRADUATE STUDY

- Completed bachelor’s degree
- Completed Graduate College Application
- Official transcripts from each college of university where credit has been earned
- Three letters of recommendation

### MINIMUM DEGREE REQUIREMENTS

18 credits including the following:

Core Courses		
EDCI 343	Fndns in Ed for Sustainability	3
EDCI 344	Mthds in Ed for Sustainability	3
EDCI 345	Trnsfrm Ldrshp Edu for Sustain	3
EDCI 346	Edu for Sustain Inquiry Action	3
In addition to the core courses, students choose 2 electives (6 credits) from the following list:		
CDAE 260	Smart Resilient Communities	3
CDAE 273	Project Development & Planning	3
CDAE 276	Community Design Studio	3
CDAE 321	Econ of Sustainable Food Syst	3
CDAE 326	Community Economic Development	3
CDAE 376	Communicating Science	3
FS 340	Food Systems, Science & Policy	3
FS 345	Food Systems, Soc & Policy	3
PSS 311	Introduction to Agroecology	3
PSS 312	Ecological Foundations of Agro	3
PSS 313	PAR & Transdiscipl Agroecology	3
PSS 314	Agroecol, Food Sov. & Soc Mov.	3

## EDUCATION FOR SUSTAINABILITY MCGS

All students must meet the Requirements for the micro-Certificates of Graduate Study (CGS) (p. 259)

### OVERVIEW

The 12-credit micro-Certificate of Graduate Study in Education for Sustainability (EFS) provides preK-12, postsecondary, and informal educators as well as those working in museum education, outdoor education, parks and recreation—and other fields where natural and built environments are part of the curriculum—with the knowledge and skills to empower learners in making positive changes in their communities while shifting societies to improve the quality of life for

current and for future generations. Designed in partnership with the Shelburne Farms Institute for Sustainable Schools, this certificate features an innovative co-teaching arrangement and scholarship opportunities to reduce costs for graduate students. Students completing this micro-certificate will develop a strong practical and theoretical foundation in action research, transformative education, youth leadership, and education for sustainability.

## SPECIFIC REQUIREMENTS

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE micro-CERTIFICATE OF GRADUATE STUDY

- Completed bachelor's degree
- Completed Graduate College Application
- Official transcripts from each college of university where credit has been earned
- Three letters of recommendation

### MINIMUM DEGREE REQUIREMENTS

12 Credits including the following:

Core Courses		
EDCI 343	Fndns in Ed for Sustainability	3
EDCI 344	Mthds in Ed for Sustainability	3
EDCI 345	Trnsfrm Ldrshp Edu for Sustain	3
EDCI 346	Edu for Sustain Inquiry Action	3

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES

<https://www.uvm.edu/cess/doe>

### OVERVIEW

The Educational Leadership and Policy Studies degrees are designed to cultivate leaders who apply knowledge to lead and build learning communities that make a positive difference in the lives of children, youth, families, adults, and educational and social service agencies. Framed on issues of equity and social justice, the programs are designed to prepare leaders to think and act creatively and effectively determine solutions to complex problems.

### DEGREES

- Educational Leadership and Policy Studies AMP (p. 142)
- Educational Leadership and Policy Studies M.Ed. (p. 144)
- Educational Leadership and Policy Studies Ed.D. (p. 145)
- Educational Leadership and Policy Studies Ph.D. (p. 146)

### FACULTY

**Ballysingh, Tracy Arámbula;** Assistant Professor, Department of Education; PHD, The University of Texas at Austin

**Callahan, Rebecca M.;** Professor, Department of Education; PHD, University of California, Davis

**Castro, Eliana;** Assistant Professor, Department of Education; PHD, Michigan State University

**Clark/Keefe, Kelly;** Associate Professor, Department of Education; EDD, University of Vermont

**Comerford, Susan Ann;** Associate Professor, Department of Social Work; PHD, Case Western Reserve University

**Conroy, Nicole;** Assistant Professor, Human Development and Family Sciences; PHD, Syracuse University

**Demink-Carthew, Jessica;** Associate Professor, Department of Education, PHD; University of Maryland

**Garnett, Bernice Raveche;** Associate Professor, Department of Education; SCD, Harvard University

**Garvey, Jason C.;** Associate Professor, Department of Education, PHD; University of Maryland, College Park

**Garwood, Justin D.;** Assistant Professor, Department of Education; PHD, University of North Carolina at Chapel Hill

**Haines, Shana Jackson;** Associate Professor, Department of Education; PHD, University of Kansas

**Halladay, Juliet L.;** Associate Professor, Department of Education; PHD, Michigan State University

**Hurley, Sean M.;** Associate Professor, Department of Education; PHD, Vanderbilt University

**Jorgenson, Simon;** Assistant Professor, Department of Education; PHD, University of Cincinnati

**Kervick, Colby T.;** Associate Professor, Department of Education; EDD, University of Vermont

**Kolbe, Tammy G.;** Associate Professor; Department of Education; EDD, University of Vermont

**Mayo, Cris;** Professor, Department of Education; PHD, University of Illinois at Urbana-Champaign

**Meyer, Lori;** Associate Professor, Department of Education; PHD, University of Illinois

**Neumann, Maureen D.;** Professor, Department of Education; PHD, University of Washington

**Northey, Kaitlin;** Assistant Professor, Department of Education; PHD, Rutgers University

**Reyes, Cynthia C.;** Associate Professor, Department of Education; PHD, University of Illinois at Chicago

**Strolin-Goltzman, Jessica S.;** Professor, Department of Education; PHD, University of Albany

**Toolin, Regina;** Associate Professor, Department of Education; PHD, University of Wisconsin-Madison

**Vannest, Kimberly;** Professor, Department of Education; PHD, Louisiana State University, Baton Rouge

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (<https://catalogue.uvm.edu/graduate/degreerequirements/requirementsforacceleratedmastersdegreeprograms/>)

### OVERVIEW

An accelerated entry pathway into the Master's Program in Educational Leadership and Policy Studies affords opportunities for UVM undergraduates interested in the efficient linkage of their

undergraduate and graduate degree programs. The Accelerated Masters Program in Educational Leadership and Policy Studies (AMPELPS) seeks to build upon an institutional goal that stresses career alignment in disciplines and academic areas, across the undergraduate to graduate degree experience. In essence, the accelerated pathway allows UVM juniors in their Spring semester to apply for admission to the graduate program. After acceptance into the M.Ed., students may take up to 9 credits of graduate-level courses at UVM toward both their Bachelor's and M.Ed. The targeted audience are those undergraduates who seek advanced training and experiences towards the leadership of learning organizations and programs. The accelerated program is restricted to the non-licensure Master's Program track. Students completing this pathway through the Master's degree will be unable to be recommended for licensure.

Recruitment of students into AMPELPS would stem from five types of affiliated undergraduate programs:

1. Students interested in leadership positions in youth and adult recreation programs, intermural sports leagues, K-12 athletic program administration, and/or sports team management. Programs targeted include:

- a. Coaching-(CESS)-Undergraduate Minor
- b. Sports Management (CESS/Rubenstein)-Undergraduate Minor

2. Students interested in leading youth or adult groups through environmental curricula housed in state or national parks, curating educational exhibits in cultural or science museums, and/or administering youth camps. Programs targeted include:

- a. Parks, Recreation and Tourism (Rubenstein)-Undergraduate Major
- b. Environmental Studies (UVM)-Undergraduate Major/Minor

3. Students interested the pairing of outdoor or environmentally based recreation programs with occupational, physical, or mental health therapies. These students have worked or envision working for organizations that lead youth or adults into wilderness or related environments in the pursuit of therapeutic goals. Programs targeted include:

- a. Human Development and Family Studies (CESS)-Undergraduate Major/Minor
- b. Social Work (CESS)-Undergraduate Major

4. Students interested in the leadership of and programming for community based learning centers. These centers might provide a range of educational, family, literacy and related support services for refugees, English language learners, and adult populations.

- a. English Language Learners (CESS)-Undergraduate Concentration/Minor
- b. Social Work (CESS)-Undergraduate Major

- c. Community Development and App. Economics (CALS)-Undergraduate Major/minor

5. Students from social science fields like political science, economics, sociology and community development who seek foundational training at the graduate level towards careers in educational policy studies, administration, and analysis. Students who have partially completed or completed teaching Majors, but seek alternatives upon graduation will also be welcomed. Programs targeted would include:

- a. Social science Majors (CAS)—Undergraduate Majors/Minors
- b. Teaching degrees (CESS)-Undergraduate Majors
- c. HDFFS Program (CESS)

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of education for Accelerated Students

Admissions to the accelerated entry program requires the following:

1. Students must have earned a cumulative grade point average of 3.25 at the beginning of the 2nd semester of his/her junior year to be considered for possible admission to the AMPELPS program.
2. Completion of the Graduate College Accelerated Master's Degree Permission Form
3. Completion of the EL Graduate College Application Form online, which includes a written essay that matches their undergraduate program of study, professional experience and professional goals with the M.Ed. in Educational Leadership; Three letters of recommendation, including a letter of support from a faculty member who agrees to serve as a primary advisor during enrollment into the M.Ed. Program.
4. Applications will be reviewed by program faculty and finalists will be interviewed.

### Minimum Degree Requirements for the Degree of Master of education

- Completion of the graduate program focusing on general educational leadership studies requires 33 credit hours of study distributed among courses, summer seminars, independent study, clinical field experiences, and internships.
- Through close faculty mentoring, approximately half of all courses taken comprise of the core curriculum, with the remainder making up the students individual subject area concentrations.
- An action research project and a leadership portfolio mark the final requirements of the program. Portfolios are presented at each student's culminating oral examination. Students interested in AMPELPS should review M.Ed. Program Requirements as specified in the Catalogue.

Following admission, and working with the Program Coordinator, accelerated students shall complete the Program Plan of Study. This



study plan shall indicate which courses in the Educational Leadership program will be taken during their undergraduate studies and also count towards the M.Ed. Participation in the accelerated program requires the satisfactory completion of the undergraduate course of study.

AMPELPS students may take courses limited to those offered in the Core Curriculum of the Master's program prior to the completion of the bachelor's, inclusive of:

- EDLP 300 (<https://catalogue.uvm.edu/search/?P=EDLP%20300>): Leading Learning Organization and any one or two of the following:
- EDFS 355 (<https://catalogue.uvm.edu/search/?P=EDFS%20355>): Data Analysis for Decision Making
- EDLP 380 (<https://catalogue.uvm.edu/search/?P=EDLP%20380>): Inequality in Education
- EDLP 310 (<https://catalogue.uvm.edu/search/?P=EDLP%20310>): Effecting and Managing Change
- EDLP 320 (<https://catalogue.uvm.edu/search/?P=EDLP%20320>): Collaborative Consultation.

In summary, AMPEL students are expected to take 6 credit hours of EDLP core coursework during their senior year, but may take a total of 9. A culminating total of 33 credit hours are needed to earn the Master's. The remaining core courses will be taken after completion of the bachelor's degree.

### Thesis Option

The EDLP program has a thesis option in which 6 credits of EDLP 391 (<https://catalogue.uvm.edu/search/?P=EDLP%20391>), Master's Thesis Research, replaces the equivalent number of elective course credits. A thesis is developed in collaboration with a supervising EDLP faculty member and adheres to policies and procedures of the Graduate College. Thesis research may only be pursued after the completion of the bachelor's degree and full-time graduate student status begins.

### Comprehensive Examination

The comprehensive examination is taken in the last semester prior to graduation. The examination consists of an oral presentation of a portfolio built throughout the program.

### Requirements for Advancement to Candidacy for the Degree of Master of education

Students in the accelerated program are expected to maintain a high degree of academic and professional standing. A minimum cumulative undergraduate GPA of 3.25 is required for continuation in the M.Ed. program, through the completion of the undergraduate degree. Once fully enrolled as a graduate student, AMPELPS participants must adhere to the same standards defined in the Catalogue as other students in the Master of Education Program in Educational Leadership.

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES M.ED.

All students must meet the Requirements for the Master of Education Degree (<https://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthemasterofeducationdegree/>)

### OVERVIEW

The master's degree in Educational Leadership and Policy Studies is designed to cultivate leaders who can apply knowledge toward leading and building learning communities designed to make a positive difference in the lives of children, youth, families, adults, and communities. The program prepares public and private school leaders, curriculum leaders, teacher leaders, leaders of educational and social service agencies, and leaders for other educational organizations. Additionally, professionals (i.e. police, non-profit administrators, civil-servants and care workers) involved in leading educational training and programming for their respective organizations and services are often attracted to this program of study. The program is designed to prepare leaders to think and act creatively, responsibly, and effectively in leadership roles.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Education

There are two application deadlines. Applications are due November 15th for admission the following spring and April 1st for admission the following summer and fall. The process for application is as follows:

- Students apply to the Graduate College through electronic submission of the application materials. Materials are available on the website for the University of Vermont Graduate College.
- Applicants may be required to interview with the master's program coordinator or program faculty member.
- Applicants will receive written notification of the status of their application from the Graduate College. Applicants are responsible for making sure all application materials have been submitted to the Graduate College.
- Once accepted, applicants will receive a letter of acceptance from the program coordinator and will be assigned an advisor.

#### Minimum Degree Requirements

The program requirements, depending on a degree focused on general educational leadership studies or a focus on school building administration with licensure, include:

- 33 to 36 credits distributed among courses, summer seminars, independent study, clinical field experiences, and internships.
- 15 of which compose the core curriculum, with the remainder making up the student's individual concentration. Students desiring the Vermont Administrative Licensure will take a majority of their electives in areas required through licensure standards as defined by Vermont Competencies for Administrative Endorsement and Vermont Standards for Professional Educators.

- The core curriculum consists of the following courses:
  - EDLP 300 (<https://catalogue.uvm.edu/search/?P=EDLP%20300>): Leading Learning Organizations
  - EDLP 310 (<https://catalogue.uvm.edu/search/?P=EDLP%20310>): Effecting and Managing Change
  - EDLP 320 (<https://catalogue.uvm.edu/search/?P=EDLP%20320>): Collaborative Consultation
  - EDFS 355 (<https://catalogue.uvm.edu/search/?P=EDFS%20355>): Applied Data Analysis for Decision Making OR EDFS 209 (<https://catalogue.uvm.edu/search/?P=EDFS%20209>): Intro to Research
  - EDLP 380 (<https://catalogue.uvm.edu/search/?P=EDLP%20380>): Inequality in Education
  - EDLP 390 (<https://catalogue.uvm.edu/search/?P=EDLP%20390>): Internship
- A leadership portfolio which marks the final requirement of the program. Portfolios are presented as part of the Master's Comprehensive Orals at the completion of each student's degree program.

A maximum of 9 credits may be accepted in transfer into the program. Transfer credit may be completed prior to admission to the program provided that the credit is approved by the student's graduate studies committee and that the credit conforms to all other Graduate College requirements.

### Thesis Option

The EDLP program has a thesis option in which 6 credits of EDLP 391 (<https://catalogue.uvm.edu/search/?P=EDLP%20391>), Master's Thesis Research, replaces the equivalent number of elective course credits. A thesis is developed in collaboration with a supervising EDLP faculty member and adheres to policies and procedures of the Graduate College.

### Comprehensive Examination

The comprehensive examination is taken in the last semester prior to graduation. The examination consists of an oral presentation of a portfolio built throughout the program.

### Requirements for Advancement to Candidacy for the Degree of Master of Education

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES ED.D.

All students must meet the Requirements for the Doctor of Education (p. 263) Degree.

### OVERVIEW

The Ed.D. (Doctorate in Education) is an applied research program for professionals serving in educational leadership positions in PreK-12 schools, higher education, social service and non-profit organizations. The program is framed around issues of equity and

social justice and solutions to complex problems of practice. The curriculum is grounded in professional knowledge that integrates practice and research. We aim to produce leaders who can construct and apply knowledge to make a positive difference in the lives of individuals, families and communities through promoting excellence in:

- leadership and change strategies in and across organizations;
- development of learning organizations in response to social issues;
- design, implementation, and supervision of applied research in education;
- interpretation and application of research;
- understanding of broad social issues and policies from the perspectives of justice, equity, and diversity;
- meeting the needs of students with learning challenges and disabilities and their families;
- analysis of policy and fiscal management in education and social services;
- implementation of policies and practices that promote equity and social justice, collaboration, and cultural awareness and responsiveness.

This program has been designed to respond to the expanding demands placed on leaders in educational and human service organizations where leaders are increasingly expected to:

- design and supervise local research and varied evaluative studies;
- interpret and apply recent national research findings to practice;
- analyze and apply governmental regulations and court decisions;
- develop organizational responses to emerging social expectations;
- organize and lead staff development programs;
- understand and apply broad-based economic principles to social and fiscal policy;
- develop and manage budgets; and
- assess and respond to the psychological needs of educational consumers.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Education

Applicants must possess a:

- master's degree or equivalent, from an accredited institution,
- cumulative grade point average of 3.00 for previous graduate study,
- Online application,
- Current resume or curriculum vitae,
- Detailed Statement of Purpose including a summary of how the Ed.D. program relates to your professional, career, and educational goals,
- 3 letters of recommendation using the Graduate College form,

- Transcripts from all institutions attended, and
- Scholarly writing sample.

Applications must be submitted by the program deadline.

### Minimum Degree Requirements

Students admitted to graduate studies must complete successfully core requirements in research, educational foundations, policy studies, organizational change, and leadership. The required concentration is composed of courses chosen and approved by program faculty from an area of student interest (e.g., curriculum and instruction, higher education, educational leadership, special education) within the College of Education and Social Services. Students must satisfactorily complete the following Program of Study:

Core Requirements (18 credits):		
EDLP 400	ProSeminar: Doctoral Intro (Professional Seminar: K-16 Educational Research)	3
EDLP 407	Epistemologies in Education	3
EDFS 455	Soc Process & Institutional Chg	3
EDLP 431	Adv Sem Organizational Ldrshp	3
EDLP 437	Sem on Educational Policy	3
EDLP 449	Dissertation Writing Seminar	3
Required Research Courses (9 credits):		
EDFS 347	Qualitative Research Methods	3
EDLP 419	Quantitative Research Methods	3
EDLP 459	Mixed Method Research	3
Elective Research Courses (3 credits) - 4 options listed below:		3
EDLP 350	Survey Research Methods	
EDFS 396	Advanced Special Topics (Ethnography in Education Research or Case Study Research Methods)	
EDFS 348	Analyze&Write Qualitative Rsch	
EDLP 396	Advanced Special Topics (Research Methods in Program Evaluation)	
Focus Area: Graduate course options within CESS (guided by student interest and program advisor approval)		12
Dissertation Research Credits:		
EDLP 491	Doctoral Dissertation Research	17
Total Required		59

A maximum of 6 credit hours may be accepted in transfer from an accredited graduate program. Credits to transfer may be completed prior to admission to the Doctor of Education program provided that the credit is approved by the student's program advisor and conforms to all Graduate College and EDLP program requirements.

### Comprehensive Examination

Consistent with Graduate College requirements, the Ed.D. program requires students to complete a comprehensive examination of core knowledge prior to the completion of the degree program, with the exception of EDLP 449, taken in the spring of Year 3. This examination occurs in the semester following completion of the core course curriculum. Currently the comprehensive examination is administered in October. The examination tests knowledge in areas of study germane to all Ed.D. students. Students may not sit for the comprehensive examination until they have successfully completed their core courses.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Education

Successful completion of (1) all core courses with 3.00 GPA, (2) the comprehensive examination, and (3) defense of a dissertation proposal allows the student to advance to doctoral candidacy.

For further information concerning program advising and Ed.D. requirements refer to the Educational Leadership and Policy Studies doctoral programs website.

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Ph.D. program in Educational Leadership and Policy Studies is a multidisciplinary program that seeks to examine complex educational and social problems through the integration of multiple theoretical, methodological, and disciplinary lenses. The Ph.D. in Educational Leadership and Policy Studies is intended as a full-time program to prepare candidates to attain a high level of scholarly competence and to develop the capacity to contribute knowledge to their field. The program will develop scholars who can analyze and inform the development of educational systems and public policies that will positively impact the lives of children and youth and address broad societal issues such as child poverty. The degree will serve students who wish to pursue research/teaching careers in universities and/or research and policy positions in government agencies, think tanks, non-governmental organizations, and other public and private sector organizations.

The goals of the program include, but are not limited to:

- Preparing professional researchers, scholars, and faculty competent in conducting and sharing research.
- Focusing on research training that uses advanced quantitative, qualitative, and mixed method approaches to add to theoretical knowledge.
- Emphasizing publication of research findings to enhance knowledge in education and social services.
- Developing areas of interdisciplinary specialization.

Candidates will be mentored in conducting independent research, presenting papers at professional conferences, and submitting their work for publication.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy**

- Master’s degree in a related field such as educational leadership, educational studies, higher education, public administration, counseling, social work, or curriculum and instruction characterized by a distinguished academic record;
- Demonstrated commitment in statement of purpose and references to social change and justice
- Evidence of experience in inquiry at a level that will predict successful research and college teaching;
- GRE general test scores taken within the last 5 years;
- Research interests compatible with those of College of Education and Social Services faculty;
- Strong inquiry and writing skills as illustrated in a submitted scholarly writing sample;
- In-depth understandings of systems change, leadership, and policy in order to conduct high quality research;
- Articulated connection or fit with research agenda of existing program faculty; and
- Submission of an application by the program deadline.

**Minimum Degree Requirements**

A minimum of 75 credits of doctoral studies following formal admission to the program comprised of:

Core Requirements (18 credits):		
EDLP 400	ProSeminar: Doctoral Intro	3
EDLP 407	Epistemologies in Education	3
EDFS 455	Soc Process & Institutional Chg	3
EDLP 431	Adv Sem Organizational Ldrshp	3
EDLP 437	Sem on Educational Policy	3
EDLP 449	Dissertation Writing Seminar	3
Required Research Courses (9 credits):		
EDFS 347	Qualitative Research Methods	3
EDLP 419	Quantitative Research Methods	3
EDLP 429	Adv Quantitative Rsch Methods	3
Elective Research Courses (9 credits) - 5 options listed below:		9
EDLP 350	Survey Research Methods	
EDLP 459	Mixed Method Research	
EDFS 396	Advanced Special Topics (Ethnography in Education Research or Case Study Research Methods)	

EDFS 348	Analyze&Write Qualitative Rsch	
EDLP 396	Advanced Special Topics (Research Methods in Program Evaluation)	
Concentration		12
Graduate course options within CESS (guided by student interest and committee approval)		
Field of Study/Cognate		6
Transdisciplinary options outside of CESS (guided by student interest and committee approval)		
Comprehensive Exam:		
An empirical draft article on a topic agreed upon by the student, the Program Advisor, and one additional faculty reader.		
Dissertation Research Credits		21
EDLP 491	Doctoral Dissertation Research	
Total Credits		75

All course credits beyond the Core Requirements are distributed in educational leadership, research, critical perspectives, organizational change, and selected specialty content areas.

A maximum of 6 credit hours may be accepted in transfer from an accredited graduate program. Credits to transfer may be completed prior to admission to the EDLP Ph.D. program provided that the credit is approved by the student’s graduate program advisor and that the credit conforms to all other Graduate College requirements. Candidates for the Ph.D. must satisfactorily complete a minimum of 69 hours in residence. This requirement is completed by courses taken through UVM and taken after the student has been admitted to the Graduate College.

**dissertation requirements**

Dissertation expectations require a Journal Article format with a focus on original research, illustrating mastery of competing theories with the goal of informing knowledge (per Graduate College guidelines). This format requires that the candidate will complete one or more journal article(s) with the goal of manuscript submission for publication in refereed journals.

**Comprehensive Examination**

In order to assess students' scholarship and critical thinking, a comprehensive examination is required by the end of a student's course of study (typically the third year). The examination consists of a critical, empirical article on a topic to be agreed upon by the student, their mentor, and one additional faculty reader, with these individuals approving an abstract of the paper in advance. The article must demonstrate comprehensive empirical and theoretical mastery of the agreed-upon topic, including relevant knowledge on which the specific research area is based.

Once the student's advisor and 2 other faculty member deem the article original and ready for review, the student will schedule a research colloquium on the topic of the paper for the CESS

community. The student's faculty committee will serve as the examiners for the comprehensive examination. They will, by consensus, assign a grade of fail, conditional pass, or pass for the comprehensive examination. The article may later be incorporated into the student's doctoral dissertation if deemed appropriate by the student's dissertation committee.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of all core courses with 3.00 GPA and a comprehensive examination, as well as defense of a dissertation proposal, allows the student to advance to doctoral candidacy.

For further requirements concerning program advising and Ph.D. requirements, refer to the Educational Leadership and Policy Studies doctoral programs website.

## ELECTRICAL ENGINEERING

<http://www.uvm.edu/~cems/soe/>

### OVERVIEW

The Electrical Engineering (EE) program at the University of Vermont is at the forefront of research in the areas of digital signal processing, control systems, power and energy systems, wireless communications, and electronic circuit and system design and testing. This rigorous and focused program offers competitive funding and prepares graduate students for careers in research and technical leadership. Graduate students can contribute to interdisciplinary research within a broad range of applications, including power/energy, biomedical, aerospace, and transportation. In addition, the EE program partners with other academic units to offer M.S. and Ph.D. degrees in Materials Science and a Ph.D. degree in Biomedical Engineering.

### DEGREES

- Electrical Engineering AMP (p. 148)
- Electrical Engineering M.S. (p. 149)
- Electrical Engineering Ph.D. (p. 149)

### FACULTY

**Almassalkhi, Mads;** Associate Professor, Department of Electrical and Biomedical Engineering; PHD, University of Michigan

**Bates, Jason H. T.;** Professor, Department of Electrical and Biomedical Engineering; DSC, Canterbury University; PHD, University of Otago

**Bongard, Joshua C.;** Professor, Department of Computer Science; PHD, University of Zurich

**Cipolla, Marilyn Jo;** Professor, Department of Neurological Sciences; Chair, Department of Electrical and Biomedical Engineering; PHD, University of Vermont

**Doiron, Amber L.;** Assistant Professor; Department of Electrical and Biomedical Engineering; PHD, University of Texas Austin

**Duffaut Espinosa, Luis;** Assistant Professor, Department of Electrical and Biomedical Engineering; PHD, Old Dominion University

**Frolik, Jeff L.;** Professor, Department of Electrical and Biomedical Engineering; PHD, University of Michigan

**Hines, Paul D.;** Professor, Department of Electrical and Biomedical Engineering; PHD, Carnegie Mellon University

**Jangraw, David;** Assistant Professor, Department of Electrical and Biomedical Engineering, PhD, Columbia University

**Lee, Byung S.;** Professor, Department of Computer Science; PHD, Stanford University

**McGinnis, Ryan;** Assistant Professor, Department of Electrical and Biomedical Engineering; PHD, University of Michigan

**Ossareh, Hamid-Reza;** Assistant Professor, Department of Electrical and Biomedical Engineering, PHD; University of Michigan

**Wshah, Safwan;** Assistant Professor, Department of Computer Science; PHD, State University of New York at Buffalo

**Xia, Tian;** Professor, Department of Electrical and Biomedical Engineering; PHD, University of Rhode Island

## ELECTRICAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Qualified undergraduate students who plan to earn a M.S. in electrical engineering may enroll in the Accelerated Master's Entry Program, which enables students to begin working on the M.S. while still an undergraduate. Students apply to the program by the second semester of their junior year. Following acceptance by the Graduate College, students may take up to 6 graduate credits while still an undergraduate that can be counted toward both the B.S. and the M.S. degrees. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree. This is subject to approval of the student's graduate advisor. Students in the program who want to pursue the thesis option typically engage in research in the summer following their junior year

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

To apply to the program, students must have a cumulative grade point average of at least 3.20 at the time of application, must submit a letter of application to the graduate program coordinator naming a faculty member who has agreed to serve as their graduate advisor and must complete the Graduate College application.

#### Minimum Degree Requirements

Advanced courses in electrical engineering, physics, computer science, and mathematics (18 to 24 credits) with at least 15 credits appropriately distributed in approved areas of study in the Electrical Engineering department. Thesis research (6 to 12 credits).

Students are free to pursue any M.S. degree option: thesis, project, or course-work only options. For students interested in academic

research and working closely with a faculty advisor, a thesis is normally expected in the program.

In all cases, successful completion of the M.S. degree will require passing a comprehensive examination. This examination will in part be based on course work that was taken in the pursuit of the M.S. degree. Thesis option students will be tested orally at the time of their thesis proposal while project students will be asked to write and present a report on a design or research topic of interest.

### Comprehensive Examination

M.S. Thesis Option: The student must orally present a proposal for their thesis research at least 3 months prior to graduation. The student's thesis committee will orally examine the student based on the student's coursework and research focus.

M.S. Project Option: Under the supervision of an EE graduate faculty member, the student must prepare and present a written proposal for their research project approximately 6 months prior to graduation. The student's project committee will orally examine the student based on the student's coursework and research focus.

M.S. Coursework Option: The student must complete an oral comprehensive exam during the final semester of residence at UVM based on course work for EE graduate courses where a grade below a B+ was earned.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

An accredited bachelor's degree in electrical engineering or equivalent education.

## ELECTRICAL ENGINEERING M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Electrical Engineering (EE) program at the University of Vermont (UVM) offers a program of study leading to the M.S. degree in Electrical Engineering. Areas of research expertise in electrical engineering include control systems, signal processing, electric power & energy systems, solid state physical electronics, semiconductor materials and devices, wireless communications, VLSI design & testing, and biomedical engineering.

Typically candidates have obtained the Bachelor of Science degree in Electrical Engineering prior to application but those who haven't are encouraged to apply for the program if they have extensive background in mathematics and the basic sciences. In such cases, it may be necessary for a student to complete the entrance qualifications without receiving credit toward graduate studies. The general requirements for admission by the Graduate College must be met.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An accredited bachelor's degree in an appropriate field.

### Minimum Degree Requirements

Advanced courses in electrical engineering, physics, computer science, and mathematics (18 to 24 credits) with at least 15 credits appropriately distributed in approved areas of study in the Electrical Engineering department. Thesis research (6 to 12 credits).

Students are free to pursue any M.S. degree option: thesis, project, or course-work only options. For students interested in academic research and working closely with a faculty advisor, a thesis is normally expected in the program.

In all cases, successful completion of the M.S. degree will require passing a comprehensive examination. This examination will in part be based on course work that was taken in the pursuit of the M.S. degree. Thesis option students will be tested orally at the time of their thesis proposal while project option students will be asked to write and present a report on a design or research topic of interest.

### Comprehensive Examination

M.S. Thesis Option: The student must orally present a proposal for their thesis research at least 3 months prior to graduation. The student's thesis committee will orally examine the student based on the student's coursework and research focus.

M.S. Project Option: Under the supervision of an EE graduate faculty member, the student must prepare and present a written proposal for their research project approximately 6 months prior to graduation. The student's project committee will orally examine the student based on the student's coursework and research focus.

M.S. Coursework Option: The student must complete a written and/or oral comprehensive exam during the final semester of residence at UVM.

M.S. Coursework Option: The student must complete an oral comprehensive exam during the final semester of residence at UVM based on course work for EE graduate courses where a grade below a B+ was earned.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

An accredited bachelor's degree in electrical engineering or equivalent education.

## ELECTRICAL ENGINEERING PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Electrical Engineering (EE) Ph.D. program at the University of Vermont is at the forefront of research in the areas of digital signal processing, control systems, power and energy systems,

wireless communications, and electronic circuit and system design and testing. This rigorous and focused Ph.D. program offers competitive funding and prepares graduate students for careers in research and technical leadership. EE Ph.D. graduate students can contribute to interdisciplinary research within a broad range of applications, including power/energy, biomedical, aerospace, and transportation. In addition, the EE program partners with other academic units to also offer a Ph.D. degree in Materials Science and a Ph.D. degree in Biomedical Engineering.

Typically candidates have obtained the Master of Science degree in Electrical Engineering prior to application but other applicants are encouraged to consider the program if they have extensive background in mathematics and/or the basic sciences. In such cases, it may be necessary for a student to complete the entrance qualifications without receiving credit toward graduate studies. The general requirements for admission as outlined under the Regulations of the Graduate College must be met.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy**

A master's degree in electrical engineering or the equivalent is recommended, however, exceptional applicants with a bachelor's degree in electrical engineering or the equivalent may be directly admitted. Admission to the Ph.D. program from applicants outside of electrical engineering may need to complete entrance qualifications without receiving course credit towards graduate studies.

**Minimum Degree Requirements for the Degree of Doctor of Philosophy**

A total of 75 credit hours of graduate work are required for the Ph.D. degree, with at least 51 credits taken in residence at UVM and at least 30 credits in coursework, 15 of which must be graded at UVM following matriculation into the program. These courses should be selected to meet the following requirements:

2 courses to satisfy the EE Ph.D. core requirement (≥ 6 credit hours), which consists of EE 301 (System Theory) and EE 302 (Stochastic Processes). These courses are typically offered in alternate years in the fall semester. To achieve candidacy, students must complete both courses with a B or better grade.	
At least 3 additional courses (≥ 9 credit hours) of advanced topics in electrical engineering (200 or higher) specifically selected with their graduate advisor to facilitate your research goals.	
To bolster their background in a particular area and with their advisor's approval, a student may apply 3 100 or 200-level (that are not already approved for graduate credit) credit hours to their Ph.D. degree requirements. These credits may apply to the 75 in total required but not to the 15 credits of EE coursework specified above. Students interested in taking this course for graduate credit will need to submit a Permission to Take a 100/200 Level Course for Graduate Credit Form to the Graduate College before the first day of class.	
A student with a M.S. degree in Electrical Engineering can apply up to 24 credit hours from this M.S. degree toward the Ph.D. coursework requirements, subject to the approval of the EE graduate studies committee.	

At least 20 credit hours of EE 491, doctoral dissertation research, supervised by the student's Ph.D. advisor.	
Following the successful completion of all course and research credits, students requiring continuing registration must enroll in either GRAD 901 (less than half-time), GRAD 902 (at least half-time), or GRAD 903 (full-time) as a reflection of their current research activity.	

Students should complete a coursework plan in their first year of Ph.D. studies, and submit this plan to the graduate studies committee for review.

**Comprehensive Examination**

To be eligible for taking the comprehensive exam, the student must have completed taking 1 of the 2 EE core courses (EE 301 or EE 302) with passing grades B or higher. Candidacy is achieved with successful completion of the exam and successful completion (B or higher) of the second EE core course (EE 301 or EE 302) before the end of their 4th semester.

The written part of the examination will be a report presented in the form of an IEEE conference paper, with the format of double column and maximum length of 6 pages. The paper will be focused on a research topic in the area of the candidate's dissertation work, and will comprise three Specific Aims:

1. Introduction, background and literature review related to the research problem. Development of a comprehensive bibliography related to their research topic.
2. A clear description of open issues related to the research topic. Discussion of the value and innovative aspects of the student's proposed research.
3. Proposed research approach description, hypothesis(es) and/or goal(s), potential barriers and possible solutions, preliminary data, and experimental design plan.

The first aim will demonstrate the student's ability to collect and contextualize prior art in the area of research. The second aim will demonstrate the student's ability to identify new research problems and justify their value to the field. The third aim will be a "stretch aim" that extends beyond the completed aspects of the candidate's research. In this third aim, the candidate will be expected to exhibit evidence of an ability to generate imaginative and thoughtful hypotheses, and to think laterally about how their PhD research area could be developed in a new direction. The candidate should gain the approval of their thesis committee regarding the general area of the proposal prior to beginning work on it.

The oral part of the comprehensive examination will be a formal seminar by the student in front of the faculty committee, to take place after the committee members have had a chance to review the written report, which should be in the hands of the committee members at least 2 weeks prior to the oral presentation. The student will be asked to defend the paper and to answer any additional questions the committee members feel appropriate. It is expected that there will be specific questions directly associated with broad electrical

engineering fundamentals. The expectation is that the oral portion will be completed prior the start of the student's 3rd semester.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of Ph.D. comprehensive examinations.

The majority of students will have completed a core program comprising graduate courses before taking the comprehensive examination.

## ENGINEERING MANAGEMENT

**This program is not currently accepting students.**

### FACULTY

**Burkman, Kenneth<sup>P</sup>**; Senior Lecturer, Department of Engineering Management; MS, Naval Postgraduate School

**Buzas, Jeff Sandor**; Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Dewoolkar, Mandar M.**; Professor, Civil and Environmental Engineering; PHD, University of Colorado Boulder

**Dubief, Yves C.**; Associate Professor Department of Mechanical Engineering; PHD, Institut National Polytechnique de Grenoble

**Frolik, Jeff L.**; Professor, Department of Electrical and Biomedical Engineering; PHD, University of Michigan Ann Arbor

**Huston, Dryver R.**; Professor, Department of Mechanical Engineering; PHD, Princeton University

**Lucas, Marilyn T.**; Associate Professor, Grossman School of Business; PHD, University of Illinois Urbana-Champaign

**Monsen, Erik**; Associate Professor, Grossman School of Business; PHD, University of Colorado at Boulder

<sup>P</sup> Practitioner-based appointment

## ENGINEERING MANAGEMENT AMP

**This program is not currently accepting students.**

## ENGINEERING MANAGEMENT M.S.

**This program is not currently accepting students.**

## ENGLISH

<http://www.uvm.edu/~english/>

### OVERVIEW

The degree combines the history of literatures in English, from the Medieval period to the 21st century, with literary theory and cultural criticism. The department also has graduate faculty who specialize in Film and Television Studies, and Rhetoric and Composition.

### DEGREES

- English AMP (p. 152)
- English M.A. (p. 153)

## FACULTY

**Alexander, Sarah C.**; Associate Professor, Department of English; PHD, Rutgers University

**Barnaby, Andrew Thomas**; Professor, Department of English; PHD, Princeton University

**Baruth, Philip Edward**; Professor, Department of English; PHD, University of California Irvine

**Bernard, Emily E.**; Professor, Department of English; PHD, Yale University

**Besette, Jean M.**; Associate Professor, Department of English; PHD, University of Pittsburgh

**Bottoms, Gregory Todd**; Professor, Department of English; MFA, University of Virginia

**Fenton, Elizabeth A.**; Professor, Department of English; PHD, Rice University

**Fogel, Daniel Mark**; Professor, Department of English; PHD, Cornell University

**Gennari, John**; Professor, Department of English; PHD, University of Pennsylvania

**Harrington, Susanmarie**; Professor, Department of English; PHD, University of Michigan Ann Arbor

**Huh, Jinny**; Associate Professor, Department of English; PHD, University of Southern California

**Jenemann, David**; Dean, Honors College; Professor, Department of English; PHD, University of Minnesota Twin Cities

**Kete, Mary Louise**; Professor, Department of English; PHD, Harvard University

**Lindstrom, Eric Reid**; Professor, Department of English; PHD, Yale University

**Losambe, Lokangaka**; Professor, Department of English; PHD, University of Ibadan

**Magistrale, Anthony Samuel**; Professor, Department of English; PHD, University of Pittsburgh

**McGowan, Todd**; Professor, Department of English; PHD, Ohio State University

**Morgan Parmett, Helen**; Associate Professor, Department of Theatre; PHD, University of Minnesota, Twin Cities

**Neroni, Hilary L.**; Professor, Department of English; PHD, University of Southern California

**Nilsen, Sarah Dawn**; Associate Professor, Department of English; PHD, University of Southern California

**Noel, Deborah**; Senior Lecturer, Department of English; PHD, University of Georgia

**Rohy, Valerie**; Professor, Department of English; PHD, Tufts University

**Schnell, Lisa Jane**; Associate Professor, Department of English; PHD, Princeton University

**Scott, Helen C.**; Professor, Department of English; PHD, Brown University

**Sisk, Jennifer L.**; Associate Professor, Department of English; PHD, Yale University

**Turner, Sarah**; Senior Lecturer, Department of English; PHD, Case Western Reserve University

**Witters, Sean A.**; Senior Lecturer; Department of English; PHD; Brandeis University



**Yoo, Hyon Joo**; Associate Professor, Department of English; PHD, Syracuse University

## ENGLISH AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Accelerated Master's Degree (AMP) entry programs are designed to allow current UVM undergraduate students to earn both bachelor's and master's degrees within a total of 5 years. Accepted AMP students in the department of English begin work toward their M.A. during their senior year while completing the B.A. Up to 9 credits may be taken in the senior year that count toward both the B.A. and the M.A.. 3 credits toward the MA are then taken in the summer after graduation, and the remaining MA credits (9 per semester) are completed in year 5.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Arts for Accelerated Students

An undergraduate major in English or its equivalent with evidence (in the form of transcripts, letters of recommendation from UVM faculty members, and writing sample) that the applicant's undergraduate career has adequately prepared him or her for the particular demands of graduate study (please contact the Director of Graduate Studies with questions regarding preparedness for graduate-level study of English); minimum cumulative GPA of 3.0; and demonstration of proficiency in writing (both by a statement of purpose detailing the applicant's academic interests and research agenda and by the writing sample). GRE scores are not required.

AMP students must choose the thesis or comprehensive option before the end of their senior year. Those AMP students electing to follow the thesis track must identify the thesis advisor before the end of the senior year. By the end of that academic year these thesis students will also submit a comprehensive reading list that will be the basis of preparation for the thesis exam. Those AMP students electing to follow the comprehensive track will choose advisors and submit reading lists for 3 field exams by the end of their senior year.

#### Minimum Degree Requirements for the Degree of Master of arts

OPTION A (THESIS)		
ENGS 350	Surv of Lit Theory & Criticism	3
7 additional courses		

Students may take ONE 100- or 200-level course for graduate credit with approval of the course instructor, the Director of Graduate Studies, and the Graduate College. (Please note that most English department Senior Seminars—course numbers 201-282—are preapproved for graduate credit and are exempted from this restriction.) Candidates must also submit a relevant reading list, pass a 4-hour written comprehensive exam based on it, complete 6 additional credits by writing an acceptable thesis (ENGS 391), and defend the thesis successfully in a 1-hour oral exam. Please note that all incoming Teaching Assistants are required to take ENGS 345. This 3-credit course does count toward the requisite number of credits for course work (for both options).		
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OPTION B (COMPREHENSIVE OPTION)		
ENGS 350	Surv of Lit Theory & Criticism	3
9 additional courses		
Students may take 1 100- or 200-level course for graduate credit with approval of the course instructor, the Director of Graduate Studies, and the Graduate College. (Please note that most English department Senior Seminars—course numbers 201-282—are preapproved for graduate credit and are exempted from this restriction.) Candidates must submit 3 reading lists (covering three different areas of the discipline) and pass a 4-hour written comprehensive exam based on them. Please note that all incoming Teaching Assistants are required to take ENGS 345. This 3-credit course does count toward the requisite number of credits for course work (for both options).		

### Comprehensive Examination

AMP students writing a thesis take their exam in the fall of their fifth year of study (first year following completion of the bachelor's degree). Students completing the Comprehensive Option track take their exam in the spring of their fifth year of study (first year following completion of the bachelor's degree). In both cases, the exam consists of three 75-minute essays. Exams are open-book and open-notes, but no portion of the exam may be pre-written.

For the Thesis Option exam, the student's first and second readers evaluate all three essays. If their assessments differ on any essay, the Director of Graduate Studies will ask an appropriate third reader to break the tie. Students who fail 1 or more essays have failed the examination and may ask to be re-tested not less than 1 month after the examination date. The first reader, in consultation with the second reader, will determine what constitutes a fair re-examination. Both readers assess the re-examination essay or essays. Students who fail all or part of their re-examination must leave the Master's program.

For the Comprehensive Option, each of the student's 3 examiners will provide the student with an examination question. (A faculty member may write more than 1 question and offer the student a choice of essays to write.) The composer of each question grades that response. Students who fail 1 of their 3 essays may be re-tested in that area. Students who fail 2 or 3 areas must retake the entire examination. Any student who fails any part of the re-examination must leave the Master's program.

## Requirements for Advancement to Candidacy for the Degree of Master of arts

Completion of the above requirements.

## ENGLISH M.A.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The degree combines the history of literatures in English, from the Medieval period to the 21st century, with literary theory and cultural criticism. The department also has graduate faculty who specialize in Film and Television Studies, and Rhetoric and Composition.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Arts

An undergraduate major in English or its equivalent with evidence (in the form of transcripts, letters of recommendation, and writing sample) that the applicant's undergraduate career provided adequate preparation for the particular demands of graduate study (please contact the Director of Graduate Studies with questions regarding preparedness for graduate-level study of English); and demonstration of proficiency in writing (both by a statement of purpose detailing the applicant's academic interests and research agenda and by the writing sample).

#### Minimum Degree Requirements for the Degree of Master of Arts

OPTION A (THESIS)			
Completion of 24 credits of course work (normally 8 courses), including:			
ENGS 350	Surv of Lit Theory & Criticism		3
7 additional courses			21
Students may take 1 100- or 200-level course for graduate credit with approval of the course instructor, the Director of Graduate Studies, and the Graduate College. (Please note that most English department Senior Seminars—course numbers 201-282—are preapproved for graduate credit and are exempted from this restriction.) Candidates must also submit a relevant reading list, pass a 4-hour written comprehensive exam based on it, complete 6 additional credits by writing an acceptable thesis (ENGS 391), and defend the thesis successfully in a 1-hour oral exam. Please note that all incoming Teaching Assistants are required to take ENGS 345. This 3-credit course does count toward the requisite number of credits for course work (for both options).			

OPTION B (COMPREHENSIVE OPTION)			
Completion of 30 credits of course work (normally 10 courses), including:			
ENGS 350	Surv of Lit Theory & Criticism		3
9 additional courses			27

Students may take 1 100- or 200-level course for graduate credit with approval of the course instructor, the Director of Graduate Studies, and the Graduate College. (Please note that most English department Senior Seminars—course numbers 201-282—are preapproved for graduate credit and are exempted from this restriction.) Candidates must submit 3 reading lists (covering 3 different areas of the discipline) and pass a 4-hour written comprehensive exam based on them. Please note that all incoming Teaching Assistants are required to take ENGS 345. This 3-credit course does count toward the requisite number of credits for course work (for both options).

### Comprehensive Examination

Students writing a thesis take their exam in the fall of their second year. Students completing the Comprehensive Option track take their exam in the spring of their second year. In both cases, the exam consists of three 75-minute essays. Exams are open-book and open-notes, but no portion of the exam may be pre-written.

For the Thesis Option exam, the student's first and second readers evaluate all three essays. If their assessments differ on any essay, the Director of Graduate Studies will ask an appropriate third reader to break the tie. Students who fail 1 or more essays have failed the examination and may ask to be re-tested not less than 1 month after the examination date. The first reader, in consultation with the second reader, will determine what constitutes a fair re-examination. Both readers assess the re-examination essay or essays. Students who fail all or part of their re-examination must leave the Master's program.

For the Comprehensive Option, each of the student's 3 examiners will provide the student with an examination question. (A faculty member may write more than 1 question and offer the student a choice of essays to write.) The composer of each question grades that response. Students who fail 1 of their 3 essays may be re-tested in that area. Students who fail 2 or 3 areas must retake the entire examination. Any student who fails any part of the re-examination must leave the Master's program.

#### Requirements for Advancement to Candidacy for the Degree of Master of Arts

Completion of the above requirements.

## FIELD NATURALIST (PLANT BIOLOGY)

<http://www.uvm.edu/cals/plantbiology/field-naturalist-program>  
(<http://www.uvm.edu/~plantbio/>)

### OVERVIEW

The Field Naturalist Program is a unique field-based experience that develops the potential of tomorrow's conservation leaders by emphasizing scientific integration, oral and written communication, and environmental problem solving. Students receive a solid grounding in field-related sciences and are trained to integrate scientific disciplines into a coherent whole at the landscape level. Students also develop competence in evaluating field sites from a number of perspectives and/or criteria, translating scientific insights into ecologically sound decisions, and communicating effectively to a wide range of audiences.

## DEGREES

- Field Naturalist (Plant Biology) M.S. (p. 154)

## FACULTY

**Barrington, David Stanley;** Professor, Department of Plant Biology; PHD, Harvard University

**Paris, Catherine Ann;** Senior Lecturer, Department of Plant Biology; PHD, University of Vermont

**Poleman, Walter Mallery;** Senior Lecturer, Rubenstein School of Environment and Natural Resources; MS, University of Vermont

**Sundue, Michael A.;** Research Assistant Professor, Department of Plant Biology; PHD, CUNY Graduate Center / The New York Botanical Garden

## FIELD NATURALIST (PLANT BIOLOGY) M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Field Naturalist Program is a unique field-based experience that develops the potential of tomorrow's conservation leaders by emphasizing scientific integration, oral and written communication, and environmental problem solving. Students receive a solid grounding in field-related sciences and are trained to integrate scientific disciplines into a coherent whole at the landscape level. Students also develop competence in evaluating field sites from a number of perspectives and/or criteria, translating scientific insights into ecologically sound decisions, and communicating effectively to a wide range of audiences.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science, Field Naturalist Option

- Sustained interest and engagement in the environment
- A track record of academic and professional achievement in science or environment
- Compelling recommendations
- At least two years of job, professional, or life experience after college

#### Minimum Degree Requirements

All students must successfully complete a total of 30 credit hours including a set of core courses in the field sciences and professional writing as well as elective courses in the life sciences, earth sciences, and ecology, to be chosen in consultation with the student's advisor and studies committee. Satisfactory completion of an oral comprehensive examination is required. A Field Naturalist student's degree culminates in satisfactory completion of a field project for a sponsoring organization that includes a professional report, a literature review, two oral presentations, and a journal publication or an article for a general audience.

### Comprehensive Examination

An oral examination takes place in the student's second year. During this examination the student identifies, inventories and assesses the pieces, patterns, and processes of a previously unvisited landscape, and presents findings in a manner that would be meaningful to staff, officers, and scientists of a professional conservation organization.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Satisfactory completion of an oral comprehensive examination.

## FOOD SYSTEMS

[https://www.uvm.edu/foodsystems/graduate\\_programs](https://www.uvm.edu/foodsystems/graduate_programs) ([https://www.uvm.edu/foodsystems/graduate\\_programs/](https://www.uvm.edu/foodsystems/graduate_programs/))

### OVERVIEW

Food Systems is an exciting and flourishing domain of inquiry, one that looks at the complex and interdependent relationships between humans and their food - everything from microbes found in compost facilities to global trade agreements.

Always keeping in mind that food systems are evolving and dynamic, our curriculum integrates social science, humanities and natural science approaches to understanding connections among vital interests of humanity in creating nourishment, pursuing health and well-being and sustaining the environment.

The program draws from over 30 UVM faculty members with primary affiliations in 14 departments extended across 5 colleges. The program curriculum integrates humanities, social and natural science approaches to understanding complex and interdependent food systems of varying scope and scale.

Students examine key issues in our contemporary food system through:

- Collaborate with community partners on a variety of food systems problems and solutions
- Engage in experiential education from farm-to-plate, in the field and in the laboratory
- Integrate ideas and knowledge using a transdisciplinary approach

### DEGREES

- Food Systems AMP (p. 155)
- Food Systems M.S. (p. 156)
- Food Systems Ph.D. (p. 157)

## FACULTY

**Barlow, John;** Associate Professor, Department of Animal and Veterinary Sciences; DVM, University of Illinois Urbana-Champaign; PHD, University of Vermont

**Bartlett, Robert, V.;** Professor, Department of Political Science; PHD, Indiana University Bloomington

**Belarmino, Emily Morgan;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, London School of Hygiene and Tropical Medicine

**Bertmann, Farryl;** Senior Lecturer, Department of Nutrition and Food Sciences; PHD, Arizona State University

**Bishop-von Wettberg, Eric;** Associate Professor, Department of Plant and Soil Science; PHD, Brown University

**Bose, Pablo Shiladitya;** Associate Professor, Department of Geography; PHD, York University

**Chase, Lisa;** Extension Professor: Natural Resources Specialist and Director of the Vermont Tourism Research Center; PHD, Cornell University

**Chen, Yolanda H.;** Associate Professor, Department of Plant and Soil Science; PHD, University of California Berkeley

**Conner, David S.;** Associate Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**DeWitt, Rocki-Lee;** Professor, Grossman School of Business; PHD, Columbia University

**Doggett, Tyler;** Professor, Department of Philosophy; PHD, Massachusetts Institute of Technology

**Etter, Andrea J.;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, Purdue University

**Farley, Joshua C.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Floreani, Rachael Ann;** Associate Professor, Department of Mechanical Engineering; PHD, Colorado State University

**Galford, Gillian;** Research Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, Brown University

**Garnett, Bernice Raveche;** Associate Professor, Department of Education; SCD, Harvard University

**Gennari, John;** Professor, Department of English; PHD, University of Pennsylvania

**Greenwood, Sabrina Louise;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, University of Guelph

**Harvey, Jean Ruth;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pittsburgh

**Heiss, Sarah Noel;** Associate Professor, Department of Community Development and Applied Economics; PHD, Ohio University

**Hurley, Stephanie E.;** Associate Professor, Department of Plant and Soil Science; DDES, Harvard University

**Jorgenson, Simon;** Assistant Professor, Department of Education; PHD, University of Cincinnati

**Kindstedt, Paul Stephen;** Professor, Department of Nutrition and Food Sciences; PHD, Cornell University

**Koliba, Christopher J.;** Professor, Department of Community Development and Applied Economics; PHD, Syracuse University

**Kolodinsky, Jane Marie;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Kraft, Jana;** Associate Professor, Department of Animal and Veterinary Sciences; PHD, Friedrich-Schiller-University of Jena

**Mares, Teresa Marie;** Associate Professor, Department of Anthropology; PHD, University of Washington

**Mazzoni, Cristina;** Wolfgang and Barbara Mieder Green and Gold Professor of Italian; PHD, Yale University

**Mendez, Victor E.;** Professor, Department of Plant and Soil Science; PHD, University of California Santa Cruz

**Merrill, Scott;** Research Assistant Professor, Department of Plant and Soil Science, PHD, Colorado State University

**Morse, Cheryl E.;** Associate Professor, Department of Geography; PHD, University of British Columbia

**Neher, Deborah;** Professor, Department of Plant and Soil Science; PHD, University of California Davis

**Pinel, Elizabeth;** Professor, Department of Psychological Science; PHD, University of Texas at Austin

**Pope, Lizzy;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, University of Vermont

**Reynolds, Travis;** Associate Professor, Department of Community Development and Applied Economics; PHD, University of Washington

**Smith, Julia M.;** Research Associate Professor, Department of Animal and Veterinary Sciences; DVM, Cornell University

**Tobin, Daniel;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Pennsylvania State University

**Trubek, Amy B.;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pennsylvania

**Usher, Mark D.;** Lyman-Roberts Professor of Classics, Department of Classics; PHD, University of Chicago

**Zia, Asim;** Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## FOOD SYSTEMS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Qualified University of Vermont undergraduate students who plan to earn a Master's degree in Food Systems may enroll in the Accelerated Master's Entry Program (AMP), which enables students to begin working on a master's degree while still an undergraduate. Students apply to the program in the second semester of their junior year or the first semester of their senior year. After admission to the graduate program by the Graduate College, students will choose up to 9 credits of graduate level courses from the list of approved electives below that can be taken while still an undergraduate. These credits will also count towards the master's degree.

### APPROVED ELECTIVES - FOR AMP STUDENTS PRIOR TO COMPLETION OF THE BACHELOR'S DEGREE.

The instructor of record must acknowledge their registration at the graduate level before the course begins.

ENVS 212 - Advanced Agroecology  
 CDAE 208/ASCI 208 - Agricultural Policy & Ethics  
 CDAE 237 - Economics of Sustainability  
 NFS 313 - Food Safety & Public Policy  
 CDAE 326 - Community Economic Development  
 CDAE 354 - Advanced Microeconomics  
 PA 306 - Policy Systems  
 PA 317 - Systems Analysis & Strategic Management  
 PH 312 - Food Systems & Public Health  
 CDAE 321- Economics of Sustainable Food Systems

## SPECIFIC REQUIREMENTS

Must be a UVM student with a declared Major or Minor in Food Systems. Please visit the Food Systems Graduate program website for application information and deadlines.

### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Master's Students

- A declared Food Systems Major or Minor
- Cumulative GPA of 3.00 or higher
- Completion of a college-level statistics course
- Completion of the Graduate College application form and three letters of recommendation, including a faculty letter of support from a current Food Systems Graduate Faculty member

### Minimum Degree Requirements

31 credits, including a 3-4 credit final project		
Required Courses:		
FS 335	Qualitative Research Methods (Spring)	3
FS 345	Food Systems, Soc & Policy (Fall)	3
FS 340	Food Systems, Science & Policy (Spring)	3
FS 351	Professional Development Sem. (Spring)	1
CDAE 351	Research & Evaluation Methods (Fall)	3
FS 392	Master's Project Research	3-4
The remainder of required credit hours must be satisfied through graded electives.		
AMP students may only complete a Master's Project. They cannot do a thesis as the capstone for their Master's degree.		

### Comprehensive Examination

There is a required comprehensive examination. The details and format are decided upon by the Student Development & Evaluation Committee and will be discussed with the student well in advance of the exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Satisfactory completion of the Comprehensive Exam.

## FOOD SYSTEMS M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

Food Systems M.S. graduates gain a broad and deep understanding of contemporary food systems, as well as a set of applied skills and experience – preparing them to succeed.

Most students complete required coursework and spend one semester designing and researching a final project. However, upon

request of a Food Systems faculty member, a student can design and complete a year-long thesis research project.

For more information, please contact the Program Coordinator.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

The Food Systems Graduate Program is transdisciplinary and involves an understanding of social, physical, and life science concepts related to food from production through consumption. Therefore, students from all academic backgrounds are welcome to apply.

Minimum requirements include:

- GPA of 3.00 or higher.
- TOEFL or IELTS exam scores must be submitted if you are an international student.
- Completion of a college-level statistics course. If this information is not clearly listed on a college transcript, you will need to provide additional documentation as evidence that you have fulfilled this requirement.

### Minimum Degree Requirements

31 credit hours, including:

Required Courses:		
FS 335	Qualitative Research Methods (Spring)	3
FS 345	Food Systems, Soc & Policy (Fall)	3
FS 340	Food Systems, Science & Policy (Spring)	3
FS 351	Professional Development Sem. (Spring)	1
CDAE 351	Research & Evaluation Methods (Fall)	3
FS 392	Master's Project Research (Project Students)	3-4
FS 391	Master's Thesis Research (Thesis Students)	6
The remainder of required credit hours must be satisfied through graded electives. This is 14-15 credits for students completing a project, and 12 credits for students completing a thesis.		
Students taking FS 391 must complete and defend a thesis in order to graduate. Students taking FS 392 must complete and defend a project in order to graduate.		

### Comprehensive Examination

There is a required comprehensive examination. The details and format are decided upon by the Student Development & Evaluation Committee and will be discussed with the student well in advance of the exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Satisfactory completion of all degree requirements and the Comprehensive Exam.

## FOOD SYSTEMS PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforthedoctorofphilosophydegree/>)

### OVERVIEW

The PhD in Food Systems combines a comprehensive investigation of food systems and a commitment to developing methods for solving the current problems of the food system through a cohort intensive experience. Every year, the food systems cohort will work together to address problems and devise potential solutions. Students then move towards disciplinary depth and mastery by designing a course of study with a dissertation committee and developing a research proposal. Students will also engage in independent research.

### SPECIFIC REQUIREMENTS

#### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

There are two ways for a potential PhD candidate to pursue this program. First, a student with a BA/BS can apply to the PhD program. Second, a student can apply to the PhD after completing an MA or MS in an allied field, either at the University of Vermont or at another institution.

Minimum requirements include:

- GPA of 3.00 or higher
- TOEFL or IELTS exam scores must be submitted if you are an international student.
- Completion of a college-level statistics course. If this information is not clearly listed on a college transcript, you will need to provide additional documentation as evidence that you have fulfilled this requirement.
- A letter of support from a Food Systems Faculty member who agrees to serve as primary advisor during enrollment in the PhD Program.

#### MINIMUM DEGREE REQUIREMENTS

75 credits, including a minimum of 30 hours of graded coursework and 20 credits of supervised dissertation research.

Required Courses:		
FS 345	Food Systems, Soc & Policy	3
FS 340	Food Systems, Science & Policy	3
FS 355	Ethics and the Food System	3
FS 491	Doctoral Dissertation Research	minimum of 20 credits
EDLP 449	Dissertation Writing Seminar	1-3
or FS 360	Dissertation Writing Seminar	

Students must also take a minimum of 9 credits of methodology coursework in consultation with advisor that represent a variety of methodological and research design approaches, such as FS 335, CDAE 351, EDLP 459, and CSYS 302. Consult with advisor for complete list.	
Students must also take FS 381 - Issues and Solutions Seminar 2 times during their course of study. This is a 1-credit seminar.	2

### COMPREHENSIVE EXAMINATION

The comprehensive examination is a tool to evaluate the progress of each student and ensure that they are prepared to proceed toward the doctorate degree.

Phase 1 is an oral exam that tests the student's ability to read, analyze and synthesize scholarly knowledge across disciplines as well as to design a research-based response to a specific food systems issue or problem.

Phase 2 includes two steps: a dissertation pre-proposal and proposal submission. The form, content and timeline will be explained to the student by their advisor and will follow guidelines set forth by the Student Development & Evaluation Committee, in collaboration with the student's dissertation committee.

#### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Maintain a 3.00 GPA in designated first and second year courses and successful completion of the comprehensive exam.

## GEOLOGY

<http://www.uvm.edu/~geology/>

### OVERVIEW

The Master of Science in geology is a rigorous research thesis program with grounding in related course work. Research programs include environmental geology; geomorphology; water resources; environmental (bio)geochemistry; mineralogy; sedimentary, igneous and metamorphic environments; geochronology and structural geology; tectonics; and the evolution of orogen. Examples of specific faculty interests include geologic history and recent sedimentation in the Lake Champlain Basin; processes and chronology of glaciation; stable and cosmogenic isotopic studies; water quality and pollutant transport; crystal chemistry and crystallography; mineral structure analysis; molecular-scale environmental mineralogy; (bio)geochemical cycling in the critical zone; the tectonic evolution of continental margins and interiors; petrofabric and structural analysis of deformed rocks; partial melting and deep crustal processes; timing of deformation and rates of tectonic processes; and stratigraphy and sedimentary environments of lower Paleozoic sandstones and carbonates.

### DEGREES

- Geology M.S. (p. 158)

## FACULTY

**Klepeis, Keith Andrew;** Professor, Department of Geography and Geosciences; PHD, University of Texas Austin

**Lini, Andrea;** Associate Professor, Department of Geography and Geosciences; PHD, ETH-Zurich

**Perdrial, Julia Nathalie;** Assistant Professor, Department of Geography and Geosciences; PHD, Université Louis-Pasteur, Strasbourg, France

**Perdrial, Nicolas;** Research Assistant Professor, Department of Geography and Geosciences; PHD, Université Louis-Pasteur, Strasbourg, France

**Schroth, Andrew W.;** Research Associate Professor, Department of Geography and Geosciences; PHD, Dartmouth College

**Webb, Laura E.;** Associate Professor, Department of Geography and Geosciences; PHD, Stanford University

## GEOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 260).

### OVERVIEW

The Master of Science in Geology is a rigorous research thesis program with grounding in related course work. Research programs include environmental geology; geomorphology; water resources; environmental (bio)geochemistry; mineralogy; sedimentary, igneous and metamorphic environments; geochronology and structural geology; tectonics; and the evolution of orogen. Examples of specific faculty interests include geologic history and recent sedimentation in the Lake Champlain Basin; processes and chronology of glaciation; stable and cosmogenic isotopic studies; water quality and pollutant transport; crystal chemistry and crystallography; mineral structure analysis; environmental mineralogy; water-rock interactions; (bio)geochemical cycling in the critical zone; the tectonic evolution of continental margins and interiors; petrofabric and structural analysis of deformed rocks; partial melting and deep crustal processes; timing of deformation and rates of tectonic processes; and stratigraphy and sedimentary environments of lower Paleozoic sandstones and carbonates.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

- Bachelor's degree in geology or related field from an accredited institution with year-long courses in chemistry, physics, biology, and mathematics preferred. The M.S. program is also open to undergraduate majors in physics, chemistry, biology, engineering or mathematics who have accumulated 12 semester hours of course work in geology.
- Strong undergraduate record, letters of recommendation, and satisfactory basic GRE scores.

Applicants should identify a potential faculty advisor (or advisors) and include research interests in the application statement.

Acceptance to the program is a competitive process and admission is dependent upon available Teaching and/or Research Fellowships.

#### Minimum Degree Requirements for the Degree of Master of Science

Admitted students will be assigned a 3-person advisory committee at the beginning of the first year of graduate study. The committee will prescribe a study program based on the interests of the student and the principal graduate advisor.

For the thesis option, successful writing, oral presentation and defense of a research thesis are required. Satisfactory completion will be determined by the candidate's thesis committee. Advanced courses in geology must total at least 30 semester hours, including at least one 300-level course and 6 to 9 credits for thesis research. Students enrolled in a traditional (thesis) M.S. cannot switch to the non-thesis option without prior approval from the thesis committee.

For the non-thesis option, at the time of enrollment the student must select a general area in which to write a project report. The report is the culmination of independent study and may be the result of an extensive literature search, fieldwork, laboratory work, or similar effort. The report must follow the general guidelines for writing a thesis and is subject to the principal advisor's approval. Advanced courses in geology must total at least 30 semester hours, including at least 1 300-level course and 3 to 6 credits for research.

Both options require giving a public oral defense after the thesis or non-thesis research project is completed.

For both options, a minimum of 15 graded credits used in compilation of the graduate GPA must be taken in residence at UVM. Advanced courses in related sciences are encouraged and may be substituted for some selected geology courses on approval by the departmental advisor. With the prior approval of their department and the Graduate College, students may apply one 100/200 level, 3-credit undergraduate course towards their graduate program. A student's advisor must petition the Graduate College for approval before the student enrolls in the course. Consult individual programs for further limitations. Under no circumstances will a course numbered below 100 be applicable to a master's program.

#### Comprehensive Examination

The comprehensive exam for the Geology M.S. comprises 2 parts. Part 1 is a written research proposal and oral presentation that must be completed before the end of the second semester. The proposal must discuss the research objectives and their significance and include a work plan demonstrating feasibility. The presentation is followed by geology faculty/thesis committee questions that cover the assumptions, methodology, and the relationship of the proposed work to and its dependence on auxiliary sciences. Part 2 is a written progress report and oral presentation and must be completed before the end of the third semester. The progress report presents the latest research findings and must demonstrate sufficient progress toward the M.S. degree. Faculty/committee questions cover the data presented, interpretations, and work plan to complete the thesis.

## Requirements for Advancement to Candidacy for the Degree of Master of Science

Advancement to candidacy requires satisfactory completion of a comprehensive examination. The comprehensive examination includes both a written and oral 1) research proposal and 2) progress report during the second and third semesters of enrollment, respectively.

## GERMAN

<http://www.uvm.edu/~grdept/>

### OVERVIEW

Current research interests include history of German language; Medieval literature; literature of the 18th, 19th, 20th, and 21st centuries; folklore; Exile studies; and translation studies.

### DEGREES

- German M.A. (p. 159)

### FACULTY

**Schreckenberger, Helga;** Professor, Department of German and Russian; PHD, University of Kansas

## GERMAN M.A.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

Current research interests include history of German language; Medieval literature; literature of the 18th, 19th, 20th, and 21st centuries; folklore; Exile studies; and translation studies.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Arts

An undergraduate major in German, including a year course in literature and a year course in advanced composition and conversation or the equivalent. Satisfactory scores on the Graduate Record Examinations general (aptitude) section.

#### Minimum Degree Requirements

30 credits of graduate-level courses including:

GERM 282	Sem on Particular Author	3
Additional courses in German, which may include 2 advanced courses in a related field		15-21
Thesis research		6-12

#### Comprehensive Examination

The comprehensive exam for the German M.A. degree is taken upon completion of all required coursework (at the end of the 4th semester, at latest). The exam is conducted over a period of 5 hours. Subject matter for the exam questions will be drawn from 3 German graduate

program courses of the student's choosing. In each subject area, students will answer 1 of the 3 questions offered.

## Requirements for Advancement to Candidacy for the Degree of Master of Arts

Students need to pass the comprehensive examination and successfully complete and defend a thesis.

## GREEK AND LATIN

<http://www.uvm.edu/~classics/>

### OVERVIEW

Our program emphasizes mastery of general philological skills in Greek and Latin, in preparation for further training at the doctoral level, teaching in public and private highschools, and a variety of other interesting paths. Current faculty research interests include Mycenaean and Homeric Greece; Greek and Latin lyric poetry; Greek drama; Attic orators; ancient literary criticism; Greek and Roman philosophy and intellectual history; Greek and Roman historiography; Latin epic and satire; Greek and Roman technical authors; Roman imperial families; mythology; the Ancient Near East and Egypt; ancient music and performance.

### DEGREES

- Greek and Latin AMP (p. 159)
- Greek and Latin M.A. (p. 160)
- Greek and Latin M.A.T. (p. 161)

### FACULTY

**Bailly, Jacques A.;** Associate Professor, Department of Classics; PHD, Cornell University

**Chiu, Angeline C.;** Associate Professor, Department of Classics; PHD, Princeton University

**Franklin, John C.;** Professor, Department of Classics; PHD, University College London

**Usher, Mark David;** Associate Professor, Department of Classics; PHD, University of Chicago

## GREEK AND LATIN AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

This Accelerated Master's Entry Program (AMP) offers select UVM undergraduate students of Greek and Latin an opportunity to earn both the bachelor's and master's degrees in Greek and Latin in 5 years. 9 credits toward the M.A. are earned during the senior year that may also count toward the B.A. The remaining M.A. credits are completed in the 5th year. Full-time graduate student status can begin the summer after undergraduate graduation and be maintained until completion of the M.A. in Greek and Latin. Students typically pursue the master's degree in Greek and Latin either as a stepping stone to doctoral work (hopefully well-funded as a result), or to teaching in high schools (typically Latin).



**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of arts for Accelerated Students**

Students must apply for and be accepted to the AMP through the standard Graduate College application process. Normally, the application and admission process must be finalized prior to the beginning of the senior year (typically in the Spring of the junior year). Students must be admitted by the Graduate College before taking any courses that will apply to the master’s degree, i.e., all courses used for the master’s degree must be taken after formal admission to the AMP. Courses approved for graduate credit are 200-level or higher with the prefix GRK, LAT, CLAS, or GKLT. Students taking a course approved for graduate credit as part of the AMP program must notify the faculty member they are taking the course at the graduate level before the course begins and must complete the additional work required of graduate students in that course. That notification must be copied to gradcoll@uvm.edu. (gradcoll@uvm.edu)

Consideration for admission requires the following:

- Minimum cumulative GPA of 3.00
- Minimum knowledge of Greek and Latin language: at least 1 course in each language at the 200-level (the more the better).
- Standard Graduate College application, including:
- Completion of the Graduate College Application form
  - 3 letters of recommendation from UVM faculty members
  - Reading knowledge of German (preferred), French, or Italian. Students lacking this may submit a plan describing how they will acquire such knowledge outside of the Spring and Fall semester of their 5th year for consideration (e.g. intensive course in summer between 4th and 5th years).

**Minimum Degree Requirements for the Degree of Master of arts**

TRACK A (NON-THESIS)	
30 credits of graded course work consisting of:	
18 credits of GKLT 381 (of which 6 are taken during senior year, and 12 in the fifth year).	18
12 additional credits of advanced courses in Greek, Latin, Classics, or approved credits in related fields.	12

Most students should expect to follow Track A, since maximum exposure to language and literature is usually most beneficial at this stage-of-career. The development of research and writing samples for subsequent Ph.D. applications comes rather from 4 research papers (1 per semester).

TRACK B (THESIS)	
6 credits of thesis research (GKLT 391), and successful completion and defense of a master's thesis.	6
6 credits of GKLT 381 (Seminar)	6
18 credits of GKLT 381 (as in Track A).	18

6 additional credits in Greek, Latin, Classics, or approved credits in related fields	6
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Note: Students desiring to do an M.A. thesis must 1) secure explicit recommendations that they be allowed to do so from the 3 faculty who write recommendation letters for them to be admitted to the AMP; 2) identify the thesis advisor before the end of senior year; and 3) successfully complete the translation part of comprehensive M.A. Exams at the beginning of the Fall semester of their 5th year.

Both Options	
Comprehensive Examinations (see below)	

**Comprehensive Examination**

Comprehensive Exams may be taken in the first and last 2 weeks of Fall and Spring semesters. The Exams are in the following subjects: 1) Greek and Latin sight translation of passages from the department’s reading list. This must be attempted at the start of the fifth year; if not passed on the first attempt, it may be retaken at the start of the Spring term); 2) Greek and Roman History; 3) Literature and Philology. 4) Modern Language: reading knowledge of German (preferred), French, or Italian, sufficient to conduct research in that language.

**Requirements for Advancement to Candidacy for the Degree of Master of arts**

Completion of all requirements listed above for either the thesis or the non-thesis option.

**GREEK AND LATIN M.A.**

All students must meet the Requirements for the Master's Degree (p. 260)

**OVERVIEW**

Our program emphasizes mastery of general philological skills in Greek and Latin, in preparation for further training at the doctoral level, teaching in public and private high schools, and a variety of other interesting paths. Current faculty research interests include Mycenaean and Homeric Greece; Greek and Latin lyric poetry; Greek drama; Attic orators; ancient literary criticism; Greek and Roman philosophy and intellectual history; Greek and Roman historiography; Latin epic and satire; Greek and Roman technical authors; Roman imperial families; mythology; the Ancient Near East and Egypt; ancient music and performance.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Arts**

An undergraduate major or minor or the equivalent; Greek and Latin language skills sufficient to take advanced courses (usually at least 2 years of each); a reading knowledge of a modern foreign language, usually French, German, or Italian.

**Minimum Degree Requirements**

Track A (Non-Thesis)	
30 credits of graded course work. The 30 credits of course work consist of:	
24 credits of GKLT 381 A (Latin Seminar) and B (Greek Seminar). Each seminar involves the work of the cross-listed 200-level literature seminar, usually supplemented by a prose composition component and/or research paper.	24
6 additional credits of advanced courses in Greek, Latin, Classics, or approved credits in related fields	6

Most students should expect to follow Track A, since maximum exposure to language and literature is usually most beneficial at this stage-of-career. The development of research and writing samples for subsequent Ph.D. applications comes rather from 4 research papers (1 per semester).

Track B (Thesis), by permission	
24 credits of graded course work plus at least 6 credits of thesis research (GKLT 391), and successful completion and defense of a master's thesis. The 24 credits of course work consist of:	
18 credits of GKLT 381 (Seminar). Each seminar involves the work of the cross-listed 200-level literature seminar, supplemented by a prose composition component and/or research paper.	18
6 additional credits in Greek, Latin, Classics, or approved credits in related fields.	6

Track B (Thesis) is by permission of the Faculty, and is reserved for those with sufficiently advanced philological skill; minimally candidates must have passed the Greek and Latin Exams by the beginning of the third semester.

Both Tracks	
Comprehensive Examinations (see below)	

**Comprehensive Examination**

Comprehensive Exams may be taken in the first and last 2 weeks of Fall and Spring semesters. The Exams are in the following subjects:

- Greek and Latin sight translation of passages from the department's reading list (this exam must be attempted at the start of the third semester; if not passed on the first attempt, it may be retaken at the start of the fourth)
- Greek and Roman History
- Literature and Philology
- Modern Language (student must demonstrate reading knowledge of German (preferred), French, or Italian, sufficient to conduct research in that language)

**Requirements for Advancement to Candidacy for the Degree of Master of Arts**

Completion of all requirements listed above for either the non-thesis or thesis Track.

**GREEK AND LATIN M.A.T.**

All students must meet the Requirements for the Master's Degree (p. 260)

**OVERVIEW**

The M.A.T. is designed for 2 groups of people: those who already have licensure as secondary school teachers (but wish a higher qualification); and those who do not yet have licensure.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Arts in Teaching**

An undergraduate major or minor or the equivalent in Greek, Latin, or Classics; most importantly Greek and Latin language skills sufficient to take advanced courses (usually at least 2 years of each); a reading knowledge of a modern foreign language—especially German, French, or Italian—is highly recommended.

**Minimum Degree Requirements**

Those who already have licensure must complete a minimum of 30 credits of work, with at least 18 in the field of specialization (Latin, Greek and Classical Civilization courses) and at least 6 in education (consult with advisor in education). Those who are seeking licensure must complete at least 21 credits in the field of specialization and at least 30 credits in education (consult with advisor in education).

In all cases, the individual program of study must be approved by advisors in Classics (for the Latin and related credits) and in Education (for the education credits).

Course requirements in Latin, Greek, or Classical Civilization include:

Students must complete 18 credits of Latin at or above the 200 level, including at least 1 semester of Latin Prose Composition (LAT 211/LAT 212). The following substitutions may be possible at the discretion of the Classics faculty: 1 200-level or higher course in Roman (or Greek) history; 1 200-level or higher course in Roman (or Greek) Art History; and 200-level Greek courses.	
A second foreign language is strongly recommended, either a modern one as a second teaching field, or Greek as a complement to Latin.	
The standards of performance in courses taken with the Department of Classics will be the same as for the M.A. in Greek and Latin.	

**Description and Timing of Comprehensive Examination**

Students must take Comprehensive Exams in their field of specialization as well as in Education (please consult with Education for details about their comprehensive exam.) The student must pass the following specialization Exams:

- Latin sight translation Exam, to be taken at the end of the second semester (retaken, if needed, in the week before the start of third semester).
- Ancient History (emphasis on Roman, but including Greek and, if appropriate, Near Eastern History).

- Literature and Philology.
- Oral examination taken at the conclusion of the teaching Practicum.

The format of the Comprehensive Examinations is at the discretion of the faculty. Students pursuing licensure are strongly encouraged to complete these exams before the end of the second semester, if possible (candidates will be fully occupied by education requirements in their second year, and Classics faculty are not available to administer exams in the summer).

### Requirements for Advancement to Candidacy for the Degree of Master of Arts in Teaching

Completion of the above requirements.

## GREEK AND LATIN LANGUAGES

<http://www.uvm.edu/~classics/>

### OVERVIEW

Students and scholars in many disciplines (e.g. classics, history, English, Medieval studies, religious studies, philosophy) need proficiency in Latin and Greek to carry out research. Other students come to classics too late in their undergraduate career to acquire language proficiency at a level which qualifies them for Ph.D. or M.A.T. programs. Still other students are high school teachers who want to expand their repertoire of teaching subjects or who simply want to improve their mastery of their subject matter. Every year, excellent students inquire about the M.A. program who do not have sufficient Greek or Latin. Although some students may need to take a course or 2 prior to formally beginning the program in order to bring their Greek or Latin up to the level at which courses count for the certificate, this certificate offers an intensive language experience designed for such students.

### DEGREES

- Greek and Latin Languages (GKLT) CGS (p. 162)

### FACULTY

**Bailly, Jacques A.;** Associate Professor, Department of Classics; PHD, Cornell University

**Chiu, Angeline C.;** Associate Professor, Department of Classics; PHD, Princeton University

**Franklin, John C.;** Professor, Department of Classics; PHD, University College London

**Usher, Mark David;** Associate Professor, Department of Classics; PHD, University of Chicago

## GREEK AND LATIN LANGUAGES (GKLT) CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

### OVERVIEW

Scholars in many disciplines (e.g. Classics, History, English, Medieval studies, Religion, Philosophy) need proficiency in Latin and Greek

to conduct research. Other students come to Classics too late in their undergraduate career to have acquired language proficiency at a level which qualifies them for Ph.D. programs. Still others are high school teachers who want to expand their teaching repertoire, or improve their mastery. This certificate program offers an intensive language experience for such students. For students it can fulfill many of the same goals as Post-Baccalaurate programs elsewhere, but students are held to a graduate-level standard in most of their coursework. Students in the M.A. program who are unable to complete their Comprehensive Exams may receive the C.G.S. instead.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to the Certificate of Graduate Study

Greek and Latin language abilities sufficient to succeed in advanced courses (generally, the minimum is at least 3 semesters or the equivalent in each language; students will struggle if they meet only the minimum).

#### Minimum Degree Requirements for Certificate of Graduate Study in Greek and Latin Languages

- 2 GKLT 381 seminars, 1 in each language, are offered every semester. Each involves the work of the cross-listed 200-level literature seminar, supplemented by that of the concurrent Prose Style course (GRK 211, GRK 212 or LAT 211, LAT 212, depending on which is being offered that term) or a research paper (for the seminar not supplemented by Prose Style that term). The Prose Style component involves readings in literary prose, analyzed stylistically and imitated in composition.
- 3 additional credits of Greek or Latin, either as an Independent Study (by arrangement with Faculty) or an intermediate level course (GRK 051/LAT 051, GRK 052/LAT 052, LAT 101, LAT 102) enhanced by additional reading. Intermediate-level courses are more slowly paced, and include a good deal of syntax review and vocabulary building. As such, they admirably complement the graduate-level courses.
- Certificate students must maintain a GPA of 3.00.

## HIGHER EDUCATION AND STUDENT AFFAIRS ADMINISTRATION

<https://www.uvm.edu/cess/doe>

### OVERVIEW

The University of Vermont's Higher Education and Student Affairs Administration (HESA) graduate program is counted among the top programs in the country preparing student affairs professionals to collaboratively transform higher education.

The program welcomes full-time and part-time students with various levels of experience and backgrounds and enrolls approximately 15 students each year to promote strong and enduring relationships with fellow colleagues, award-winning faculty, and campus partners. Educators committed to the future of the nation's higher education system challenge UVM HESA students to make their graduate education an unparalleled learning experience.

## MISSION STATEMENT

To develop practitioner scholars through academic and professional preparation whose commitment to reflection and social justice will transform higher education and student affairs in the spirit of The Vermont Connection.

## CORE VALUES

### ACADEMIC AND PROFESSIONAL PREPARATION

Through partnerships between faculty and student affairs professionals, we promote excellence through academic and professional rigor. We cultivate the knowledge and skills necessary for success in the profession through the synergy between classroom and experiential learning as conceptualized by philosopher and UVM alumnus John Dewey.

### SOCIAL JUSTICE

We are committed to pursuing social justice as both a process and a goal to dismantle individual, institutional, and societal oppression. Grounded in the ethos of HESA, UVM, and the profession, we strive to transform student affairs for more equitable and inclusive opportunities in higher education.

### REFLECTION

We foster reflection of self, others, and contexts as a critical component of growth in professional practice. Through critical consciousness we strive to improve higher education and student affairs with an aim toward promoting individual, institutional, and societal change.

### THE VERMONT CONNECTION

The Vermont Connection is a collegial network of former and current students, faculty, and student affairs professionals with the shared vision of uplifting community through relationships. The spirit of The Vermont Connection weaves together the history, present, and future of UVM HESA.

Campus partners cultivate relationships through supervising practica and assistantships, teaching HESA courses, and providing professional development opportunities. Funding opportunities are available to students through assistantships, full- and part-time work, and graduate travel stipends to professional and academic conferences.

Extensive information about the program is available on the HESA website.

Inquiries regarding this program should be addressed to:

The University of Vermont  
Higher Education and Student Affairs Administration  
208 Colchester Avenue  
Mann Hall 201  
Burlington, Vermont 05405  
802-656-2030

## DEGREES

- Higher Education and Student Affairs Administration M.Ed. (p. 163)

## FACULTY

**Ballysingh, Tracy Arámbula;** Assistant Professor, Department of Education; PHD, University of Texas at Austin

**Garvey, Jason C.;** Associate Professor, Department of Education; PHD, University of Maryland, College Park

## HIGHER EDUCATION AND STUDENT AFFAIRS ADMINISTRATION M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 261)

## SPECIFIC REQUIREMENTS

### Requirements for Admission

#### 1. APPLICATION INFORMATION

Applications to the HESA Program are processed by the UVM Graduate College via the online admissions process. This process includes the documents that are listed below.

Applicants are strongly advised to submit all materials (e.g., transcripts, recommendations, resume) by or before the deadline to receive a full and timely review. Applications will not be reviewed by the admissions committee until complete.

PLEASE NOTE: For those applying for an assistantship, the assistantship application is due at the same time as the academic application.

#### Required Application Materials

- Graduate Application Form- The online application form is available on the Graduate College website.
- Statement of Purpose- Select a quote that embodies a critical moment in your life and, in 500-1000 words, reflect upon your aspirations and promise for pursuing the student affairs profession as a University of Vermont HESA student.
- Three Letters of Recommendation

Three letters of recommendation must be submitted directly to UVM by individuals who have an academic or professional relationship with the applicant. These individuals must be well acquainted with the applicant's accomplishments and potential for becoming an effective student affairs professional as well as readiness for graduate study. For applicants seeking to attend graduate school immediately after graduation from an undergraduate institution, at least two of these letters should be from an instructor/faculty member. Please do not include letters written by friends, family friends, therapists, or acquaintances. We recommend that applicants contact their recommenders early in the process to avoid delays in UVM receiving letters. The HESA admissions committee only reviews complete application packets.

All letters of recommendation should accompany the application to arrive by December 1. We allow a small buffer of a couple of days to allow for arrival and processing.

PLEASE NOTE: The application for assistantship is separate from the application for admission to the HESA program, and the two applications are reviewed by separate groups of evaluators. The former is reviewed by assistantship providers with whom applicants may interview for positions, and the latter is reviewed by the HESA admissions committee. Here are what the letters of recommendation should address for each application:

HESA Academic Program Application: At least one letter from a faculty member (preferably two) and the third from a student affairs professional. These letters should highlight preparedness for graduate level work, communication skills, critical reasoning skills, etc.

Student Affairs Graduate Assistantship Application: There are no restrictions on who writes these letters, but these letters should speak to interests and passion for student affairs and should highlight professional preparation as an undergraduate student/returner to the academy.

Having shared these expectations, if the third individual who is writing a letter of recommendation can speak to these two separate but complementary criteria in the same letter, applicants can use the same letters for both applications. However, each letter must have an original signature.

- Unofficial College Transcripts

Official transcripts are not necessary when submitting applications. An unofficial transcript of course work (undergraduate and graduate) should be submitted from every college and/or university attended for the Admissions Committee to review. Please make sure any community college credits are listed on the college or university transcript. If admitted to the program, applicants will be required to submit an official transcript for all course work (undergraduate and graduate) upon an acceptance of the offer.

- Professional Resume/Curricula Vitae (CV)

An up-to-date resume/CV that attests to the applicant’s education, work and volunteer experience should be included in the application packet.

- English Proficiency Examination

Applicants whose native language is not English are required to submit proof of English proficiency. Applicants must submit official scores of either the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or Duolingo. The minimum score for

admission to the Graduate College at UVM is 90 for TOEFL; 6.5 for IELTS; and 110 for Duolingo.

- Application Fee- \$65

Please note:

- Candidates whose applications are COMPLETE (including the resume/CV) by December 1 will be given priority consideration. Applications completed after the December 1 deadline cannot be guaranteed a full-review.
- All materials must be submitted online through the Graduate College. Materials that arrive external (e.g., in the mail, through email) to the online process cannot be considered for academic admissions.
- GREs are not required for academic admissions into the HESA program or for applicants seeking an assistantship or university funding through financial aid.

## 2. INTERVIEW

An Interview and Program Orientation Session is held for students who pass the initial academic application screening. Invitations for the Interview and Program Orientation Sessions will be issued approximately three weeks prior to the first session.

### Minimum Degree Requirements

The HESA curriculum is 40 credits, including 10 core courses, 2 elective courses, and practicum. Typically completed in 2 years full-time or 3 years part-time, it is designed to promote self-directed field-based experiences to complement academic learning through 300 hours of practicum experience and summer internship opportunities. With the assistance of a faculty advisor, each student builds an experience to meet their interests and professional aspirations.

EDHI 300	Prgrm Eval & Assess in HESA	3
EDHI 361	The (Un)Changing Academy	3
EDHI 362	College Students and Contexts	3
EDHI 363	Controversies of the Academy	3
EDHI 364	Helping Skills in Stdn Affairs	3
EDHI 375	Social Justice/Inclusion in HE	3
EDHI 376	Student Development Theory	3
EDHI 377	Higher Education Law	3
EDHI 383	Higher Ed Admin & Organization	3
EDHI 385	Foundations & Functions of CSP	3
EDHI 395	Lab Experience in Education (3 semesters)	2
EDHI 396	Capstone:Eth,Val&Mean/High Ed	3
EDHI 397	Problems in Education	1

## Comprehensive Examination

The comprehensive exam requirement of the Graduate College is met through successful completion of the Capstone Seminar course taken during the final semester of enrollment. This culminating experience is designed to be a final assessment of a student's professional portfolio as aligned with the ACPA & NASPA Professional Competencies for Student Affairs Educators.

## Requirements for Advancement to Candidacy for the Degree of Master of Education

HESA core faculty have established several milestones to review each student's academic and professional performance as graduate students. These reviews are to assess holistically whether or not students have demonstrated an adequate level of competency in academic performance and in other critical areas of student affairs professional practice as guided by the 2015 Professional Competency Areas for Student Affairs Educators established by ACPA and NASPA Professional Competencies Taskforce. These milestones include an academic review at the end of the first and third semesters as well as a comprehensive review of academic, assistantship and practica performances at the end of year one (or second semester) in the program.

## HISTORIC PRESERVATION

<http://www.uvm.edu/~histpres/>

### OVERVIEW

The University of Vermont Historic Preservation program aims to prepare graduate degree students for broad-based careers in the conservation and sustainable management of the historic environment through studies and research in heritage preservation administration, planning, architectural conservation, adaptive use and economic development, architectural and cultural history, documentation, law, and cultural resource management.

### DEGREES

- Historic Preservation AMP (p. 165)
- Historic Preservation M.S. (p. 166)

### FACULTY

**McCullough, Robert L.;** Professor, Department of History; PHD, Cornell University; JD, Hamline University

**Visser, Thomas Durant;** Professor, Department of History; MS, University of Vermont

## HISTORIC PRESERVATION AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Historic Preservation Accelerated Master's Entry Program (AMP) provides an opportunity for capable undergraduate UVM students to enroll directly in the Historic Preservation graduate program while taking advantage of Accelerated Master's Program degree incentives. Following their formal admission into the Historic

Preservation AMP, students work simultaneously on their B.A. and M.S. requirements, counting up to 9 credits of 200-level courses approved for graduate credit toward both the B.A. and the M.S. degrees. The remaining 21 credits of graduate study required for Historic Preservation M.S. degree normally would be taken in 3 semesters following undergraduate graduation.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

- Students must be working towards a baccalaureate degree with a major in a preservation-related field such as history, architectural history, art history, architecture, engineering, planning, business administration, economics, community development, interior design, law, American studies, or environmental studies.
- Cumulative GPA of 3.0

### Minimum Degree Requirements for the Degree of Master of Science

30 credits of course work with Grad Internship or 33 credits with Master's Thesis. A minimum of 30 credits must be taken in historic preservation.

Required courses in Historic Preservation:		
HP 200	History American Architecture	3
HP 201	History on the Land	3
HP 205	Historic Preservation Law	3
HP 206	Rschg Historic Structure/Sites	3
HP 302	Community Preservation Project	3
HP 304	Contemp Preservation Plan&Pol	3
HP 305	Hst Preservation Pract Methods	3
HP 306	Architectural Conservation I	3
HP 307	Architectural Conservation II	3
HP 303	Grad Internship	1-6
or HP 391	Master's Thesis Research	
A written comprehensive examination given during the third semester		
An internship in a preservation agency, or a written thesis. The internship or thesis may be undertaken upon completion of 2 semesters of concentrated course work with advisor's permission. For the thesis option, a total of 6 credits is required for HP 391, as well as advisor's permission		

### Comprehensive Examination

The comprehensive examination for M.S. Historic Preservation students is required to be taken by the end of the final semester of courses. Normally this is scheduled during the second half of the fall semester. This written examination covers broad knowledge in

historic preservation. Information on the date, general details, and format of this examination is provided to students in advance.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Completion of the above requirements.

## HISTORIC PRESERVATION M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

All graduate students enter the program in the fall. Most complete their studies after 3 semesters and a summer internship. Part-time enrollment is also possible by special arrangement.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A baccalaureate degree with a major in a preservation-related field such as history, architectural history, art history, architecture, engineering, planning, business administration, economics, community development, interior design, law, American studies, or environmental studies.

#### Minimum Degree Requirements for the Master of Science

30 credits of course work with Graduate Internship or 33 credits with Master's Thesis. A minimum of 30 credits must be taken in historic preservation.

Required courses in Historic Preservation:		
HP 200	History American Architecture	3
HP 201	History on the Land	3
HP 205	Historic Preservation Law	3
HP 206	Rschg Historic Structure/Sites	3
HP 302	Community Preservation Project	3
HP 304	Contemp Preservation Plan&Pol	3
HP 305	Hst Preservation Pract Methods	3
HP 306	Architectural Conservation I	3
HP 307	Architectural Conservation II	3
An internship in a preservation agency or a written thesis. For the internship option, a total of 3 credits is required for HP 303. For the thesis option, a total of 6 credits is required for HP 391, as well as advisor's permission. The internship or thesis may be undertaken upon completion of 2 semesters of concentrated course work with advisor's permission.		
A written comprehensive examination given during the third semester		

### Comprehensive Examination

The comprehensive examination for M.S. Historic Preservation students is required to be taken by the end of the final semester of courses. Normally this is scheduled during the second half of the fall semester. This written examination covers broad knowledge in historic preservation. Information on the date, general details, and format of this examination is provided to students in advance.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Completion of the above requirements.

## HISTORY

<http://www.uvm.edu/~history/>

### OVERVIEW

The Department of History offers a comprehensive program of courses in the history of the Americas, Europe, Asia, and Africa, and in global and comparative studies. At the graduate level, students develop broad historical knowledge and acquire training in historical interpretation and methods.

### DEGREES

- History AMP (p. 167)
- History M.A. (p. 168)

### FACULTY

**Briggs, Charles;** Senior Lecturer, Department of History; PHD, University of North Carolina, Chapel Hill

**Brown, Dona L.;** Professor, Department of History; PHD, University of Massachusetts Amherst

**Buchanan, Andrew N.;** Senior Lecturer, Department of History; PHD, Rutgers University

**Deslandes, Paul Raymond;** Associate Professor, Department of History; PHD, University of Toronto

**Ergene, Bogac A.;** Professor, Department of History; PHD, Ohio State University

**Esselstrom, Erik W.;** Associate Professor, Department of History; PHD, University of California Santa Barbara

**Field, Sean Linscott;** Professor, Department of History, PHD, Northwestern University

**Grimmer, Ian;** Senior Lecturer, Department of History; PHD; University of Chicago

**Gustafson, Melanie Susan;** Associate Professor, Department of History; PHD, New York University

**Huener, Jonathan D.;** Associate Professor, Department of History; PHD, University of Illinois Urbana-Champaign

**Kornbluh, Felicia A.;** Associate Professor, Department of History; PHD, Princeton University

**Massell, David Perera;** Professor, Department of History; PHD, Duke University

**McGowan, Abigail S.;** Associate Professor, Department of History; PHD, University of Pennsylvania

**Osten, Sarah Elizabeth;** Assistant Professor, Department of History; PHD, University of Chicago

**Phelps, Nicole M.;** Associate Professor, Department of History; PHD, University of Minnesota Twin Cities

**Schrafstetter, Susanna B.;** Professor, Department of History; PHD, University of Munich

**Steinweis, Alan E.;** Professor, Department of History; PHD, University of North Carolina

**Stilwell, Sean Arnold;** Professor, Department of History; PHD, York University

**Whitfield, Harvey Amani;** Professor, Department of History; PHD, Dalhousie University

**Zdatny, Steven M.;** Professor, Department of History; PHD, University of Pennsylvania

## HISTORY AMP

### OVERVIEW

The accelerated master's degree in history is designed to allow current UVM undergraduate history majors to earn both bachelor's and master's degrees in a streamlined period of time. Following formal admission to the Accelerated Master's Program, students will work simultaneously on their B.A. and M.A. requirements, counting up to 6 graduate-level credits toward both the B.A. and the M.A. degrees. Another 3 graduate credits can be counted towards the M.A. degree while an undergraduate but cannot count towards the B.S. degree.

### SPECIFIC REQUIREMENTS

#### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF ARTS FOR ACCELERATED STUDENTS

Applicants should be undergraduate history majors in the third year of the undergraduate program. Candidates must submit applications to the AMP through the standard Graduate College application process. The application includes an undergraduate transcript; 3 letters of recommendation from faculty members; a writing sample; and a statement of purpose. GREs are not required for the AMP. The application and admission process must be finalized before courses may be counted toward the M.A.

#### MINIMUM DEGREE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

OPTION A (PORTFOLIO)		
HST 301	Graduate Historiography	3
HST 397	Special Readings and Research	3
24 additional credits in 200- and/or 300-level course work		24
Successful completion of the comprehensive examination		
Successful compilation of a portfolio of work demonstrating the student's thematic and methodological proficiencies		
OPTION B (EXPANDED ESSAY)		
HST 301	Graduate Historiography	3
HST 397	Special Readings and Research	3

24 additional credits in 200- and/or 300-level course work		24
Successful completion of the comprehensive examination		
Successful completion and defense of the Expanded Essay		
Option C (Thesis)		
HST 301	Graduate Historiography	3
HST 391	Master's Thesis Research	6
21 additional credits in 200- and/or 300-level course work		21
Successful completion of the comprehensive examination		
Successful completion and defense of the master's thesis		

HST 301 is required for all students. Those enrolled in the Accelerated Masters Program may take this required course in the senior undergraduate year, when it will count toward the M.A., but not the B.A.

At least 15 credits of course work must be earned in seminars, but students may complete independent study courses that involve the creation of individualized reading lists and regular meetings with instructors appointed to the graduate faculty. With the consent of the student's advisor, 6 credits of the required course work for the M.A. may be taken in related fields outside of the history department. Students must maintain a grade point average of at least 3.30 (B +) each semester. Students failing to maintain this average will be dismissed from the program.

### COMPREHENSIVE EXAMINATION

Students in the Accelerated Master's Program must pass a comprehensive examination in a field of specialization, to be defined in consultation with the primary faculty advisor.

The examination requires students to provide a comprehensive analysis of major themes and problems in their field of historical specialization, including attention to historiography and interpretive problems. The examination may take 1 of several forms, to be determined by the faculty advisor in consultation with the student and the director of graduate studies. Options include: a timed written examination; an oral examination; a take-home essay; a historiographical review undertaken as part of the student's master's thesis; an annotated syllabus or detailed lesson plans for a field of study. Exams will be assessed by the primary faculty advisor and a second faculty member.

Candidates whose initial efforts are not judged satisfactory may re-take the exam. In most instances, reexamination will occur within 1 month. Students failing the examination twice will be dismissed from the program.

AMP students will ordinarily take the Comprehensive Examination in December or January of the second year of the program.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF ARTS

Completion of the above requirements.



## HISTORY M.A.

All students must meet the Requirements for the Master's Degree (p. 260).

### OVERVIEW

The Department of History offers a comprehensive program of courses in the history of the Americas, Europe, Asia, and Africa, and in global and comparative studies. At the graduate level, students develop broad historical knowledge and acquire training in historical interpretation and methods. Students may pursue the M.A. on either a part-time or full-time basis.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Arts

Applicants should have an undergraduate major in history or in a related field of the humanities or social sciences with the equivalent of a minor in history. The Graduate College application requires: 3 letters of recommendation; a statement of purpose; and a writing sample (normally a research paper completed in an undergraduate history course). Applicants are welcome to submit Graduate Record Examination scores or other evidence of achievement as optional additions to the required submissions.

To be considered for admission, a candidate must have a grade point average of 3.00 (B) in his or her last 2 years of undergraduate study, with evidence of better work 3.30 (B+) in history.

#### Minimum Degree Requirements for the Degree of Master of Arts

Option A (Portfolio)		
HST 301	Graduate Historiography	3
HST 397	Special Readings and Research	3
24 additional credits in 200- and/or 300-level course work		24
Successful completion of the comprehensive examination		
Successful compilation of a portfolio of work demonstrating the student's thematic and methodological proficiencies		
Option B (Expanded Essay)		
HST 301	Graduate Historiography	3
HST 397	Special Readings and Research	3
24 additional credits in 200- and/or 300-level course work		24
Successful completion of the comprehensive examination		
Successful completion and defense of the Expanded Essay		
Option C (Thesis)		
HST 301	Graduate Historiography	3
HST 391	Master's Thesis Research	6
21 additional credits in 200- and/or 300-level course work		21

Successful completion of the comprehensive examination	
Successful completion and defense of the master's thesis	

All students enrolled in the M.A. program are required to take HST 301 during their first semester. At least 15 credits of course work must be earned in seminars, but students may complete independent study courses that involve the creation of individualized reading lists and regular meetings with instructors appointed to the graduate faculty. With the consent of the student's advisor, 6 credits of the required course work for the M.A. may be taken in related fields outside of the history department. Students must maintain a grade point average of at least 3.30 (B+) each semester. Students failing to maintain this average will be dismissed from the program.

#### Comprehensive Examination

All graduate students must pass a comprehensive examination in a field of specialization, to be defined in consultation with the primary faculty advisor. The examination requires students to provide a comprehensive analysis of major themes and problems in their field of historical specialization, including attention to historiography and interpretive problems. The examination may take 1 of several forms, to be determined by the faculty advisor in consultation with the student and the director of graduate studies. Exams will be assessed by the primary faculty advisor and a second faculty member. Comprehensive Examinations are typically taken in September or January of the second year of the program. Candidates whose initial efforts are not judged satisfactory may re-take the exam. In most instances, reexamination will occur within 1 month. Students failing the examination twice will be dismissed from the program.

#### Requirements for Advancement to Candidacy for the Degree of Master of Arts

Completion of the above requirements.

## INTERDISCIPLINARY - EDUCATION

<https://www.uvm.edu/cess/doe>

### Overview

Interdisciplinary studies provide tools to deepen research, theory, and practice for those seeking academic advancement, professional development, and/or lifelong learning. This degree includes a strand in social justice education and a strand for individually-designed programs in consultation with an advisor. The program draws primarily from graduate courses in Educational Leadership, Counseling, and Higher Education and Student Affairs Administration. Many students pursue certificates in Interdisciplinary Studies of Disability and/or Resiliency-Based and Trauma-Informed Practices. Students may include courses from other departments within the college and the university.

### DEGREES

- Interdisciplinary M.Ed. (p. 169)

## FACULTY

**Mayo, Cris**; Professor; Department of Education; PHD, University of Illinois at Urbana-Champaign

## INTERDISCIPLINARY M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 261)

### OVERVIEW

Interdisciplinary studies provide tools to deepen research, theory, and practice for those seeking academic advancement, professional development, and/or lifelong learning. This degree includes a strand in social justice education and a strand for individually-designed programs in consultation with an advisor. The program draws primarily from graduate courses in Educational Leadership, Counseling, and Higher Education and Student Affairs Administration. Many students pursue certificates in Interdisciplinary Studies of Disability and/or Resiliency-Based and Trauma-Informed Practices. Students may include courses from other departments within the college and the university.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Education

Applicants should have a clear understanding of how the Interdisciplinary graduate program will serve their career goals. For this reason, major emphasis in admissions is placed upon the applicant's Statement of Purpose. Detailed information about admission criteria is as follows:

- Applicants are welcome to schedule an interview or correspond via email with the director.
- Submit three letters of reference, at least one of which should be an academic reference. Because some students have been out of college for a number of years (even decades), professional workplace references are also accepted.
- Transcripts are required from all previous institutions attended.
- A writing sample is required only if requested.
- There is no Graduate Record Examination (GRE) requirement.
- There is no deadline for application, the program has a rolling admissions policy that is in effect 12 months a year.
- Up to 9 graduate credits previously earned within a 5-year period can be transferred into the program.

#### Minimum Degree Requirements

The Interdisciplinary degree is self-designed. All programs are worked out under the supervision of the program director. All programs are subject to student modification at any time depending on the changing personal, academic, and professional interests of the student. Here are the basic curriculum requirements:

- 36 credits are required. There is a 5-year time period to finish the degree. All courses are offered once a week in the evening, usually online. Most summer courses run daily for two weeks, 4 1/2 hours at a time. The average number of years that students take to

complete the Interdisciplinary program is currently 3 years. The majority of students are part-time.

- A minimum of two Foundations (EDFS) courses are required of most graduate programs in the College of Education and Social Services. Currently, students in the Interdisciplinary program satisfy this requirement by enrolling in EDFS 302 Philosophy of Education and EDFS 301 Introduction to Interdisciplinary Studies. There are also EDFS research courses available in quantitative and qualitative methodologies, as well as special topics EDFS courses in other subject matter, including courses in social justice education.
- A minimum of 18 graduate level credits must be taken in the College of Education and Social Services. The other 18 graduate-level credits can be taken anywhere in the University of Vermont (if desired). And, of these 18 credits, 9 graduate credits can be taken outside the University of Vermont and transferred into the Interdisciplinary program. All courses must be graduate-level courses and must be directly relevant to each student's overall goals and purposes.
- The Interdisciplinary program has a 6-credit thesis option. These 6 credits replace 6 course credits. Selecting and researching a thesis topic is an excellent way to integrate all the components of the Interdisciplinary program for students.

#### Comprehensive Examination

All College of Education and Social Services graduate programs have a no-credit comprehensive examination requirement for graduation. This requirement is individualized according to the unique professional needs of the student and is worked out with the program director.

#### Requirements for Advancement to Candidacy for the Degree of Master of Education

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## INTERDISCIPLINARY STUDY OF DISABILITIES

<https://www.uvm.edu/cess/cdci/disability-studies> (<https://www.uvm.edu/cess/cdci/disability-studies/>)

### OVERVIEW

The Certificate of Graduate Study in ISD provides education, social services, healthcare, other professionals, and individuals with disabilities and their family members, access to a cohesive and relevant course of study to enhance their education and instructional knowledge of Disability Studies. The certificate includes a total of 18 credits, 9 in core courses and 9 in approved elective courses. Two options are offered:

1. Establish a general understanding of disabilities and of related interdisciplinary practices across disciplines;
2. Combine core courses with the focused study of a specific disability or related practice area.

The certificate was created through a partnership between Special Education and Communication Science Disorders. The courses listed below are from those programs, but they are not the only courses that can be used for the certificate.

**DEGREES**

- Interdisciplinary Study of Disabilities (ISD) CGS (p. 170)

**FACULTY**

**Avila, Maria Mercedes;** Associate Professor, Department of Medicine-Pediatrics; PHD, University of Vermont  
**Killeen, Kieran M.;** Associate Professor, Department of Leadership and Developmental Sciences; PHD, Cornell University  
**Suter, Jesse C;** Research Associate Professor, Center on Disability and Community Inclusion; PHD, University of Vermont

**INTERDISCIPLINARY STUDY OF DISABILITIES (ISD) CGS**

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

**OVERVIEW**

The Certificate of Graduate Study in ISD provides education, social services, healthcare, other professionals, and individuals with disabilities and their family members, access to a cohesive and relevant course of study to enhance their education and instructional knowledge of Disability Studies. The certificate includes a total of 18 credits, 9 in core courses and 9 in approved elective courses. Two options are offered:

1. Establish a general understanding of disabilities and of related interdisciplinary practices across disciplines;
2. Combine core courses with the focused study of a specific disability or related practice area.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Certificate of Graduate Study**

- Completed bachelor’s degree
- Completed Graduate College Application
- Official transcripts from each college or university where credit has been earned
- Three letters of recommendation
- A personal statement of purpose
- A cumulative grade point average of 3.00 is recommended

**Minimum Degree Requirements**

The Certificate of Graduate Study in the ISD requires eighteen credits. Students admitted to the program must complete EDSP 274/CSD 274, EDSP 200, and develop an individualized plan of study for the remaining 12 credits. Depending on the chosen field of study, students work with their graduate advisor (if applicable) and the coordinator of this certificate program to identify twelve additional credits of coursework for their degree plan.

The core courses that are required for this certificate are:

EDSP 274	D2:Culture of Disability	3
EDSP 200	Contemporary Issues	3
Although not an exhaustive list, suggested courses include:		
CSD 299	Autism Spect Dis:Assess&Interv	
CSD 313	Augmentative Communication	
EDFS 305	Race, Justice, and Education	
EDSP 201	D2:Foundations of Special Ed	
EDSP 202	Severe Disabil Char&Intervent	
EDSP 387	Collaborative Consultation	
PH 301	Public Health & Health Policy	
PH 311	Global Public Health	
SWSS 220	Soc Welfare Pol & Services I	
SWSS 216	Th Found of Hum Beh&Soc Envr I	

Exception: VT LEND students taking this certificate are required to complete 3 elective courses (9 credits) and the following 3 required courses (9 credits):

CSD 311	Intrdisc Sem Neurodev Disabil I	3
CSD 312	Intrdisc Sem Neurodev Disabil 2	3
EDSP/CSD 274	D2:Culture of Disability	3

Additional information about this program in the ISD is available from the Certificate of Graduate Study website.

**INTERPROFESSIONAL HEALTH SCIENCES**

<http://www.uvm.edu/cnhs/>

**OVERVIEW**

Interprofessional Health Sciences is translational in nature focusing on understanding the spectrum of human functioning from the basic physiological function of cells and body systems to overall physical and psychological health and unified by the common theme of human performance. The program is designed to consider health at three levels: 1) status of body structures and functions (molecular, cellular, and organ systems levels); 2) ability of the individual to participate in human activities and assume societal roles; and, 3) psychological and social aspects of the environment that support the health of individuals and populations. This program prioritizes interprofessional and translational research. Students come from a wide range of disciplines (e.g., physical therapy and movement science, biomedical sciences, special education, communication disorders, nursing, neuroscience, psychology, nutrition, and related health professions). They learn side by side with other students and faculty from unique but related health professions to address the

contextual nature of health conditions that affect body functioning and/or societal participation.

Although not required, students have the option to pursue concentrations in the following disciplines:

- Biomedical Health Sciences
- Communication Sciences and Disorders
- Integrated Health
- Rehabilitation and Movement Sciences

## DEGREES

- Interprofessional Health Sciences Ph.D. (p. 171)

## FACULTY

**Amiel, Eyal;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Dartmouth College

**Angelopoulos, Theodore;** Professor, Department of Rehabilitation and Movement Sciences, PHD, University of Pittsburgh

**Bauerly, Kim;** Assistant Professor, Department of Communication Sciences and Disorders, PHD, University of Toronto

**Bosek, Marcia;** Associate Professor, Department of Nursing; DNSC, Rush University

**Cannizzaro, Michael S.;** Associate Professor, Department of Communication Sciences and Disorders; PHD, University of Connecticut

**Coderre, Emily;** Assistant Professor, Department of Communication Sciences and Disorders, PHD, University of Nottingham

**Deming, Paula;** Associate Professor, Department of Biomedical and Health Sciences; PHD, University of North Carolina at Chapel Hill

**Escorpizo, Reuben Samsuya;** Clinical Assistant Professor, Department of Rehabilitation and Movement Science; DPT, Des Moines University

**Failla, Mathew;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, University of Delaware

**Frietze, Seth;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Harvard University

**Gell, Nancy;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, Auburn University

**Hutchins, Tiffany L.;** Associate Professor, Department of Communication Sciences and Disorders; PHD, University of South Florida

**Kasser, Susan;** Associate Professor, Department of Rehabilitation and Movement Science; PHD, Oregon State University

**Keiffer, Melanie;** Assistant Professor, Department of Graduate Nursing, DNP, Vanderbilt University

**Krementsov, Dimitry N.;** Assistant Professor, Department of Biomedical and Health Sciences, PHD; University of Vermont

**Laurent, Jennifer S.;** Associate Professor, Department of Nursing; PHD, Duquesne University

**Lewis, Laura Foran;** Assistant Professor, Department of Nursing; PHD., University of Connecticut

**Maltby, Hendrika J.;** Professor, Department of Nursing; PHD, Curtin University of Technology

**Martin, Lili;** Clinical Assistant Professor, Department of Nursing; DNP, University of Vermont

**Mohaptra, Sambit;** Assistant Professor, Department of Rehabilitation and Movement Sciences, PHD, University of Illinois, Chicago

**Nagle, Rebecca;** Clinical Assistant Professor, Department of Nursing; DNP, University of Vermont

**Ouellette-Morton, Rebecca;** Clinical Assistant Professor, Department of Rehabilitation and Movement Science; DPT, University of New England

**Palumbo, Mary Val;** Professor, Department of Nursing; DNP, Rush Medical College

**Peters, Denise;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, DPT, University of South Carolina

**Prelock, Patricia A.;** Provost and Senior Vice President; Professor, Department of Communication Sciences and Disorders; Professor, Department of Medicine-Pediatrics; PHD, University of Pittsburgh

**Sibold, Jeremy;** Associate Professor, Department of Rehabilitation and Movement Science; EDD, West Virginia University

**Smith, Paula;** Clinical Assistant Professor, Department of Rehabilitation and Movement Science; PHD, Virginia Commonwealth University

**Tompkins, Connie L.;** Associate Professor, Department of Rehabilitation and Movement Science; PHD, University of New Orleans

**Tourville, Timothy;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, University of Vermont

**Velleman, Shelley;** Professor, Department of Communication Sciences and Disorders; PHD., University of Texas Austin

**Westervelt, Karen C.;** Clinical Assistant Professor, Department of Rehabilitation and Movement Science; PHD, Bond University-Robina, Queensland, Australia

## INTERPROFESSIONAL HEALTH SCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (<http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforthedoctorofphilosophydegree/>)

## OVERVIEW

Interprofessional Health Sciences is translational in nature focusing on understanding the spectrum of human functioning from the basic physiological function of cells and body systems to overall physical and psychological health and unified by the common theme of human performance. The program is designed to consider health at 3 levels: 1) status of body structures and functions (molecular, cellular, and organ systems levels); 2) ability of the individual to participate in human activities and assume societal roles; and, 3) psychological and social aspects of the environment that support the health of individuals and populations. This program prioritizes interprofessional and translational research. Students come from a wide range of disciplines (e.g., physical therapy and movement science, biomedical sciences, special education, communication disorders, nursing, neuroscience, psychology, nutrition, and related health professions). They learn side by side with other students and

faculty from unique but related health professions to address the contextual nature of health conditions that affect body functioning and/or societal participation.

Doctoral student preparation considers three central principles:

1. Educating students as researchers and scientists, including how to contribute to evidence-based practice.
2. Fostering in students an interdisciplinary approach to education, research, and practice.
3. Engaging students in innovative instruction and assessment that is interprofessional and aligns with changes in delivery of health and human services.

## SPECIFIC REQUIREMENTS

### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Students with at least a master's degree or the equivalent in a health-related field (e.g., kinesiology, exercise physiology, exercise science, movement sciences, communication sciences and disorders, rehabilitation science, nursing, psychology, education) may apply. Evaluations will be based upon the applicant's grade point average, previous research experience, a statement of purpose for graduate study, and 3 letters of reference. In rare circumstances students with a bachelor of science degree showing exceptional promise as evidenced by their previous research experience, mentor recommendations, undergraduate GPA will be considered.

### MINIMUM DEGREE REQUIREMENTS

For students entering with a prior graduate degree in a relevant field, the Ph.D. in Interprofessional Health Sciences requires 76 credits, 32 of which are required course credits and 20 of which are required research credits. The remaining 24 credits are elective, 12 of which may transfer in from the prior degree. Students must maintain a 3.0 average in coursework, have no more than 1 grade below a B, have acceptable evaluations of their research, and pass their qualifying examination. Students will be required to teach in at least 1 course under the mentorship of a faculty member or serve as a teaching assistant for at least 1 course and mentor/co-mentor an undergraduate or master's degree research project. The dissertation will be based on original research focusing on a significant problem in the student's area of specialization with an interprofessional application. Under the guidance of the dissertation committee, each student will use a format consisting of 3 publishable papers (at least 1 of which has been submitted for publication) for which they are first author, with integrated introduction and conclusion chapters.

### BIOMEDICAL AND HEALTH SCIENCES (BHSC)

Students in this concentration may focus in 2 general areas, that include, but are not limited to, the following topics:

#### BASIC SCIENCE RESEARCH

- Cancer
- Cell signaling and metabolism
- Immunology and Infectious diseases
- Genomics and Genetics

#### MEDICAL LABORATORY SCIENCE

- Molecular diagnostics and genomic medicine
- Molecular pathology and functional genomics
- Clinical microbiology
- Clinical hematology

Students should contact the IHS PHD program director for more information on concentration requirements.

### COMMUNICATION SCIENCES & DISORDERS (CSD)

Students in this concentration may focus communication disorders that include:

- Apraxia of speech
- Autism and other developmental disabilities
- Fluency disorders
- Neurogenic disorders
- Social cognition
- Speech sound disorders

Students work with their academic advisor, research mentors, and committee to design and complete 3 of the 4 required Ph.D. research rotations in the department of CSD or related field. This provides students with an opportunity to work in depth on multiple projects relevant to current CSD theories and methodologies.

### INTEGRATIVE HEALTH

Students in this concentration may focus on Integrative Health topics such as:

- Traditional European Medicine (TEM)
- Yoga
- Nature Therapy / Forest Bathing
- Culinary Medicine
- Mindfulness
- Anxiety Management Strategies
- Integrative Pain management
- Integrative psychology
- Acupuncture
- Integrative Oncology
- Behavior change/ health coaching
- Integrative physical therapy/ manual therapy

Students work with their research mentors and committee to design and complete 3 of the 4 required Ph.D. research rotations within an approved Integrative Health research setting and educational elective requirements. This provides students with an opportunity to work in depth on multiple projects relevant to current Integrative Health theories and methodologies. UVM Integrative Health is a member

of the Academic Consortium for Integrative Medicine and Health (ACIMH) and students are encouraged to take an active role in the Consortium's Research Working Group.

### REHABILITATION AND MOVEMENT SCIENCE (RMS)

Students in this concentration may focus on topics that include, but are not limited to:

- Biomechanics
- Motor control
- Muscle physiology
- Exercise and physical activity
- Neurophysiology and neurorehabilitation
- Movement analysis
- Physiological biomarkers
- Imaging
- Outcome measure assessment

Students work with their research mentor(s) and committee to design and fulfill degree requirements within this concentration. Two regular (100 hours each) and one extended (200 hours) research laboratory rotations should take place in the department of RMS or in a RMS-approved research laboratory. This provides students with an opportunity to work in-depth on various research projects relevant to current RMS research areas.

Students in all concentrations are required to take the following courses:

CTS 301	Design Clin&Translational Res	3
CTS 310	Conduct Clin&Translational Res	3
CTS 315	Report Clin&Translational Res	3
CTS 320	Analyze Clin&Translational Res	3
CTS 325	Multi Analysis Clin&Trans Res	3
EDLP 459	Mixed Method Research	3
IHS 401	Topics & Measurement in IHS	3
IHS 402	Applying the ICF Model in IHS	3
IHS 430	Sem/Pract Teach & Learn IHS	3
IHS 450	Prof Writing & Grantsmanship	2
PH 301	Public Health & Health Policy	3
20 credit hours of IHS 491, Doctoral Dissertation Research		20
Elective courses related to Interprofessional Health Sciences (face to face, online, evening)		12
Students coming into the program with a graduate degree will transfer in 12 credits from their prior degree		12
<b>Total Credits</b>		<b>76</b>

Students coming into the program with an undergraduate degree will need to earn an additional 12 credits of elective courses, for a total of 88 credits.	
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### COMPREHENSIVE EXAMINATION

The qualifying examination process (QE), which serves as a comprehensive exam and the exam for advancement to candidacy for the PhD, will be undertaken after students have completed all of the didactic course requirements of the program with a GPA of 3.0 or better. This exam process will consist of 2 portions, a research proposal written in the form of a grant proposal and an oral defense of this proposal, and a dissertation concept paper.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Doctoral candidacy is achieved after the student passes a formal proposal defense. After approval of the concept paper, the student works on the formal dissertation proposal, and, with guidance from his/her dissertation chair, schedules a date with the committee for the formal proposal defense.

### MATERIALS SCIENCE

<http://www.uvm.edu/matsci/>

### OVERVIEW

UVM's graduate program in Materials Science is engaged in interdisciplinary education and research on the fundamental physical, chemical, electrical and mechanical properties and applications of materials. Our internationally-recognized faculty and our graduate students focus on a variety of theoretical and experimental research topics ranging from electronic materials to bio-polymers. Current interests include nanomechanics, graphene and quantum magnetism, dynamics of quantum systems, spin-dependent phenomena in semiconductors, real-time x-ray scattering and thin film microfabrication, synthesis of novel organometallics and small molecule semiconductors, supramolecular nanomaterials, computational multiscale modeling of complex materials, as well as materials for biomedical applications. Experimental and computational on-campus facilities include state-of-the-art transport, microscopy, spectroscopy (optical and X-ray) characterization and a supercomputing center. Our experimental faculty and graduate students work in close collaboration with scientists from national laboratories such as the Brookhaven National Lab and the National High Magnetic Field Lab.

We offer students the opportunity to follow customized curricula organized in 3 tracks (Electronic Materials, Biomaterials and Mechanics of Materials) that prepares them to be successful in their chosen research area. Research and teaching graduate assistantships are available for full-time students on a competitive basis and the program also welcomes self-supporting part-time students in partnership with industry.

## DEGREES

- Materials Science AMP (p. 174)
- Materials Science M.S. (p. 175)
- Materials Science Ph.D. (p. 175)

## FACULTY

**Badireddy, Appala Raju**; Assistant Professor, Department of Civil and Environmental Engineering; PHD, University of Houston

**Clougherty, Dennis Paul**; Professor, Department of Physics; PHD, Massachusetts Institute of Technology

**Doiron, Amber L.**; Assistant Professor; Department of Electrical and Biomedical Engineering; PHD, University of Texas Austin

**Dubief, Yves C.**; Associate Professor Department of Mechanical Engineering; PHD, Institut National Polytechnique de Grenoble

**Fletcher, Douglas G.**; Professor, Department of Mechanical Engineering; PHD, University of Virginia

**Floreani, Rachael Ann**; Associate Professor, Department of Mechanical Engineering; PHD, Colorado State University

**Furis, Madalina Ioana**; Adjunct Professor, Department of Physics; PHD, University of Buffalo

**Headrick, Randall L.**; Professor, Department of Physics; PHD, University of Pennsylvania

**Kotov, Valeri N.**; Professor, Department of Physics; PHD, Clarkson University

**Landry, Christopher C.**; Professor, Department of Chemistry; PHD, Harvard University

**Li, Jianing**; Associate Professor, Department of Chemistry; PHD, Columbia University

**Li, Wei**; Assistant Professor, Department of Mechanical Engineering; PHD, Michigan State University

**Ma, Jihong**; Assistant Professor, Department of Mechanical Engineering; PHD, University of Minnesota, Twin Cities

**Punihaole, David**; Assistant Professor, Department of Chemistry; PHD, University of Pittsburgh

**Ruggiero, Michael**; Assistant Professor, Department of Chemistry; PHD, Syracuse University

**Sansoz, Frederic P.**; Professor, Department of Mechanical Engineering; PHD, Ecole Des Mines de Paris

**Schadler, Linda S.**; Dean, College of Engineering and Mathematical Sciences; Professor, Department of Mechanical Engineering; PHD, University of Pennsylvania

**Schneebeli, Severin**; Associate Professor, Department of Chemistry; PHD, Columbia University

**Vanegas, Juan**; Assistant Professor, Department of Physics; PHD; University of California Davis

**Waterman, Rory**; Professor, Department of Chemistry; PHD, University of Chicago

**White, Matthew S.**; Associate Professor, Department of Physics; PHD; University of Colorado Boulder

**Xia, Tian**; Professor, Department of Electrical and Biomedical Engineering; PHD, University of Rhode Island

## MATERIALS SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The Accelerated Master's Entry Program leads to both B.S. and M.S. degrees in 5 years. The program is open to undergraduate physics, electrical engineering, and mechanical engineering majors. Interested students should contact the Materials Science Director by the beginning of their junior year.

Following formal Graduate College admission to the Accelerated Master's Program, up to 9 credits of approved graduate coursework may be taken that may be counted toward both the undergraduate and graduate degree requirements.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A major in physics, chemistry, engineering, or mathematics.

### Minimum Degree Requirements

The above requirements for admission must be supplemented in either of the following ways:

OPTION A (THESIS)	
30 graduate credits of an approved program of study including at least 18 credits of coursework; completion of at least 1 3-credit course in each of the following categories: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials*, computational materials science*, and synthesis and characterization of materials* (* = select 2 out of 3); satisfactory completion of a comprehensive examination, and satisfactory completion of an M.S. thesis including its defense at an oral examination.	
OPTION B (NON-THESIS)	
30 graduate credits of an approved program of study; completion of at least 1 3-credit course in each of the following categories: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials*, computational materials science*, and synthesis and characterization of materials* (* = select 2 out of 3), and satisfactory completion of a comprehensive examination.	

### Comprehensive Examination

Full-time Materials Science M.S. candidates are required to pass a written Comprehensive (Qualifying) Exam with a score of 50% or better, no later than 4 semesters after joining the program. Failure to pass the test will result in dismissal from the program. The deadline for part-time students is the semester they complete 24 credits. All students (full and part-time) are allowed a maximum of 2 attempts to pass the exam. Offered annually, the 3-hour exam requires students to solve a minimum of 3 problems that cover the following topics: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials, computational materials science, synthesis and characterization of materials or equivalent core course requirements.

## Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of a comprehensive examination in Materials Science.

## MATERIALS SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

Students must engage in research and defend a thesis and complete a comprehensive exam.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A bachelor's degree in physics, chemistry, metallurgy, engineering, materials science, or mathematics. Applicants with other backgrounds will be evaluated individually.

#### Minimum Degree Requirements

The above requirements for admission must be supplemented in either of the following ways:

OPTION 1 (THESIS)	
30 graduate credits of an approved program of study including at least 18 credits of coursework; completion of at least 1 3-credit course in each of the following categories: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials*, computational materials science*, and synthesis and characterization of materials* (* = select 2 out of 3); satisfactory completion of a comprehensive examination; and satisfactory completion of an M.S. thesis including its defense at an oral examination.	30
OPTION 2 (NON-THESIS)	
30 graduate credits of an approved program of study; completion of at least 1 3-credit course in each of the following categories: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials*, computational materials science*, and synthesis and characterization of materials* (* = select 2 out of 3) solid state theory, quantum mechanics, applied mathematics, and materials properties of solids, and satisfactory completion of a comprehensive examination.	30

### Comprehensive Examination

Full-time Materials Science M.S. candidates are required to pass a written Comprehensive (Qualifying) Exam with a score of 50% or better, no later than 4 semesters after joining the program. Failure to pass the test will result in dismissal from the program. The deadline for part-time students is the semester they complete 24 credits. All students (full and part-time) are allowed a maximum of 2 attempts to pass the exam. Offered annually, the 3-hour exam requires students to solve a minimum of 3 problems that cover the following topics: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials, computational materials science,

synthesis and characterization of materials or equivalent core course requirements.

## Requirement for Advancement to Candidacy for the Degree of Master of Science

Successful completion of a comprehensive examination in Materials Science.

## MATERIALS SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Materials Science Ph.D. leads to a degree in 5 years. Students must engage in research and defend a dissertation. Successful completion of a comprehensive exam within the first 2 years of the program is required.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

An accredited Master's Degree (or equivalent) in physics, chemistry, metallurgy, engineering, mathematics, or materials science.

#### Minimum Degree Requirements

In addition to the above, the following are required:

- A minimum of 75 graduate credits including a minimum of 20 in dissertation research. An overall grade point average in graduate courses of 3.00 or better
- Completion of at least one 3-credit course in 5 of the following 6 categories (other appropriate core area courses may be approved by the Program Director). Note that 2 of the selected courses need to be from the following 3 categories: Quantum Properties of Materials, Computational Materials Science, Synthesis and Characterization of Materials.

Electrical and Optical Properties of Materials - Core Courses:		
PHYS 242	Intro to Solid State Physics	
PHYS 341	Solid State Physics	
EE 261	Semiconductor Materials/Device	
Thermodynamics and Kinetics - Core Courses:		
CHEM 260	Advanced Physical Chemistry (cannot be double-counted to simultaneously satisfy 2 categories)	
PHYS 265	Thermal & Statistical Physics	
ME 204	Biothermodynamics	
Mechanical Properties of Materials - Core Courses:		
ME 252	Mechanical Behavior Materials	
ME 255	Adv Engineering Materials	



ME 201	Biomaterials Engineering	
Quantum Properties of Materials - Core Courses:		
CHEM 260	Advanced Physical Chemistry (cannot be double-counted to simultaneously satisfy 2 categories)	
PHYS 273	Quantum Mechanics I	
PHYS 362	Quantum Mechanics II	
Computational Materials Science - Core Courses:		
PHYS 256	Computational Physics	
CHEM 275	Computational Chemistry	
ME 350	Multiscale Modeling	
Synthesis and Characterization of Materials - Core Courses:		
CHEM 231	Advanced Inorganic Chemistry	
CHEM 214	Polymer Chemistry	
CHEM 226	Analytical Spectroscopy	

- Satisfactory completion of a Ph.D. dissertation including its defense at an oral examination

### Comprehensive Examination

Full-time Materials Science Ph.D. candidates are required to pass a written Comprehensive (Qualifying) Exam with a score of 50% or better, no later than 4 semesters after joining the program. Failure to pass the test will result in dismissal from the program. The deadline for part-time students is the semester they complete 24 credits. All students (full and part-time) are allowed a maximum of 2 attempts to pass the exam. Offered annually, the 3-hour exam requires students to solve a minimum of 4 problems that cover the following topics: electrical and optical properties of materials, thermodynamics and kinetics, mechanical properties of materials, quantum properties of materials, computational materials science, synthesis and characterization of materials or equivalent core course requirements.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of a comprehensive examination in Materials Science.

## MATHEMATICAL SCIENCES

<http://www.uvm.edu/cems/mathstat/> (<http://www.uvm.edu/~cems/mathstat/>)

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Master of Science, Master of Science for Teachers, and Doctor of Philosophy in Mathematical Sciences. The Ph.D. program has three areas of concentration: Pure Mathematics, Applied Mathematics, and Statistics. The Department also offers a M.S. degrees in Statistics and in Biostatistics and M.S. and Ph.D. degrees

in Complex Systems & Data Science. It has Accelerated Master's Programs in Mathematics and in Statistics, which are available to UVM undergraduate students.

Opportunities for research arise from the research interests of the Department faculty, which include: algebraic geometry, arithmetic geometry, combinatorics/graph theory, complex systems, computational social science, Fourier/harmonic analysis, logic, mathematical cryptography, network science, number theory, biomathematics, fluid mechanics, numerical methods for, and analytical theories of, partial differential equations, as well as in bioinformatics, time series analysis, survival analysis, discriminant analysis, classification methods, bootstrap methods, categorical data analysis, measurement error models, and experimental design.

### DEGREES

- Mathematical Sciences AMP (p. 177)
- Mathematical Sciences M.S. (p. 178)
- Mathematics M.S.T. (p. 179)
- Mathematical Sciences Ph.D. (p. 179)

### FACULTY

**Backman, Spencer;** Assistant Professor, Department of Mathematics and Statistics, PHD, Georgia Institute of Technology  
**Bagrow, James;** Assistant Professor, Department of Mathematics and Statistics; PHD, Clarkson University  
**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford  
**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh  
**Chaudhuri, Paramita Saha;** Assistant Professor, Department of Mathematics and Statistics; PHD, University of Washington  
**Cole, Bernard F.;** Professor, Department of Mathematics and Statistics; PHD, Boston University  
**Danforth, Chris;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park  
**Dupuy, Taylor;** Assistant Professor, Department of Mathematics and Statistics; PHD, University of New Mexico  
**Lakoba, Taras Igorevich;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University  
**Rombach, Puck;** Assistant Professor, Department of Mathematics and Statistics; PHD, University of Oxford, Somerville College  
**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook  
**Vincent, Christelle;** Assistant Professor, Department of Mathematics and Statistics; PHD, University of Wisconsin-Madison  
**Warrington, Gregory S.;** Professor, Department of Mathematics and Statistics; PHD, Harvard University  
**Wilson, James Michael;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles  
**Yang, Jianke;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology  
**Young, Jean-Gabriel;** Research Assistant Professor, Department of Computer Science, PHD, Université Laval

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## MATHEMATICAL SCIENCES AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (<http://catalogue.uvm.edu/graduate/degree/requirements/requirementsforacceleratedmastersdegreeprograms/>)

### OVERVIEW

A master's degree in mathematical sciences, statistics or biostatistics can be earned in a shortened time by careful planning during the junior and senior years at UVM. For example, the M.S. could be earned in just 1 additional year, because 6 credits of undergraduate courses can also be counted concurrently toward the M.S. degree requirements. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate at UVM, but cannot count towards the B.S. degree.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Students are strongly encouraged to declare their wish to enter the Accelerated Master's Entry Program in writing to the Director of the Mathematics Program by the end of their sophomore year at UVM. This is needed for successful planning of the student's coursework, as indicated below. The student needs to apply to and be accepted by the Graduate College before taking the first course (MATH 241) that they wish to count towards the M.S. degree requirements. Following acceptance by the Graduate College, they can receive concurrent undergraduate and graduate credit for up to 6 credits of 200-level courses approved for graduate credit. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree.

Additional information is available in the Handbook for Graduate Studies in Mathematics, found on the Mathematics and Statistics Department website.

#### Minimum Degree Requirements for the Degree of Master of Science

Each student must complete one of the following options:

OPTION A (THESIS)	
24 semester hours of acceptable graduate credits in advanced mathematics courses, and 6 semester hours of thesis research (MATH 391) culminating in a master's thesis.	30
OPTION B (NON-THESIS)	
30 semester hours of acceptable graduate credits in advanced mathematics courses. No thesis is required.	
BOTH OPTIONS	

Under either option, students must take, or acquire the knowledge of the content in, the courses MATH 331 and MATH 333, and must satisfactorily complete at least 4 300-level mathematics courses.	
In both options students must select a major concentration from among the following areas: Analysis, Algebra, Applied Mathematics, or Discrete Mathematics. The concentration shall consist of at least 9 approved credits in advanced mathematics courses in the respective area, 3 of which must be at the 300-level; students writing a thesis may count the 6 hours of thesis credit toward these 9 hours.	
With approval of the student's advisor up to 6 credits of courses outside mathematics may be used to fulfill the major, minor, or degree requirements.	

### Comprehensive Examination

M.S. students must pass a comprehensive exam consisting of two parts: a written exam and either a second written exam or a thesis. The written exams are offered each August and January. Ph.D. students in the program take these exams as well, but with a more demanding criteria for passing. For example, M.S. students need to demonstrate proficiency in the concepts of MATH 241 (<http://catalogue.uvm.edu/search/?P=MATH%20241>) & MATH 242 (<http://catalogue.uvm.edu/search/?P=MATH%20242>), but not necessarily in material covered by MATH 331 (<http://catalogue.uvm.edu/search/?P=MATH%20331>) & MATH 333 (<http://catalogue.uvm.edu/search/?P=MATH%20333>) (which Ph.D. students must do).

Students in the AMP program in Mathematical Sciences must complete MATH 241 (<http://catalogue.uvm.edu/search/?P=MATH%20241>) and MATH 242 (<http://catalogue.uvm.edu/search/?P=MATH%20242>) with a grade of B+ or better in their undergraduate years. They may then opt to take the analysis exam in August at the beginning of their year as a Masters student, or earlier. Their final opportunity to take this exam is in January before their final semester.

All M.S. students in Mathematical Sciences must take the written exam in analysis. For students who are not writing a thesis, the second exam is chosen from the areas of algebra, numerical analysis, differential equations, or combinatorics. For students who are writing a thesis, a successful M.S. thesis defense takes the place of the second exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Students who have been admitted to the Accelerated Master's Program in mathematics normally advance to candidacy in this program at the end of their senior year. The criteria for advancement to candidacy are:

1. Completion of a bachelor's program in mathematics at UVM, or completion of a bachelor's program in science or engineering at UVM with a minor in mathematics;
2. Completion of at least 2 additional mathematics or statistics courses at the 200-level approved for graduate credit with grades of B or better in each (these are in addition to MATH 241 (<http://catalogue.uvm.edu/search/?P=MATH%20241>) MATH 242

(<http://catalogue.uvm.edu/search/?P=MATH%20242>) and the two 200-level courses required for admission to the program). Of the 200-level courses in mathematics, two must have been completed at the graduate level with a grade of B+ or better.

3. Completion of a 300-level course in Mathematics with a grade of B or better. This course will count towards the master's degree but may not be counted towards the student's undergraduate degree or GPA, and so must be taken as an overload.

Students who have been admitted to the AMP on the completion of their junior year but who fail to meet the requirements for advancement to candidacy for the M.S. degree will only be permitted to continue towards their M.S. degree after review by the Mathematics Graduate Committee and with the written approval of the Director of the Graduate Program in Mathematics.

## MATHEMATICAL SCIENCES M.S.

All students must meet the Requirements for the Master's Degree (<http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforthemastersdegree/>)

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Master of Science (M.S.) in Mathematical Sciences. Each student declares a major subject, which may be algebra, analysis, applied mathematics, or discrete mathematics. Within this major, the student may pursue either course work or a thesis; the last of the two options requires the student to find an advisor within the department faculty.

Opportunities for research arise from the research interests of the department faculty. See the Department of Mathematics and Statistics website for further details. The department also offers the Ph.D. and an Accelerated Master's Program in Mathematical Sciences, as well as M.S. degrees in Statistics and Biostatistics and Ph.D. and M.S. degrees in Complex Systems & Data Science.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Applicants should have demonstrated strength in either pure or applied mathematics, a bachelor's degree with a major in mathematics or a closely related discipline, and satisfactory recommendations. See the departmental website for further details.

#### Minimum Degree Requirements for the Degree of Master of Science

Each student must complete one of the following options:

OPTION A (THESIS)	
24 semester hours of acceptable graduate credits in advanced mathematics courses, and 6 semester hours of thesis research (MATH 391) culminating in a master's thesis.	
OPTION B (PROJECT)	

24 semester hours of acceptable graduate credits in advanced mathematics courses, and 6 semester hours of MATH 392.	
OPTION C (COURSE)	
30 semester hours of acceptable graduate credits in advanced mathematics courses. No thesis is required.	
ALL OPTIONS	
Under all options, students must take, or acquire the knowledge of the content in, the courses MATH 331 and MATH 333, and must satisfactorily complete at least 4 300-level mathematics courses.	
In all options students must select a major concentration from among the following areas: Analysis, Algebra, Applied Mathematics, or Discrete Mathematics. The concentration shall consist of at least 9 approved credits in advanced mathematics courses in the respective area, 3 of which must be at the 300-level; students writing a thesis may count the 6 hours of thesis credit toward these 9 hours.	
With approval of the student's advisor up to 6 credits of courses outside mathematics may be used to fulfill the major, minor, or degree requirements.	

### Comprehensive Examination

M.S. students must pass a comprehensive exam consisting of two parts: a written exam and either a second written exam or a thesis. The written exams are offered each August and January. Ph.D. students in the program take these exams as well, but with a more demanding criteria for passing. For example, M.S. students need to demonstrate proficiency in concepts of MATH 241 (<http://catalogue.uvm.edu/search/?P=MATH%20241>) & MATH 242 (<http://catalogue.uvm.edu/search/?P=MATH%20242>), but not necessarily in material covered by MATH 331 (<http://catalogue.uvm.edu/search/?P=MATH%20331>) & MATH 333 (<http://catalogue.uvm.edu/search/?P=MATH%20333>) (which Ph.D. students must do).

For example, a student taking MATH 241 (<http://catalogue.uvm.edu/search/?P=MATH%20241>) & MATH 242 (<http://catalogue.uvm.edu/search/?P=MATH%20242>) in their first year could sit for the analysis exam in August before their second year begins, with a second opportunity in January before their final semester.

All M.S. students need to take the analysis exam. For non-thesis students, the second exam may be in any of the following areas: algebra, numerical analysis, differential equations, or combinatorics. For thesis students, a successful M.S. thesis defense satisfies the requirement of the second exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

The requirements for advancement to candidacy are the completion of any prerequisites noted when the student was admitted.

## MATHEMATICS M.S.T.

All students must meet the Requirements for the Master's Degree (<http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforthemastersdegree/>)

### OVERVIEW

The Department of Mathematics offers programs towards the Master of Science, Master of Science for Teachers, and the Doctor of Philosophy in Mathematical Sciences. There are two areas of concentration: pure mathematics and applied mathematics. The programs emphasize the interaction between these two areas and the common role of scientific computation. Students can take courses common to both areas, enabling them to gain an appreciation of the mathematical techniques and the connections between theory and applications. Department research interests include analysis, algebra, arithmetic geometry, number theory, graph theory, combinatorics, complex systems, computational social science, fluid mechanics, biomathematics, differential equations, network science, mathematics education, numerical analysis, and modeling.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Teachers

A bachelor's degree from an accredited institution, licensure as a teacher, and experience teaching grades K-12. GRE scores are not required.

#### Minimum Degree Requirements for the Degree of Master of Science for Teachers

Thirty credits of course work in mathematics. With the approval of their advisor and the Graduate College, students may choose courses from the 100-level or from closely related fields. The student must have a curriculum program approved by her/his advisor. The student must pass an oral comprehensive examination. No thesis is required.

#### Comprehensive Examination

The comprehensive examination must be taken no later than five weeks before the end of the semester preceding the conferral of the degree. The details of the examination are decided upon by each student's examination committee and will be discussed with the student in advance of the exam.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science in Teaching

The requirements for advancement to candidacy are the completion of any prerequisites noted when the student was admitted.

## MATHEMATICAL SCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Doctor of Philosophy in Mathematical Sciences in 3

areas of concentration: applied mathematics, pure mathematics and statistics.

Opportunities for research arise from the research interests of the Department faculty, which include algebraic geometry, arithmetic geometry, combinatorics/graph theory, complex systems, computational social science, Fourier/harmonic analysis, logic, mathematical cryptography, network science, number theory, biomathematics, fluid mechanics, numerical methods for, and analytical theories of, partial differential equations. Research foci in statistics include bioinformatics, classification methods, time series analysis, survival analysis, discriminant analysis, bootstrap methods, categorical data analysis, measurement error models, and experimental design. Opportunities are available for biostatistical research related to problems in agriculture and the life sciences, health and medicine, and natural resources and the environment.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Because of the breadth of pure and applied mathematics and statistics, it is recognized that applicants for admission will have diverse backgrounds. Admission requirements are therefore flexible. Applicants should have demonstrated strength in either pure or applied mathematics, a bachelor's degree with a major in mathematics, statistics or a closely related discipline.

#### Minimum Degree Requirements for the Degree of Doctor of Philosophy

Each student must complete the comprehensive examination and an approved plan of study including at least 75 credits in course work or dissertation research. The student is required to write a doctoral dissertation and pass a final oral defense of that dissertation. The department requires 2 semesters of college-teaching experience. Students are expected to demonstrate appropriate proficiency in the use of technology. There is no formal language requirement.

**MASTER'S DEGREE CREDENTIAL:** Students who do not have a master's in mathematical science in the track they are pursuing for the doctorate may petition their doctoral Studies Committee and the Graduate College to receive a master's degree during the progression of their doctoral studies. Students must complete the requirements of the course-based option for the master's in the relevant discipline (mathematics, biostatistics or statistics). Students should indicate their intent to pursue the master's degree prior to the second year in the doctoral program to provide appropriate advising for completion of the master's degree requirements. Completion of the requirements for the master's and the petition to the Graduate College to award the master's degree must occur before completion of the final component of the doctoral comprehensive examination.

#### Comprehensive Examination

**PURE AND APPLIED MATHEMATICS TRACKS:** The Examination consists of 3 parts: 2 written exams and 1 written survey of the proposed research area accompanied by an oral presentation. Syllabi for these exams are available from the Director of Graduate Studies in Mathematics. They are taken at distinct times

and all 3 must be satisfactorily completed in order to advance to candidacy. For students with a concentration in Pure Mathematics, 2 three-hour written exams are chosen from among 3 options: real and complex analysis, algebra, and combinatorics. For students with a concentration in Applied Mathematics, 1 three-hour written exam is in numerical analysis and the other 3-hour written exam is in differential equations.

The survey and oral presentation is conducted by the studies committee on a topic chosen by the student in consultation with the committee.

The 2 written examinations must be passed by the middle of the second year in the program. All 3 exams must be passed by the beginning of the third year.

**STATISTICS TRACK:** The Examination consists of 3 parts, 2 written and 1 oral. They are taken at distinct times and all 3 must be satisfactorily completed in order to advance to candidacy. The first written exam is based on the courses STAT 211 ([http://catalogue.uvm.edu/search/?P=STAT 211](http://catalogue.uvm.edu/search/?P=STAT%20211)), STAT 221 ([http://catalogue.uvm.edu/search/?P=STAT 221](http://catalogue.uvm.edu/search/?P=STAT%20221)), STAT 223 ([http://catalogue.uvm.edu/search/?P=STAT 223](http://catalogue.uvm.edu/search/?P=STAT%20223)), STAT 231 ([http://catalogue.uvm.edu/search/?P=STAT 231](http://catalogue.uvm.edu/search/?P=STAT%20231)), STAT 251 ([http://catalogue.uvm.edu/search/?P=STAT 251](http://catalogue.uvm.edu/search/?P=STAT%20251)), and STAT 261 ([http://catalogue.uvm.edu/search/?P=STAT 261](http://catalogue.uvm.edu/search/?P=STAT%20261)). The first component of the comprehensive exam is typically held 2 weeks after the final exam period in the spring semester. The second written exam is an extensive literature review of a topical area written in the form of a review paper and must be passed by the middle of the second year in the program. The oral exam is scheduled after successful completion of both written exams and must be passed by the beginning of the third year. The oral exam is a presentation of the current state of research in a defined area and proposal for the future work to be conducted.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of the comprehensive examination.

## MECHANICAL ENGINEERING

[https://www.uvm.edu/cems/me/graduate\\_program](https://www.uvm.edu/cems/me/graduate_program) ([https://www.uvm.edu/cems/me/graduate\\_program/](https://www.uvm.edu/cems/me/graduate_program/))

### OVERVIEW

The main asset of the UVM mechanical engineering graduate program is certainly the human factor, including our dedicated faculty and staff, and motivated students.

### Curriculum

We continuously update our curriculum to address modern topics in mechanical engineering, and to offer a breadth of courses that makes studying in our program more flexible, whether the student intends to earn an M.S. as a continuing student from local industries, or directly obtain a doctorate right from the bachelor's degree. Most of our graduate students are full-time and actively engaged in research projects with one or two faculty mentors who are dedicated to their

success. The size of the program also enables them to have close interactions with the rest of the faculty, and to regularly participate in the life of the program via graduate student seminars and invited speaker presentations.

### Graduate

Since its creation, students from across the United States and various countries around the world have graduated from the UVM mechanical engineering graduate program. Also, we actively seek to admit a diverse group of students in mechanical engineering to address the contemporary challenges of our society. To date, our graduates have achieved successful careers in academia as distinguished professors, in industry as engineers and entrepreneurs, and in government positions as program directors for national funding agencies or scientists at national laboratories.

### Faculty and Research

The success of our graduate program is built on a distinguished faculty whose research is recognized nationally and internationally through innovation, dissemination of knowledge in high-impact journals, and research awards. Our focus is to create a research environment that is often interdisciplinary and collaborative from which our students can flourish. Our faculty is actively engaged in applied and fundamental research to address timely scientific questions relevant to mechanical engineering, using experimental, computational and theoretical methods. The mechanical engineering faculty at UVM works closely with students in five research areas: 1- Computational Multiscale Simulations & Theory; 2- Thermo-fluid & Aerospace Engineering; 3- Medical Research; 4 - Dynamical Sensing, Monitoring and Control, and 5- Materials Science and Engineering.

### DEGREES

- Mechanical Engineering AMP (p. 181)
- Mechanical Engineering M.S. (p. 181)
- Mechanical Engineering Ph.D. (p. 182)

### FACULTY

**Dubief, Yves C.**; Associate Professor, Department of Mechanical Engineering; PHD, Institut National Polytechnique de Grenoble  
**Fiorentino, Niccolo M.**; Assistant Professor, Department of Mechanical Engineering; PHD, University of Virginia  
**Fletcher, Douglas G.**; Professor, Department of Mechanical Engineering; PHD, University of Virginia  
**Floreani, Rachael Ann**; Associate Professor, Department of Mechanical Engineering; PHD, Colorado State University  
**Garimella, Suresh**; President, University of Vermont, Professor, Department of Mechanical Engineering; PHD, University of California at Berkeley  
**Huston, Dryver R.**; Professor, Department of Mechanical Engineering; PHD, Princeton University  
**Louisos, William**; Senior Lecturer, Department of Mechanical Engineering; PHD, University of Vermont  
**Ma, Jihong**; Assistant Professor, Department of Mechanical Engineering, PHD, University of Minnesota, Twin Cities  
**Marshall, Jeffrey Scott**; Professor, Department of Mechanical Engineering; PHD, University of California Berkeley

**Meyers, Jason;** Research Assistant Professor, Department of Mechanical Engineering; PHD, Univ. Libre de Bruxelles / von Kármán Institute

**Sansoz, Frederic P.;** Professor, Department of Mechanical Engineering; PHD, Ecole des Mines de Paris

**Schadler, Linda S.;** Dean, College of Engineering and Mathematical Sciences; Professor, Department of Mechanical Engineering; PHD, University of Pennsylvania

## MECHANICAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Qualified undergraduate students who plan to earn a M.S. in mechanical engineering may enroll in the Accelerated Master's Entry Program, which enables students to begin working on the M.S. while still an undergraduate. Students apply to the program in the second semester of their junior year. Following acceptance by the Graduate College, students may take up to 6 graduate credits while still an undergraduate that can be counted toward both the B.S. and the M.S. degrees, subject to approval of the student's graduate advisor. Another 3 graduate credits can be counted towards the M.S. degree while an undergraduate but cannot count towards the B.S. degree. Students in the Accelerated Masters Program must follow either the non-thesis option or research thesis option M.S. degree requirements. For the thesis option, research counting toward the thesis must begin immediately in the summer following the completion of the bachelor's degree.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

To apply for the program, students must be enrolled at the University of Vermont in mechanical engineering with a cumulative grade point average of at least 3.20 at the time of application, and must complete the CEMS Accelerated Masters Permission Form and the Graduate College application. For thesis students, the application should name a graduate faculty member who has agreed to serve as their thesis advisor. No Graduate Record Examination (GRE) is required for AMP applicants.

#### Minimum Degree Requirements for the Degree of Master of Science

The Mechanical Engineering AMP requires the completion of advanced courses in mechanical engineering, mathematics, and other approved courses and research (for thesis students) totaling at least 30 credits.

Students are required to complete:

A prescribed set of nine core course credits which cover areas of advanced engineering, mathematics, continuum mechanics, and numerical methods	
6 course credits in the area of specialization for their degree	6

Currently, the program offers areas of specialization in:

- Biomechanics and Biomaterials
- Control and Design of Mechanical Systems;
- Materials Engineering and Nanomechanics;
- Thermodynamics, Fluids and Energy; and
- Computational Mechanics.

Further details on the core course requirements and the areas of specialization can be obtained from the Mechanical Engineering Graduate Program website.

OPTION A (THESIS)	
In addition to core courses, students selecting the thesis option must complete between 6 and 9 thesis credits (ME 391) prior to the master's thesis defense, with the expectation that the student's research must culminate in an original piece of work publishable as a conference proceedings paper or a peer-reviewed journal article. Those opting for a 6-credit thesis must complete an additional 3 credits of approved course work	
OPTION B (NON-THESIS)	
Students selecting the non-thesis option must complete an additional 15 credits of course work beyond the core credits in lieu of a thesis. Of the additional course work, a minimum of 9 credits must be in a chosen area of specialization.	

### Comprehensive Examination

The comprehensive examination for the thesis option consists of successfully presenting a proposal research seminar.

Candidates in the non-thesis option must successfully present a 25-min. public seminar for the Mechanical Engineering Seminar Series. The seminar should be a comprehensive literature review on a subject matter relevant to the candidate's chosen area of specialization in mechanical engineering.

The candidate is given a maximum of 2 opportunities to pass the comprehensive examination.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

A cumulative grade point average of 3.00 or better.

## MECHANICAL ENGINEERING M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Mechanical Engineering Graduate Program offers a Master's of Science (M.S.) degree in mechanical engineering. Each student must meet the general requirements for admission as outlined under

the regulations of the University of Vermont Graduate College. Typically, students entering the program have received a bachelor's degree in mechanical engineering or a related field. Applicants with other backgrounds will be evaluated individually and must complete prescribed undergraduate technical course work. Part-time study leading to the M.S. degree is also possible for engineers who are employed in the vicinity. Areas of research interest in the program currently include: Aerospace Engineering, Turbulence, Complex and Bio Fluids, Multiscale Mechanics, Micro Technology and Robotics, Nanomaterials & Composites, Energy Harvesting, System Control & Diagnostics, Biomechanics & Orthopedics, Biomaterials, and High-performance Computing.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Science**

An accredited bachelor's degree in Mechanical Engineering or equivalent is the typical requirement; however, students holding a bachelor's degree in a related engineering or scientific field may also qualify for admission. Completion of the general (aptitude) portion of the Graduate Record Examination is required only for those students who are applying for a Graduate Teaching or Research Assistantship.

**Minimum Degree Requirements for the Degree of Master of Science**

The Mechanical Engineering Graduate Program offers both thesis and non-thesis options for the master's degree. Both options require the completion of advanced courses in mechanical engineering, mathematics, and other approved courses and research (for thesis students) totaling at least 30 credits. Graduate students receiving financial support via teaching or research fellowships are required to select the thesis option. Part-time students typically select the non-thesis option but may choose the thesis option if they prefer. Students normally decide on which option they intend to pursue at the beginning of their program.

All students are required to complete:

A prescribed set of 9 core course credits which cover areas of advanced engineering, mathematics, continuum mechanics, and numerical methods	
6 course credits in the area of specialization for their degree	6

Currently, the program offers areas of specialization in:

- Biomechanics and Biomaterials;
- Control and Design of Mechanical Systems;
- Materials Engineering and and Nanomechanics;
- Thermodynamics, Fluids and Energy; and
- Computational Mechanics

Further details on the core course requirements and the areas of specialization can be obtained from the Mechanical Engineering Graduate Program website.

Option A (Thesis)	
In addition to core courses, students selecting the thesis option must complete between 6 and 9 thesis credits (ME 391) prior to the master's thesis defense, with the expectation that the student's research must culminate in an original piece of work publishable as a conference proceedings paper or a peer-reviewed journal article. Those opting for a 6-credit thesis must complete an additional 3 credits of approved course work	
Option B (Non-thesis)	
Students selecting the non-thesis option must complete an additional 15 credits of course work beyond the core credits in lieu of a thesis. Of the additional course work, a minimum of 9 credits must be in a chosen area of specialization.	

**Comprehensive Examination**

The comprehensive examination for the thesis option consists in successfully presenting a proposal research seminar.

Candidates in the non-thesis option must successfully present a 25-min. public seminar for the Mechanical Engineering Seminar Series. The seminar should be a comprehensive literature review on a subject matter relevant to the candidate's chosen area of specialization in mechanical engineering.

The candidate is given a maximum of 2 opportunities to pass the comprehensive examination.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

A cumulative grade point average of 3.00 or better.

**MECHANICAL ENGINEERING PH.D.**

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

**OVERVIEW**

The Mechanical Engineering Graduate Program offers a Doctor of Philosophy (Ph.D.) degree in mechanical engineering. Each student must meet the general requirements for admission as outlined under the regulations of the University of Vermont Graduate College. Typically, students entering the program have received a master's degree in mechanical engineering or a closely-related field. Applicants with other backgrounds will be evaluated individually and may be asked to complete prescribed undergraduate technical course work. Areas of research interest in the program currently include: Aerospace Engineering, Turbulence, Complex and Bio Fluids, Multiscale Mechanics, Micro Technology and Robotics, Nanomaterials & Composites, Energy Harvesting, System Control & Diagnostics, Biomechanics & Orthopedics, Biomaterials, and High-performance Computing.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

An accredited master's degree in mechanical engineering or closely related discipline is required. Completion of the general (aptitude) portion of the Graduate Record Examination is required.

### Minimum Degree Requirements for the Degree of Doctor of Philosophy

The degree of Doctor of Philosophy requires of candidates a minimum of 75 credits to be earned in course work and in dissertation research. The 75 credits must be distributed in such a way that at least 39 credits must be earned in courses and seminars and a minimum of 21 credits must be earned in dissertation research. Students must complete at least 15 credits in graduate-level mechanical engineering course work at UVM from the different areas of specialization. This mechanical engineering coursework requirement can include M.S. course credits earned at UVM; however students must complete 15 credits of graded graduate coursework after matriculation into the doctoral program. Currently, the program offers areas of specialization in:

- Biomechanics and Biomaterials;
- Control and Design of Mechanical Systems;
- Materials Engineering and Nanomechanics;
- Thermodynamics, Fluids and Energy; and
- Computational Mechanics.

All Ph.D. candidates complete a doctoral dissertation consisting of original research and of sufficient quality to merit publication in an archival journal.

### Comprehensive Examination

All Ph.D. candidates must pass the comprehensive examination. The comprehensive examination tests the proficiency of the students in 4 topics of the mechanical engineering curriculum or closely related fields. The candidate works with his/her advisor and the graduate program coordinator to form a committee of 4 graduate faculty, 1 of whom should hold an appointment outside of mechanical engineering (1 faculty member may test the student on two distinct topics). The first part of the comprehensive examination consists of a written part spanning no more than 4 hours (1 hour per topic). In the second part of the examination, the committee meets with the student to ask questions regarding the written exam and any follow up topics that may be necessary to establish the proficiency of the candidate in mechanical engineering. A candidate must pass the comprehensive examination in no more than 2 attempts. Comprehensive examinations are typically scheduled at the end of the Fall or Spring semesters. It is strongly advised that the Ph.D. candidate take the comprehensive examination at the completion of his/her second or third semester of studies.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of the Ph.D. comprehensive examination.

## MEDICAL LABORATORY SCIENCE

<http://www.uvm.edu/cnhs> (<http://www.uvm.edu/cnhs/>)

### OVERVIEW

The Master of Science in Medical Laboratory Science (MMLS) program is designed to provide students with the knowledge and skills required for leadership opportunities in management, education, research and advanced clinical practice in the medical laboratory science profession.

Individuals may enter the program via two tracks, depending on their background:

- Track 1 is for individuals with a bachelor's degree who are not certified in medical laboratory science but desire a career in the clinical laboratory sciences. Upon completion of the program, these students will be eligible to take the national certification exam in medical laboratory science offered by the American Society of Clinical Pathology (ASCP).
- Track 2 is for medical laboratory science-certified graduates who seek advanced training and expertise in evidence-based practice, scientific research, health care management and leadership. Track 2 also includes an accelerated master's option for current UVM Medical Laboratory Science students.

Both Track 1 and Track 2 involve a research-based capstone project that will engage students in hands-on research methodology, experimental practice, and scientific communication. The capstone project provides students with the opportunity to develop important skills in evidence-based practice and clinically-related research.

Program faculty conduct research that aims to understand the molecular mechanisms of human disease, with particular emphasis on immune cell activation, gene expression and molecular signal transduction. Our faculty offer advanced practice courses in molecular methods, clinical laboratory correlations, emerging diagnostic technologies, healthcare leadership and management, quality, evidence based practice, research design and methods; and research experiences to prepare graduates of both tracks to become future leaders in the profession.

Students in Track 1 will complete a semester-long clinical practicum at one of our clinical affiliate hospitals as part of the core NAACLS-accredited program.

### Degrees

- Medical Laboratory Science AMP (p. 184)
- Medical Laboratory Science M.S. (p. 185)

### FACULTY

**Amiel, Eyal;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Dartmouth College

**Deming, Paula;** Associate Professor, Department of Biomedical and Health Sciences; PHD, University of North Carolina at Chapel Hill

**Frietze, Seth;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Harvard University



**Fung, Mark K.;** Professor, Department of Pathology and Laboratory Medicine; MD, PHD, University of Alabama School of Medicine  
**Krementsov, Dimitry N.;** Assistant Professor, Department of Biomedical and Health Sciences, PHD; University of Vermont  
**Moreau, Katrina;** Clinical Assistant Professor, Department of Biomedical and Health Sciences; M.A.T., MLS, Tufts University  
**Scheiber, Melissa;** Clinical Assistant Professor, Department of Biomedical and Health Sciences, PHD: Medical University of South Carolina

## MEDICAL LABORATORY SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Degree Entry Program (AMP) in Medical Laboratory Science is designed to offer select UVM medical laboratory science students an opportunity to earn both the bachelor's degree and the master's degree in Medical Laboratory Science in 5 years. 6 credits toward the M.S. will be earned during the senior year; which will also count toward the B.S.. 6 credits will then be completed during the summer after college graduation, with all remaining requirements fulfilled in academic year 5.

The objective of this program is to prepare certified medical laboratory scientists for leadership roles in medical laboratory science practice and research. Graduates will have advanced training and expertise in evidence-based practice, scientific research, and healthcare management. Students in the AMP program will complete the MLS Track 2 curriculum requirements.

Track 2 involves a research-based capstone project that will engage students in hands-on research methodology, experimental practice, and scientific communication. The capstone project provides students with the opportunity to develop important skills in evidence-based practice and clinically-related research.

Program faculty conduct research that aims to understand the molecular mechanisms of human disease, with particular emphasis on immune cell activation, gene expression and molecular signal transduction. Our faculty offer advanced practice courses in molecular methods, clinical laboratory correlations, emerging diagnostic technologies, healthcare leadership and management, quality, evidence based practice, research design and methods; and research experiences to prepare graduates of both tracks to become future leaders in the profession.

### SPECIFIC REQUIREMENTS

#### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE

Students should apply for admission into the AMP in Medical Laboratory Science in the beginning of the spring semester of their junior year. Consideration for admission requires the following:

- Must be a current 3<sup>rd</sup> year medical laboratory science student in good standing

- A minimum cumulative GPA of 3.00
- Completion of the Graduate College Application form
- Written personal statement
- Recommendation by a MLS faculty member

### MINIMUM DEGREE REQUIREMENTS

A minimum of 30 credits and successful completion of a comprehensive written exam are required for completion of the AMP in Medical Laboratory Science. In addition, students must successfully complete and defend a research-based capstone project.

Students must also meet the Graduate College requirements for the Master's Degree including maintaining a minimum GPA of 3.0.

30 credits of advanced practice coursework.

FOURTH YEAR UNDERGRADUATE/FIRST YEAR GRADUATE DUAL ENROLLMENT		
Summer or Fall Semester		
STAT 200	QR: Med Biostat&Epidemiology	3
or STAT 211	QR: Statistical Methods I	
Spring Semester		
NH 399	Fundamentals Critical Inquiry	3
FIFTH YEAR GRADUATE ONLY		
Summer Semester		
MLS 397	Clinical Leadership & Mgt	3
MLS 390	Research and Design II	3
Fall Semester		
MLS 372	Emerging Diag. Technologies	3
MLS 391	Research Capstone	3
Approved Elective		3
Spring Semester		
PATH 325	Genetics for Clinicians	3
CTS 302	Quality in Healthcare	3
or GRNS 328	Quality in Healthcare	
MLS 371	Clinical Correlations	3

### COMPREHENSIVE EXAMINATION

Students will complete a written comprehensive exam by the end of the spring semester of the fifth year.

### REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Successful completion of the comprehensive exam and in academic good standing.

## MEDICAL LABORATORY SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master of Science in Medical Laboratory Science (MMLS) program is designed to provide students with the knowledge and skills required for leadership opportunities in management, education, research and advanced clinical practice in the medical laboratory science profession.

Individuals may enter the program via 2 tracks, depending on their background:

- Track 1 is for individuals with a bachelor's degree who are not certified in medical laboratory science but desire a career in the clinical laboratory sciences. Upon completion of the program, these students will be eligible to take the national certification exam in medical laboratory science offered by the American Society of Clinical Pathology (ASCP). Graduation is not contingent upon passing the ASCP certification exam.
- Track 2 is for medical laboratory science-certified graduates who seek advanced training and expertise in evidence-based practice, scientific research, healthcare management and leadership. Track 2 also includes an accelerated master's option for current UVM medical laboratory science students.

Both Track 1 and Track 2 involve a research-based capstone project that will engage students in hands-on research methodology, experimental practice, and scientific communication. The capstone project provides students with the opportunity to develop important skills in evidence-based practice and clinically-related research.

Program faculty conduct research that aims to understand the molecular mechanisms of human disease, with particular emphasis on immune cell activation, gene expression and molecular signal transduction. Our faculty offer advanced practice courses in molecular methods, clinical laboratory correlations, health care leadership and management, policy, ethics, quality, research design and methods; and research experiences to prepare graduates of both tracks to become future leaders in the profession.

Students in Track 1 will complete a semester-long clinical practicum at one of our clinical affiliate hospitals as part of the core NAACLS-accredited program.

### SPECIFIC REQUIREMENTS

#### REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE

##### TRACK 1

- B.S. or B.A. in one of the life sciences (or related field) from accredited college or university
- Minimum overall GPA of 3.0
- Undergraduate and (when applicable) graduate transcripts

- General biology or anatomy and physiology (8 credits), general chemistry (8 credits), organic chemistry or biochemistry (4 credits), general microbiology with lab (4 credits), college level math (3 credits)
- TOEFL or IELTS scores (international students)
- UVM Graduate College Application

##### TRACK 2

- B.S. in Medical Laboratory Science or related field
- ASCP certification in Medical Laboratory Science or ASCP certification-eligible
- Minimum overall GPA of 3.0
- Undergraduate and (when applicable) graduate transcripts
- General biology or anatomy and physiology (8 credits), general chemistry (8 credits), organic chemistry or biochemistry (4 credits), general microbiology with lab (4 credits), college level math(3 credits)
- TOEFL or IELTS scores (international students)
- UVM Graduate College Application

### MINIMUM DEGREE REQUIREMENTS

#### TRACK 1

43 credits NAACLS accredited courses and 24 credits Advanced Practice courses (67 credits total).

FIRST YEAR		
Fall Semester		
MLS 221	Clinical Chemistry I	4
BHSC 281	Applied Molecular Biology	3
BHSC 282	Applied Molecular Biology Lab	1
STAT 200	QR: Med Biostat&Epidemiology	3
or STAT 211	QR: Statistical Methods I	
MLS 310	Advanced Immunobiology	3
Spring Semester		
BHSC 244	Immunology Lab	1
MLS 222	Clinical Chemistry II	3
CTS 302	Quality in Healthcare	3
PATH 325	Genetics for Clinicians	3
MMG 222	Advanced Medical Microbiology	4
NH 399	Fundamentals Critical Inquiry	3
Summer Semester		
MLS 397	Clinical Leadership & Mgt	3
MLS 390	Research and Design II	3
SECOND YEAR		
Fall Semester		

MLS 372	Emerging Diag. Technologies	3
MLS 255	Clinical Microbiology II	3
MLS 231	Hematology	4
MLS 262	Immunohematology	4
Spring Semester		
MLS 301	Clinical Practicum	12
MLS 391	Research Capstone	3
MLS 302	Certification Review	1

**TRACK 2**

30 credits of advanced practice coursework.

FIRST YEAR		
Fall Semester		
MLS 372	Emerging Diag. Technologies	3
STAT 200	QR: Med Biostat&Epidemiology	3
or STAT 211	QR: Statistical Methods I	
Spring Semester		
NH 399	Fundamentals Critical Inquiry	3
PATH 325	Genetics for Clinicians	3
Summer Semester		
MLS 397	Clinical Leadership & Mgt	3
MLS 390	Research and Design II	3
SECOND YEAR		
Fall Semester		
MLS 391	Research Capstone	3
Approved Elective		
Spring Semester (Note: these courses may also be taken in the Spring of year 1)		
MLS 371	Clinical Correlations	3
CTS 302	Quality in Healthcare	3
or GRNS 328	Quality in Healthcare	

**COMPREHENSIVE EXAMINATION**

Students will complete a written comprehensive exam prior to graduation.

**REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE**

Successful completion of the comprehensive exam and in academic good standing.

**MEDICAL SCIENCE**

<https://learn.uvm.edu/program/uvm-master-of-medical-science-degree/>

**OVERVIEW**

The main objective of the Master of Science in Medical Science Program is to provide a rigorous curriculum in the basic biomedical sciences that prepares students with the background knowledge and skills required to gain acceptance into and succeed in medical school as well as other health-related professional doctoral-level degree programs including dental and pharmacy school. The program offers a cohesive set of core courses that cover the major biomedical disciplines that together provide the foundation of understanding how the human body works from the molecular (biochemistry), cellular (cell biology), and systems (anatomy and physiology) levels, as well as the fundamentals required to understand drug actions in the body (pharmacology) and the principles of quantitatively interpreting scientific and epidemiological data (biostatistics).

**DEGREES**

- Medical Science M.S. (p. 187)

**FACULTY**

**Anathy, Vikas;** Assistant Professor, Department of Pathology and Laboratory Medicine; PHD, Madurai Kamaraj University

**Berger, Christopher Lewis;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Deming, Paula B.;** Associate Professor, Department of Biomedical and Health Sciences; PHD, University of North Carolina at Chapel Hill

**Francklyn, Christopher Steward;** Professor, Department of Biochemistry; PHD, University of California Santa Barbara

**Howe, Alan K.;** Associate Professor, Department of Pharmacology; PHD, Northwestern University

**Kelm, Robert;** Associate Professor, Department of Medicine-Cardiovascular; PHD, University of Vermont

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**May, Victor;** Professor, Department of Neurological Sciences; PHD, Northwestern University

**Mawe, Gary Michael;** Professor, Department of Neurological Sciences; PHD, Ohio State University

**Stumpff, Jason K.;** Assistant Professor, Department of Molecular Physiology and Biophysics; PHD, University of Colorado

**Thali, Markus Josef;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Zurich

**Tracy, Paula Babiarz;** Professor, Department of Biochemistry; PHD, Syracuse University

**Ward, Gary E.;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of California San Diego

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

## MEDICAL SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The goal of the Master of Science in Medical Science Program is to provide a rigorous curriculum in the basic biomedical sciences that prepares students with the background knowledge and skills required to gain acceptance into and succeed in healthcare-related professional degree programs such as medical, dental, or pharmacy programs. The program offers a cohesive set of core courses in biomedical disciplines that together provide foundational understanding of human structure and function. Courses provide graduate-level training in biochemistry, cell biology, anatomy, and physiology as well as pharmacology and evidence-based medicine.

The faculty below are in addition to those who have been formally appointed Graduate Faculty members:  
 Akselrod, Dmitry; Assistant Professor, Department of Radiology; MD, SUNY Upstate Medical University  
 Geeslin, Matthew; Assistant Professor, Department of Radiology; MD, University of Minnesota  
 Morris, Erin; Assistant Professor, Department of Obstetrics, Gynecology and Reproductive Sciences; MD, University of Utah School of Medicine

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Applicants are required to have a B.S. or B.A. from accredited college or university, 2 semesters of general biology, general physics, general chemistry, and organic chemistry. International Students are required to submit scores for TOEFL or IELTS.

#### Minimum Degree Requirements

UVM's Master of Medical Science degree is a 30-credit program that is designed to be completed within 1 year (12 months). Students complete Core Course Requirements, 1 anatomy, 1 biostatistics and additional electives to complete the 30-credit program.

Core Courses:		
BIOC 301	General Biochemistry	3
CLBI 301	Cell Biology	3
MPBP 301	Human Physiology & Pharm I	4
BIOC 302	General Biochemistry	3
PHRM 308	Integrative Physiol. & Pharm.	3
The following anatomy course or others as approved by the Director:		
ANNB 300	Human Gross Anatomy	6
1 from the following statistics course or others as approved by the Director:		
CTS 302	Quality in Healthcare	

CTS 325	Multi Analysis Clin&Trans Res	
PH 303	Biostatistics I:App Rsch in PH	
PSYS 304	Adv Statistical Methods I	
Choose at least 2 electives from the following or other health-related courses approved by the Director (core and elective credits must combine for an overall total of at least 30 credits):		
BIOC 351	Proteins I: Structure&Function	
BIOC 372	Cancer Biology	
MMG 222	Advanced Medical Microbiology	
MMG 223	Immunology	
MMG 225	Eukaryotic Virology	
MPBP 310	Molecular Control of the Cell	
MPBP 390	Medical Master's Capstone (only 1 Capstone course allowed)	
NSCI 302	Neuroscience	
OBYG 200	Understanding Human Pregnancy	
PH 301	Public Health & Health Policy	
PH 302	Epidemiology I	
PH 303	Biostatistics I:App Rsch in PH	
PH 304	Environmental Public Health	
PH 305	Pol,Org & Finance in Hlth Care	
PH 306	Social&Behavioral Public Hlth	
PH 307	Epidemiology 2	
PH 312	Food Systems & Public Hlth	
PH 322	One Health: Zoonoses	
PHRM 200	Medical Cannabis	
PHRM 240	Molecules & Medicine	
PHRM 272	Toxicology	
PHRM 290	Topics Molecular&Cell Pharm	
PHRM 305	Milestones in Pharmacology	
PHRM 390	Medical Master's Capstone (only 1 Capstone course allowed)	
SURG 200	Emergency Medicine Research I	

### Comprehensive Examination

Students must complete a comprehensive exam, integrating their knowledge of core course material in a written paper, by their end of their final semester in the program.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of a comprehensive examination in Medical Science.

## MICROBIOLOGY AND MOLECULAR GENETICS

### OVERVIEW

<https://www.med.uvm.edu/mmg/home> (<https://www.med.uvm.edu/mmg/home/>)

### OVERVIEW

The goal of the Microbiology and Molecular Genetics Master's Programs is to prepare students for careers in science. The program provides an increased knowledge base in both microbiology and molecular genetics as well as the ability to think critically, communicate scientific knowledge clearly and perform independent scientific research. In addition to the Microbiology and Molecular Genetics M.S. and Accelerated Master's Program (AMP), the MMG faculty participate in the interdisciplinary doctoral program in Cellular, Molecular, and Biomedical Sciences.

### DEGREES

- Microbiology and Molecular Genetics AMP (p. 188)
- Microbiology and Molecular Genetics M.S. (p. 190)

### FACULTY

**Bruce, Emily;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Cambridge University

**Chatterjee, Nimrat;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Baylor College of Medicine

**Colgate, Ross;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Diehl, Sean;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Doublié, Sylvie;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of North Carolina Chapel Hill

**Dragon, Julie;** Associate Professor, Microbiology and Molecular Genetics; PHD, University of Vermont

**Kirkpatrick, Beth Diane;** Professor, Department of Microbiology and Molecular Genetics; MD, Albany Medical College

**Lee, Andrea J.;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, University of Wisconsin-Madison

**Martorelli Di Genova, Bruno;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Federal University of Sao Paulo

**Mintz, Keith Peter;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Thali, Markus Josef;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Zurich

**Ward, Gary E.;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of California San Diego

**Wargo, Matthew;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, Dartmouth College

## MICROBIOLOGY AND MOLECULAR GENETICS AMP

All students must meet the Requirement for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Degree Entry Program (AMP) in Microbiology and Molecular Genetics is designed to offer select UVM undergraduate science majors the opportunity to obtain both their Bachelor's degree and Master's degree in Microbiology and Molecular Genetics in a total of 5 years of study. The objective of this program is to provide a broad knowledge base of microbiological and molecular genetic concepts to increase students' competitiveness to pursue additional graduate degrees (Ph.D., M.D.) or to prepare students for careers in pharmaceutical, biotechnology and related industries.

Students enrolled in this program can have up to 9 credits of graduate-level courses, which are taken during their senior undergraduate year, count towards both a Bachelor's degree and the Master's degree in Microbiology and Molecular Genetics. Students would then be expected to complete the remaining Master's degree requirements during a 5<sup>th</sup> year of study. Full-time graduate student status will start the summer after their undergraduate graduation and will be expected to be maintained until completion of their Master's degree in Microbiology and Molecular Genetics. Students interested in the Microbiology and Molecular Genetics AMP should contact the Program Coordinator.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science in Microbiology and Molecular Genetics

Students should apply for admission into the Accelerated Master's Degree Program in Microbiology and Molecular Genetics with a minimum of 75 credits and before the start of their 1<sup>st</sup> semester of their senior year. Admission into this program requires the following:

- A minimum cumulative grade point average of 3.00.
- Enrollment in an undergraduate Bachelor's degree program and completion of at least 1 year of Introductory Chemistry, 1 year of Organic Chemistry, 1 year of Calculus, MMG 101, MMG 104, BCOR 101, and BCOR 103 or MMG 196C.
- GRE/GMAT scores are NOT an admission requirement for the Accelerated Master's Degree Program in Microbiology and Molecular Genetics program.
- Students must identify a research mentor within the Department of Microbiology and Molecular Genetics in whose laboratory they will conduct their Master's degree research.

- Students **MUST** be admitted through the Graduate College before taking any courses that will be applied to the Master’s Degree.
- Courses taken as an undergraduate that will then count towards the Master’s degree must be graded with letter grades (A-F, not P/F, S/U, SP/UP). Independent study, internship and research credits are not allowed to count towards the Master’s degree.
- If more than 9 credits of graduate level coursework are taken prior to receipt of the Bachelor’s, **ONLY 9** credits will count towards the Master’s. There are no exceptions.
- Students are expected to initiate Master's degree research in the summer following their undergraduate graduation. Students who graduate in January may initiate Master's research in the spring semester and are expected to continue the research in the summer.

**Application Process**

- Completion of application to the Graduate College, meeting all Graduate College application requirements.
- Include at least 3 letters of recommendation, 1 must be from your identified research mentor.
- Include the "Accelerated Masters Permission" form, which can be found on the Graduate College website. This document must be signed by the indicated parties before being uploaded to your application.

**Minimum Degree Requirements**

A minimum of 30 credits are required for completion of the Accelerated Master's Degree in Microbiology Molecular Genetics. Students must also meet the Graduate College requirements for the Master's degree including maintaining a minimum GPA of 3.00.

Courses should be selected from the following lists.

Complete the following courses:		
BIOC 301	General Biochemistry (every fall) *	3
BIOC 302	General Biochemistry (every spring) *	3
MMG 231	Bioinformatics&Data Anlysis (every fall)	3
MMG 393	Graduate Teaching Practicum	3
MMG 396	Advanced Special Topics (Biomedical Data Analysis, every fall)	2
Approved Graduate Ethics Course		
*Successful completion of BIOC 205 / BIOC 206 can substitute for the BIOC 301 / BIOC 302 requirement for previous UVM students only. However, these will NOT count towards the 30-graduate credit requirement for the degree and thus cannot be used as part of the 9 credits that double count towards the bachelor's and master's degree.		
Choose at least 1 of the following upper-level courses:		3-4
MMG 201	Molecular Cloning Lab (every fall)	

MMG 211	Prokaryotic Molecular Genetics (every fall)	
MMG 233	Genetics and Genomics (every fall)	
Students must complete at least 1 upper-level course in Microbiology from the following selection of courses:		3-4
MMG 220	Environmental Microbiology (spring, even years)	
MMG 222	Advanced Medical Microbiology (every spring)	
MMG 225	Eukaryotic Virology (fall, even years)	
MMG 320	Cellular Microbiology (spring, odd years)	
Remaining credits in the degree program should be selected from the list above or the following approved list of courses. Special topics or other graduate courses may be acceptable by prior approval from the student's Studies Committee		3
CLBI 301	Cell Biology (every spring)	
MMG 223	Immunology (spring, odd years)	
MMG 232	QR: Advanced Bioinformatics (spring, odd years)	
At least 6 (and up to 12) credits of Master's Thesis Research (MMG 391) are required. In addition, a written thesis and defense of this thesis must occur according to the guidelines laid out by the Graduate College.		

**Comprehensive Examination**

By the end of the 1<sup>st</sup> semester in the Master’s program, M.S. students will write either an extensive literature review or research proposal that pertains to their research interests. Students can expect guidance from their advisor and Studies Committee in the writing of the proposal, but must assume responsibility for the final version and must acquire sufficient mastery of their chosen subject area to defend the proposal. Students will present their written proposal to their Studies Committee. That Committee will determine if the written proposal is satisfactory and, if it is, schedule an oral defense. During the oral defense, the Committee shall be free to explore the knowledge of the student on a range of subjects related to the proposal, much as occurs during a thesis defense. If the written review/proposal is deemed unsatisfactory or if a student fails the oral defense, the candidate will be given 1 opportunity to rewrite or re-defend his/her proposal. If the student fails a 2<sup>nd</sup> time, s/he/they will be dismissed from the M.S. program.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

**Studies Committee:**

The student’s Studies Committee will consist of the student’s research mentor, a member of the MMG graduate faculty, a faculty member from outside the Microbiology and Molecular Genetics Department to serve as the Chair of the Studies Committee and a

fourth member at the discretion of the student in consultation with their research mentor.

#### Thesis Writing and Defense:

Thesis writing cannot begin until a student has become a Candidate for the Degree of Master of Science in Microbiology and Molecular Genetics and has received approval from the student's Studies Committee.

## MICROBIOLOGY AND MOLECULAR GENETICS M.S.

All students must meet the Requirement for the Master's Degree (p. 260)

### OVERVIEW

The Department of Microbiology and Molecular Genetics offers a Master of Science degree. The M.S. degree is a thesis-based program. The program requires a minimum of 30 credits of research and coursework, a qualifying exam for candidacy, and the writing and defense of a thesis.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science in Microbiology and Molecular Genetics

- A Bachelor's degree with a minimum cumulative grade point average of 3.00.
- Minimum course requirements: Completion of 2 semesters of undergraduate biology, general chemistry, organic chemistry and calculus; in addition, 1 course in genetics, one course in microbiology with a laboratory, and 1 course in cell biology.
- GRE/GMAT scores are NOT an admission requirement for the Master's Degree Program in Microbiology and Molecular Genetics program.
- Graduate student status will start 1 week prior to the start of fall classes and will be expected to be maintained full time including summers until completion of their Master's degree in Microbiology and Molecular Genetics.
- Students MUST be admitted through the Graduate College before taking any courses that will be applied to the Master's degree requirements.

#### APPLICATION PROCESS

- Completion of application to the Graduate College, meeting all Graduate College application requirements.
- Admission to the program will be contingent upon the capacity and interests of participating departmental laboratories.

#### Minimum Degree Requirements

A minimum of 30 credits are required for completion of the Master's Degree in Microbiology and Molecular Genetics. Of the 30 credits, 6 must be master's thesis research credits. Students must also meet the Graduate College requirements for the Master's Degree including maintaining a minimum GPA of 3.00.

Students must complete the following courses:		
BIOC 301	General Biochemistry (every fall*)	3
BIOC 302	General Biochemistry (every spring*)	3
MMG 231	Bioinformatics&Data Analysis (every fall)	3
MMG 393	Graduate Teaching Practicum	3
MMG 396	Advanced Special Topics (Biomedical Data Analysis, every fall)	2
Approved Graduate Ethics Course (1 credit)		
*Successful completion of BIOC 205 / BIOC 206 can substitute for the BIOC 301 / BIOC 302 requirement for previous UVM students only. However, these will NOT count towards the 30-graduate credit requirement for the degree.		
Students must complete at least 1 upper-level course in Molecular Genetics from the following selection of courses:		3-4
MMG 201	Molecular Cloning Lab (every fall)	
MMG 211	Prokaryotic Molecular Genetics (every fall)	
MMG 233	Genetics and Genomics (every fall)	
Students must complete at least 1 upper-level course in Microbiology from the following selection of courses:		3-4
MMG 220	Environmental Microbiology (spring, even years)	
MMG 222	Advanced Medical Microbiology (every spring)	
MMG 225	Eukaryotic Virology (fall, even years)	
MMG 320	Cellular Microbiology (spring, odd years)	
Remaining credits in the degree program should be selected from lists above or the following approved list of courses. Special topics or other graduate courses may be acceptable by prior approval from the student's Studies Committee.		3-4
CLBI 301	Cell Biology (every spring)	
MMG 223	Immunology (every spring)	
MMG 232	QR: Advanced Bioinformatics	
At least 6 (and up to 9) credits of Master's Thesis Research (MMG 391) are required. In Addition, a written thesis and defense of this thesis must occur according to the guidelines laid out by the Graduate College.		

#### Studies Committee:

The student's Studies Committee will consist of the student's research mentor, a member of the MMG graduate faculty, a faculty member from outside the Microbiology and Molecular Genetics Department to serve as the Chair of the Studies Committee, and a fourth member at the discretion of the student in consultation with their research mentor.

#### Thesis Writing and Defense:

Thesis writing cannot begin until a student has become a Candidate for the Degree of Master of Science in Microbiology and Molecular

Genetics and has received approval from the student's Studies Committee.

### Comprehensive Examination

By the end of the first year, M.S. candidates will write either an extensive literature review or research proposal that pertains to their research interests. Students can expect guidance from their advisor and Studies Committee in the writing of the proposal but must assume responsibility for the final version and must acquire sufficient mastery of their chosen subject area to defend the proposal. Students will present their written proposal to their Studies Committee. That Committee will determine if the written proposal is satisfactory and, if it is, schedule an oral defense. During the oral defense, the Committee shall be free to explore the knowledge of the student on a range of subjects related to the proposal, much as occurs during a thesis defense. If the written review/proposal is deemed unsatisfactory or if a student fails the oral defense, the candidate will be given one opportunity to rewrite or re-defend his/her proposal. If the student fails a second time, s/he/they will be dismissed from the M.S. program.

### Requirements for Advancement to Candidacy for the Degree of Master of Science in Microbiology and Molecular Genetics

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

## NATURAL RESOURCES

<http://www.uvm.edu/rsenr/>

### OVERVIEW

Graduate students in the Rubenstein School work closely with faculty who are dedicated to applied environmental research in service of society and have very active research programs. Faculty take an integrated approach to their research projects, work with other faculty teams in the School, and collaborate nationally and internationally with other researchers.

### DEGREES

- Natural Resources AMP (p. 192)
- Natural Resources M.S. (p. 193)
- Natural Resources: Leadership for Sustainability M.P.S. (p. 194)
- Natural Resources: Master of Environmental Law and Policy/ Master of Science in Natural Resources (MELP/MSNR) (p. 195)
- Natural Resources Ph.D. (p. 196)

### FACULTY

**Adair, Elizabeth Carol;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Colorado State University

**Bierman, Paul Robert;** Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Washington

**Bowden, William Breck;** Professor Emeritus and Interim Associate Dean; Rubenstein School of Environment and Natural Resources; PHD, North Carolina State University Raleigh

**Chase, Lisa Cheryl;** Extension Professor and Associate Professor; Department of Ext - Programming and Faculty Support; PHD, Cornell University

**Coghill-Wemple, Beverley;** Professor, Department of Geography; PHD, Oregon State University

**D'Amato, Anthony;** Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Massachusetts Amherst

**Danks, Cecilia Marie;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of California Berkeley

**Dimov, Luben D.;** Senior Lecturer, Rubenstein School of Environment and Natural Resources; PHD, Louisiana State University

**Donovan, Therese M.;** Research Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Missouri Columbia

**Dupigny-Giroux, Lesley-Ann;** Professor, Department of Geography; PHD, McGill University

**Erickson, Jon;** Professor; Rubenstein School of Environmental and Natural Resources; PHD, Cornell University

**Farley, Joshua;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Fisher, Brendan;** Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Galford, Gillian Laura;** Research Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Brown University

**Ginger, Clare A.;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Michigan Ann Arbor

**Gould, Rachele;** Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**Hill, Jason M.;** Adjunct Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, Pennsylvania State University

**Hughes, Jeffrey Winston;** Professor Emeritus; Department of Plant Biology; PHD, Cornell University

**Ivakhiv, Adrian J.;** Professor, Rubenstein School of Environment and Natural Resources; PHD, York University

**Keeton, William Scott;** Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Washington

**Kolan, Matthew Peter;** Senior Lecturer; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Kuentzel, Walter Frederick;** Professor Emeritus; Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin-Madison

**Lawson, Steven R.;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Lloyd, John D.;** Adjunct Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Montana

**Marsden, J. Ellen;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Cornell University



**Mathews, Nancy;** Professor and Dean, Rubenstein School of Environment and Natural Resources; PHD, State University of New York College of Environmental Science & Forestry

**Mitchell, Brian;** Adjunct Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of California Berkeley

**Morales, Ana Melinda;** Assistant Professor, Rubenstein School of Environment and Natural Resources; DPHIL, Iowa State University

**Mosher, Brittany;** Assistant Professor, Rubenstein School of Environment and Natural Resources, Ph.D., Colorado State University

**Murdoch, James D.;** Associate Professor; Rubenstein School of Environment and Natural Resources; DPHIL, University of Oxford

**Nelson, Ingrid L.;** Assistant Professor, Department of Geography; PHD, University of Oregon

**Parrish, Donna;** Professor Emeritus; Rubenstein School of Environment and Natural Resources; PHD, Ohio State University

**Poleman, Walter Mallery;** Senior Lecturer; Rubenstein School of Environment and Natural Resources; MS, University of Vermont

**Pontius, Jennifer A.;** Research Assistant Professor and Interim Associate Dean; Rubenstein School of Environment and Natural Resources; PHD, University of New Hampshire

**Renfrew, Rosalind Brent;** Adjunct Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin - Madison

**Ricketts, Taylor H.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**Rodriguez-Cabal, Mariano;** Research Assistant Professor, Rubenstein School of Environmental and Natural Resources; PHD, University of Tennessee

**Roman, Joe;** Non-salaried faculty; Rubenstein School of Environment and Natural Resources; PHD, Harvard University

**Roy, Eric;** Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, Louisiana State University

**Schaberg, Paul ;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Schattman, Rachel E.;** Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Stepenuck, Kristine F.;** Extension Assistant Professor, Rubenstein School of Environment and Natural Resources, PHD; University of Wisconsin-Madison

**Stephens, Jennie;** Adjunct Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, California Institute of Technology

**Stockwell, Jason Dana;** Professor, Rubenstein School of Environmental and Natural Resources; PHD, University of Toronto

**Stokowski, Patricia A.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Washington

**Strong, Allan Matthew;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Tulane University

**Vatovec, Christine M.;** Lecturer; Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin Madison

**Voigt, Brian G.;** Lecturer and Research Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Yamamoto, Britt;** Adjunct Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Washington Seattle

## NATURAL RESOURCES AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Degree Entry Program (AMP) in Rubenstein is designed to give select UVM undergraduate students the opportunity to earn a Bachelor's and a Master's Degree in Natural Resources in 5 years. This option is only available for the thesis, and not the project, masters in Natural Resources.

Following admission to the Graduate College, students may earn up to 9 credits toward the M.S. degree in Natural Resources during their B.S./B.A. that also count toward their B.S./B.A. The remaining 21 credits will be fulfilled after completion of the B.A./B.S. when the M.S. degree becomes the primary curriculum.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Students should apply for admission into the Accelerated Master's Degree Program (AMP) in the Rubenstein School in the beginning of the spring semester of their junior year, but can apply in their first semester of their junior year as well. Consideration for admission requires the following:

- A minimum cumulative GPA of 3.00.
- Identification of a research advisor.
- Completion of the Graduate College Application form:
  - Three letters of recommendation from UVM faculty members: one letter must be from the proposed MS advisor in the Rubenstein School, one must be from another UVM faculty member, and one from the program director.
  - Address the work to be conducted as part of your statement of purpose to the grad college

Students must be admitted through the Graduate College before taking any courses that will count toward their MS degree requirements. Students taking 200 level courses approved for graduate credit as part of the AMP must notify the faculty that they are taking this course as a graduate student before the class begins. Students are expected to start their M.S. research in the summer/semester following their undergraduate graduation. Students who graduate in January (and not May) can begin their master's research in the spring semester and are expected to continue research in the summer.

#### Minimum Degree Requirements

The master of science requires from fifteen to twenty-seven credits of course work in related fields (including NR 395: Applied Ecology, Environment and Society), a public research seminar presented

at the annual graduate student symposium, a research proposal, a comprehensive examination, and 6 to 15 credits of thesis research.

### Comprehensive Examination

A written comprehensive examination is required for all master's students. Generally taken during a student's third or fourth semester, the examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both depending on the requirements of each concentration) are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any required courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA. A GPA of 3.00 or greater is also required.

## NATURAL RESOURCES M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master of Science in Natural Resources prepares students to pursue studies in advanced disciplinary topics. They will learn scientific and practical methods and develop technical skills for understanding ecological, physical, social, political, and economic aspects of environmental and natural resource issues.

Students choosing to pursue research in this program will take 15 to 24 credits of advanced course work and write and defend a thesis or project. This experience will further their knowledge and proficiency within 1 of 5 areas of concentration in natural resources:

Aquatic Ecology and Watershed Science (p. 193)

Environment, Society and Public Affairs (p. 194)

Environmental Thought and Culture (p. 194)

Forestry (p. 194)

Wildlife Biology (p. 194)

Students may elect to pursue a general degree in Natural Resources including interdisciplinary research not included in the above concentrations. Students and their graduate studies committee work closely together to design these individualized curricula, following the minimum M.S. degree requirements for course and research credits. Students are required to meet all Rubenstein School requirements, plus any additional requirements that may be determined by the Studies/Thesis Committee.

Students may also pursue a MELP/MSNR dual degree with the Vermont Law School.

Students choosing to emphasize advanced course work (27 credits) will pursue academic and work experiences leading to development of professional skills emphasizing conservation leadership, ecological

planning, and sustainable forestry. A 3-credit project/internship experience will complement the academic course work.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Undergraduate degree in an appropriate field in the sciences, social sciences, or humanities/fine arts, and three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing this degree. Most successful applicants to this highly competitive program have strong academic credentials and experience in an environmental or natural resource-related job, internship, or other related activity.

#### Minimum Degree Requirements

The master of science requires from 15 to 27 credits of course work in related fields (including NR 395: Applied Ecology, Environment and Society, and NR 306: Envisioning a Sustainable Future), a public research seminar presented at the annual graduate student symposium, a research proposal, a comprehensive examination, and 3 to 6 credits of project research, or 6 to 15 credits of thesis research.

#### Comprehensive Examination

A written comprehensive examination is required for all master's students. Generally taken during a student's third or fourth semester, the examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both depending on the requirements of each concentration) are determined by the Studies Committee and will be discussed with the student well in advance of the exam.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any required courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA. A GPA of 3.00 or greater is also required.

### AQUATIC ECOLOGY AND WATERSHED SCIENCE CONCENTRATION

The Aquatic Ecology and Watershed Science concentration provides students with advanced understanding of aquatic ecosystems and their watersheds, and the skills and methodologies required to analyze and solve technical problems concerning the effects of human activities on these systems. Current areas of research emphasis include watershed processes and management; stream and lake ecology; fish ecology and fisheries management; aquatic ecotoxicology; pollutant studies; biogeochemical dynamics, and the modeling of aquatic systems, processes and populations.

#### Minimum Degree Requirements

In addition to the general M.S. in Natural Resources requirements, this concentration requires at least 12 credits of course work in the aquatic and watershed sciences, or supportive fields (approved by the student's graduate studies committee). Students in this concentration pursue a thesis and must complete a minimum of 6 thesis research credits.

## ENVIRONMENT, SOCIETY AND PUBLIC AFFAIRS CONCENTRATION

Through the M.S. concentration in Environment, Society and Public Affairs, graduate students build theoretical understanding, analytical skills, and applied knowledge in the social dimensions of environmental and natural resource issues. Specific areas in which students may build understanding, skills, and knowledge include:

- environmental policy and planning
- community studies, human behavior, and environmental sociology
- ecological economics
- park and wilderness management
- public participation, conflict resolution, and decision making
- geospatial analysis

### Minimum Degree Requirements

In addition to the general M.S. in Natural Resources requirements, this concentration requires 21 to 24 credits of advanced courses (including 1 methods course, 1 ecology course, 3 courses reflecting this concentration's emphases including Natural Resources, Environmental Studies, or Parks, Recreation and Tourism), and 3 to 6 credits of project research or 6 credits of thesis research. Students pursue a project or thesis. An oral defense of the thesis or project is required of all students.

## ENVIRONMENTAL THOUGHT AND CULTURE CONCENTRATION

In this concentration graduate students build interdisciplinary analytical skills and theoretical understanding of environmental and natural resource issues, with a focus on their human, ethical, and cultural dimensions. Specific areas include: environmental communication and cultural studies; environmental education and interpretation; environmental ethics and philosophy; environment, development, peace, and global justice studies; environmental politics and advocacy; religion and environment; sustainability; and sustainable development.

### Minimum Degree Requirements

In addition to the general M.S. in Natural Resources requirements, this concentration requires 18 to 21 credits of advanced courses and 15 credits in a conceptually integrated curriculum of course work with specialization within environmental thought and culture, plus 6 credits of project research or 6 to 9 credits of thesis research. Students pursue a thesis or project.

## FORESTRY CONCENTRATION

The goal of this Master of Science concentration is to provide graduate students with advanced training in forest science and the opportunity to further their knowledge and proficiency in some specialized aspect of forestry. The faculty has research interests which span the broad areas of ecology, management, pathology, physiological ecology, sustainable forestry, and community forestry.

### Minimum Degree Requirements

In addition to the general M.S. in Natural Resources requirements, this concentration requires 18 to 21 credits of advanced forestry and related courses, a comprehensive examination with both a written and oral component, and 6 credits of project research or 6 to 9 credits of thesis research. Students pursue a thesis or project.

## WILDLIFE BIOLOGY CONCENTRATION

This Master of Science concentration is designed to provide a vehicle for a wildlife biologist to develop research abilities and pursue a specialized course of study. Current areas of research emphasis include applied avian ecology, behavioral ecology, game management, nongame wildlife populations, reserve design, and landscape ecology.

### Minimum Degree Requirements

In addition to the general M.S. in Natural Resources requirements, the Wildlife Biology concentration requires 18 to 21 credits of course work in wildlife and related fields, a comprehensive examination with both a written and oral component, and 3 to 6 credits of project research or 6 to 9 credits of thesis research. Students pursue a thesis or project.

## LEADERSHIP FOR SUSTAINABILITY M.P.S.

All students must meet the Requirements for the Master of Professional Studies Degree (p. 263)

### OVERVIEW

The Masters of Professional Studies in Leadership for Sustainability is a 2-year online graduate program designed for emerging and experienced leaders who wish to deepen their capacity to catalyze change and transcend boundaries. This 2-year program offers a blend of intensives, interactive online courses, professional coaching, and is supported by a network of faculty and professional affiliates. The program curriculum explores leadership practices that are inspired by the wisdom of nature and challenge systems of domination, oppression, colonialism, and extraction.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Professional studies

Requirements for Admission to Graduate Studies for the Degree of Master of Professional Studies

- A sound academic record, including a baccalaureate degree from an accredited undergraduate institution
- 3 letters of recommendation attesting to the candidate's academic and professional potential for graduate work
- A personal statement articulating motivation for participating in this program
- For international students whose native language is not English or who have not completed undergraduate degrees in English,

Test of English as a Foreign Language (TOEFL) scores must be submitted.

### Minimum Degree Requirements

Successful completion of 30 credits, including:

NR 311	Leadership for Sustainability	3
NR 312	Power Privlge & Catalyz Change	3
NR 388	Ecological Leadership Seminar (fall/spring)	3
NR 389	Ecological Ldership Practicum	3
NR 392	Master's Project Research	6
Total		21
An approved set of courses that fulfill track specialization or a suite of elective courses based on student interests.		9

### CAPSTONE PROJECT

The Capstone is designed to provide MLS students with an applied leadership experience that integrates core program-level learning outcomes while addressing pressing challenges/opportunities in their own home community/organization. The project process is supported through a combination of online modules, professional affiliate coaching, and faculty mentorship, feedback and assessment.

Students are required to develop and defend a project proposal; implement project activities and methods; complete a culminating final report; and present their Capstone project at the annual Leadership for Sustainability Summit.

### Comprehensive Examination

The written comprehensive exam will take place during the second year of the MLS Program. The exam will require students to demonstrate competency in the MLS programmatic learning outcomes. Each student's comprehensive exam will be administered and assessed by a team of MLS faculty members and professional affiliates.

### Requirements for Advancement to Candidacy for the Degree of Master of Professional Studies

Advancement requires:

- Completion of the 30 academic credit sequence described above
- Completion of the Capstone Project and Comprehensive Exam
- Presentation at the annual Leadership for Sustainability Summit

## NATURAL RESOURCES: MASTER OF ENVIRONMENTAL LAW AND POLICY/ MASTER OF SCIENCE IN NATURAL RESOURCES (MELP/MSNR)

All students must meet the Requirements for the Master's Degree (p. 260)

## OVERVIEW

### Dual Degree Program with Vermont Law School

The Master of Environmental Law and Policy (MELP)/Master of Science in Natural Resources (MSNR) Dual Degree Program offered by Vermont Law School's Environmental Law Center and the University of Vermont's Rubenstein School of Environment and Natural Resources gives students an opportunity to deepen their graduate education by integrating significant aspects of the complementary disciplines of environmental law, policy, and science.

Each school applies its own grading system to students in the program. Students must be in good academic standing at both schools to remain in the program. Each school issues its own transcript.

After completing the requirements for either degree, students will receive a diploma from the appropriate school and may attend graduation.

For more information about this program, visit the MELP/MSNR Program website.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science at the University of Vermont

Undergraduate degree in an appropriate field in the sciences, social sciences, or humanities/fine arts, and three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing this degree. Most successful applicants to this highly competitive program have strong academic credentials and experience in an environmental or natural resource-related job, internship, or other related activity.

Students interested in the Dual Degree Program are required to apply separately to each school. Each school admits students according to its own criteria for admission. Dual Degree applicants may be interviewed by admissions officials at both schools, when appropriate. Students may apply for admission to the Dual Degree Program at any time prior to the awarding of the degrees.

Students admitted to the Dual Degree Program will have academic advisors in each school. These advisors assist with curriculum planning, program requirements, and similar matters. Advisors are faculty members familiar with the course requirements for UVM.

### Minimum Degree Requirements at the University of Vermont

Students in the Dual Degree Program may earn both degrees with a total of 42 credits. Students must meet each school's degree requirements, including required courses and thesis preparation. Students take a minimum of 21 credits at VLS toward the M.E.L.P. degree and a minimum of 21 credits at UVM toward the M.S. (Natural Resources) degree. Students may transfer a maximum of 9 credits between the 2 programs. Courses to be transferred must meet

the requirements of the Dual Degree Program. Transferred credits may be applied toward both degrees.

Students have a maximum of 5 years to complete the Dual Degree Program. Course credits to be transferred must be taken within that 5-year period.

The master of science requires from 15 to 27 credits of course work in related fields (including NR 395: Applied Ecology, Environment and Society, and NR 306: Envisioning a Sustainable Future), a public research seminar presented at the annual graduate student symposium, a research proposal, a comprehensive examination, and 3 to 6 credits of project research, or 6 to 15 credits of thesis research.

### **Comprehensive Examination at the University of Vermont**

A written comprehensive examination is required for all master's students. Generally taken during a student's third or fourth semester, the examination will cover broad knowledge of the student's discipline. The details and format of the examination and its form (written or oral or both depending on the requirements of each concentration) are decided upon by the Studies Committee and will be discussed with the student well in advance of the exam.

### **Requirements for Advancement to Candidacy for the Degree of Master of Science at the University of Vermont**

Successful completion of any required courses, and at least 15 graded graduate credits earned at UVM in compilation of the graduate GPA. A GPA of 3.00 or greater is also required.

## **NATURAL RESOURCES PH.D.**

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### **OVERVIEW**

The Ph.D. program provides the opportunity for focused, in-depth research in any of the specialties of the school, while fostering an interdisciplinary appreciation and perspective through course work and interactions with ecological, physical, and social scientists in an integrated academic setting. Students can develop programs in areas such as pollution ecology, recreation and tourism, conservation biology, and environmental policy, as well as any of the traditional natural resource disciplines featured in the master's program. In addition, formal course work and practical experience in college-level teaching are an important component of the doctoral curriculum.

### **SPECIFIC REQUIREMENTS**

#### **Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy**

A potential faculty advisor holding an appointment in the Rubenstein School of Environment and Natural Resources and the Graduate College who will agree to serve as the student's primary mentor. Applicants with a Master of Science degree are preferred.

### **Minimum Degree Requirements**

The Doctor of Philosophy requires 75 total credits (including NR 395: Applied Ecology, Environment and Society, and NR 306: Envisioning a Sustainable Future). For students entering the program with a completed master's degree, 15 total graded course credits are required. For students entering the program without a master's degree, 30 total graded credits are required. Credits must include no less than 20 and no more than 45 credits of dissertation research. In addition students must complete a public proposal defense, an approved research proposal, a written and oral comprehensive examination, and a teaching/professional skills requirement. An oral defense of the dissertation is required of all students.

### **Comprehensive Examination**

Both a written and oral comprehensive examination are required for all Ph.D. students. The examination will cover broad knowledge of the student's discipline. The exams should be taken and passed during the second year of matriculation. The Graduate College requirement stipulates that the examination must occur at least six months before the dissertation is submitted.

### **Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy**

It is ordinarily expected that a student will complete the following requirements for advancement to candidacy prior to the end of the second year in the program:

- at least 12 credits of research;
- at least 30 credits at the graduate level acceptable to the student's graduate studies committee, with a minimum of 15 of the course credits graded and taken at UVM after matriculation into the degree program;
- satisfactory performance on a comprehensive examination;
- delivery of a public proposal seminar; and
- a dissertation proposal accepted by the student's graduate studies committee.

## **NEUROSCIENCE**

<http://www.uvm.edu/neurosciencegrad> (<http://www.uvm.edu/neurosciencegrad/>)

### **OVERVIEW**

The Neuroscience Graduate Program is a university-wide, multidisciplinary, Ph.D. granting program that has more than 50 faculty mentors across 13 departments and 5 colleges. This program emphasizes rigorous training in neuroscience-related research, educates students about human health, and encourages interdisciplinary research projects.

### **DEGREES**

- Neuroscience M.S. (p. 198)
- Neuroscience Ph.D. (p. 198)

## FACULTY

**Althoff, Robert;** Associate Professor, Department of Psychiatry; PHD, University of Illinois Urbana-Champaign

**Ballif, Bryan A.;** Professor, Department of Biology; PHD, Harvard University

**Barry, Jeremy;** Assistant Professor, Department of Neurological Sciences; PHD, SUNY Downstate

**Berger, Christopher Lewis;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Bongard, Joshua C.;** Professor, Department of Computer Science; PHD, University of Zurich

**Bouton, Mark Earhart;** Professor, Department of Psychological Science; PHD, University of Washington

**Brewer, Matthias;** Professor, Department of Chemistry; PHD, University of Wisconsin-Madison

**Cannizzaro, Michael S.;** Associate Professor, Department of Communication Sciences and Disorders; PHD, University of Connecticut

**Cipolla, Marilyn Jo;** Professor, Department of Neurological Sciences; PHD, University of Vermont

**Coderre, Emily;** Assistant Professor; Department of Communication Sciences and Disorders; PHD, University of Nottingham

**Coutinho-Budd, Jaeda;** Assistant Professor, Department of Biology; PHD The University of North Carolina at Chapel Hill

**Dostmann, Wolfgang R. G.;** Professor, Department of Pharmacology; PHD, University of Bremen, MD, University of Munich

**Dumas, Julie Anna;** Associate Professor, Department of Psychiatry; PHD, University of North Carolina

**Ebert, Alicia;** Associate Professor, Department of Biology; PHD, Colorado State University

**Erdos, Benedek;** Assistant Professor, Department of Pharmacology; MD, PHD, Semmelweis University, School of Medicine, Budapest, Hungary

**Falls, William A.;** Dean, College of Arts and Science, Professor, Department of Psychological Science; PHD, Yale University

**Forehand, Cynthia Jean;** Dean, Graduate College, Professor, Department of Neurological Sciences; PHD, University of North Carolina Chapel Hill

**Francklyn, Christopher Steward;** Professor, Department of Biochemistry; PHD, University of California Santa Barbara

**Freeman, Kalev;** Assistant Professor, Department of Surgery; MD, PHD, University of Colorado Boulder

**Garavan, Hugh P.;** Professor, Department of Psychiatry; PHD, Bowling Green State University

**Green, John Thomas;** Professor, Department of Psychological Science; PHD, Temple University

**Hammack, Sayamwong E;** Professor, Department of Psychological Science; PHD, University of Colorado

**Hernan, Amanda;** Assistant Professor, Department of Neurological Sciences; PHD, Dartmouth College

**Higgins, Stephen Thomas;** Professor, Department of Psychiatry; PHD, University of Kansas

**Holmes, Gregory;** Professor, Department of Neurological Sciences; MD, University of Virginia

**Howe, Alan K.;** Associate Professor, Department of Pharmacology; PHD, Northwestern University

**Hudziak, James Joseph;** Professor, Department of Psychiatry; MD, University of Minnesota Twin Cities

**Johnson, Abbie;** Assistant Professor, Department of Neurological Sciences; PHD, University of Vermont

**Krementsov, Dimitry;** Assistant Professor; Department of Biomedical and Health Sciences; PHD University of Vermont

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**Mackey, Michael Scott;** Assistant Professor, Department of Psychiatry; PHD; McGill University, Montreal, Quebec

**Mahoney, John Matthew;** Assistant Professor, Department of Neurological Sciences; PHD, Dartmouth College

**Mawe, Gary Michael;** Professor, Department of Neurological Sciences; PHD, Ohio State University

**May, Victor;** Professor, Department of Neurological Sciences; PHD, Northwestern University

**Mohapatra, Sambit;** Assistant Professor; Department of Rehabilitation and Movement Science; PHD University of Illinois, Chicago

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Santa Cruz

**Nelson, Mark;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Ou, Yangguang;** Assistant Professor, Department of Chemistry; PHD, University of Pittsburgh

**Peters, Denise;** Assistant Professor; Department of Rehabilitation and Movement Science; PHD, DPT, University of South Carolina

**Potter, Alexandra S.;** Associate Professor, Department of Psychiatry; PHD, University of Vermont

**Prelock, Patricia;** Provost and Senior Vice President; Professor, Department of Communication Sciences; Professor, Department of Medicine-Pediatrics; PHD, University of Pittsburgh

**Quénet, Delphine;** Assistant Professor, Department of Biochemistry, PHD; University of Strasbourg, France

**Schermerhorn, Alice C.;** Associate Professor, Department of Psychological Science; PHD, University of Notre Dame

**Scott, Rodney;** Professor, Department of Neurological Sciences; PHD, University of London

**Sibold, Jeremy S.;** Associate Professor, Department of Rehabilitation and Movement Science; EDD, West Virginia University

**Spees, Jeffrey;** Professor, Department of Medicine-Cardiovascular; PHD, University of California Davis

**Stafford, James;** Assistant Professor; Department of Neurological Sciences; PHD Oregon Health and Science University

**Teuscher, Cory;** Professor, Department of Medicine-Immunobiology; PHD, University of New Mexico

**Toufexis, Donna J.;** Associate Professor, Department of Psychological Science; PHD, McGill University

**Vizzard, Margaret A.;** Professor, Department of Neurological Sciences; PHD, Thomas Jefferson University

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

**Weston, Matthew;** Assistant Professor, Department of Neurological Sciences; DHSC, Baylor College of Medicine

**Whitaker, Emmett;** Assistant Professor; Department of Anesthesiology; MD, University of Rochester School of Medicine and Dentistry

**White, Sheryl Lynne;** Assistant Professor, Department of Neurological Sciences; PHD, University of Vermont

## NEUROSCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Neuroscience Graduate Program awards M.S. degrees only to students who have matriculated into the Ph.D. program but whose academic and research progress is deemed by their advisory committee to be suitable for a M.S. rather than a Ph.D. degree, or the student requests to leave the program prior to completion of the Ph.D. degree. Terminal M.S. degrees are not automatically offered to students leaving the program prematurely. Students must be recommended for the M.S. degree by their advisory committee and are required to complete the minimum course and research requirements for the M.S. as defined by the Graduate College and the Neuroscience Graduate Program.

## NEUROSCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

The Neuroscience Graduate Program is a university-wide, multidisciplinary, Ph.D. granting program that has more than 50 faculty mentors across 13 departments and 5 colleges. This program emphasizes rigorous training in neuroscience-related research, educates students about human health, and encourages interdisciplinary research projects.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

It is recommended that an incoming student have a bachelor's and/or master's degree in a biological science, neuroscience, chemistry, physics, engineering, psychology, mathematics, communication sciences or computer science. Research experience is not required, but is strongly recommended.

Applicants whose native language is not English must submit scores from Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or Duolingo.

Three letters of reference are required. Letters from research advisors or supervisors are highly desirable attesting to applicant's abilities to work independently in an academic setting.

### Minimum Degree Requirements

Students can choose between the standard track and biobehavioral track within the NGP curriculum.

#### Standard CURRICULUM Track

BIOL 261	Neurobiology (for students who have not taken any neurobiology classes)	3
CLBI 301	Cell Biology	3
MPBP 301	Human Physiology & Pharm I	4
NSCI 303	Human Gross and Microanatomy	3
NSCI 327	Resp Conduct in Biomed Rsch	1
NSCI 381	Seminar in Neuroscience (Yearly)	1
NSCI 382	Seminar in Neuroscience (Yearly)	1
NSCI 491	Doctoral Dissertation Research (Minimum of 20 required total)	1-18
NSCI 395	Advanced Special Topics (Medical Neuroscience Part I & II)	6
PSYS 304	Adv Statistical Methods I	3
or STAT 211	QR: Statistical Methods I	
PSYS 315	Biobehavioral Proseminar	3
PHRM 308	Integrative Physiol. & Pharm.	3
Advanced Neuroscience Selectives (minimum of two courses)		6

#### biobehavioral CURRICULUM track

This track provides an alternate curriculum for students interested in working in Department of Psychological Science labs.

MPBP 301	Human Physiology & Pharm I	4
NSCI 303	Human Gross and Microanatomy	3
NSCI 327	Resp Conduct in Biomed Rsch	1
NSCI 381	Seminar in Neuroscience	1
NSCI 382	Seminar in Neuroscience	1
NSCI 395	Advanced Special Topics (Medical Neuroscience Part I & II)	6
NSCI 491	Doctoral Dissertation Research	1-18
PSYS 304	Adv Statistical Methods I	3
or STAT 211	QR: Statistical Methods I	
PSYS 311	Seminar in Learning Theory	3
PSYS 315	Biobehavioral Proseminar	3
PSYS 316	Neuropsychopharmacology	3
PSYS 319	Neurobio of Learning & Memory	3
PSYS 393	Adv Professional/Research Sem (Yearly)	1

**APPROVED COURSES FOR GRADUATE CREDIT**

Below is a list of approved selectives. A student, in conjunction with their advisor, may request courses not on this list to fulfill the selective requirement. The request will need to be approved by the NGP Director.

BIOC 301	General Biochemistry	3
CSD 353	Neurogenic Comm. Disorders 2	3
MPBP 310	Molecular Control of the Cell	3
MPBP 330	Biomedical Grantsmanship	2
NSCI 230	Comparative Neurobiology	3
NSCI 323	Neurochemistry	3
PATH 328	Techniques in Microscopy	3
PBIO 294	QR:Ecological Modeling	3
PBIO 394	Data Modeling for Envir Scienc	3
PHRM 272	Toxicology	3
PHRM 290	Topics Molecular&Cell Pharm	3
PSYS 311	Seminar in Learning Theory	3
PSYS 316	Neuropsychopharmacology	3
PSYS 319	Neurobio of Learning & Memory	3
PSYS 395	Advanced Readings/Research	1-6

**Comprehensive Examination**

The qualifying examination for advancement to candidacy for a Ph.D. in Neuroscience should be taken prior to the end of the 1<sup>st</sup> semester of the 2<sup>nd</sup> year. The exam has both a written and oral component, both of which must be completed successfully. The exam committee will consist of at least 3 members of the NGP faculty. Should the student fail the examination, only 1 re-examination is allowed.

**Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy**

Satisfactory completion of required courses and research rotations. Approval of the written and oral portions of the qualifying comprehensive examination.

**NURSING**

<http://www.uvm.edu/~cnhs/nursing/>

**OVERVIEW**

The Department of Nursing offers graduate programs which prepare nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, and to acquire the foundation for doctoral study and continued professional development. The ability to work collaboratively on an interdisciplinary team, provide patient-centered care, employ evidence-based practice, access information technology, and apply

quality improvement strategies are basic competencies expected of all graduates of these programs.

The following Graduate Nursing Programs are currently being offered:

**Master of Science in Nursing - Clinical Nurse Leader (CNL)**

The Master of Science degree program for the Clinical Nurse Leader (CNL) prepares nurses for leadership positions through which evidenced-based care for groups of patients will be managed.

**Direct Entry Clinical Nurse Leader (DCNL)**

The Direct Entry into Clinical Nurse Leader (DCNL) is an accelerated, alternative-entry program for those who have not graduated from a nursing program, and who hold a baccalaureate or higher degree in another field. The program prepares the student to progress into the MS-CNL track. It is not a stand-alone accelerated RN program. The program begins with 36.5 credits and includes 810 clinical hours of full-time, year-round coursework to prepare for the NCLEX-RN exam and gain registered nurse licensure in the State of Vermont (not transferable to other states until completion of the DNP).

**Direct Entry Program in Nursing (DEPN)**

The Direct Entry Program in Nursing (DEPN) is an accelerated, alternative-entry program for those who have not graduated from a nursing program, and who hold a baccalaureate or higher degree in another field. The program prepares the student to progress into the DNP-Primary Care NP track. It is not a stand-alone accelerated RN program. The program begins with 36.5 credits and includes 810 clinical hours of full-time, year-round coursework to prepare for the NCLEX-RN exam and gain registered nurse licensure in the State of Vermont (not transferable to other states until completion of the DNP).

**Doctor of Nursing Practice (DNP)**

The Doctor of Nursing Practice (DNP) degree program has two entry options; one for registered nurses with a baccalaureate or higher degree (in nursing or another field) who wish to practice as a nurse practitioner in Primary Care, and another for post master's degree in nursing applicants who wish to pursue the DNP.

**Post-Master's Doctor of Nursing Practice (DNP)**

For candidates who have earned a MS degree in nursing and wish to pursue a DNP. Within the Post Master's DNP there are two tracks: Primary Care DNP and Executive Nurse Leader DNP.

CNHS graduate nursing students are required to complete the CNHS mandatories prior to matriculating into the program. Students must keep these requirements current throughout their program: Immunizations, CPR, HIPPA/OSHA training, annual PPD, and RN License. Some clinical sites require a Criminal Background check as well. It is required to be compliant with this process to participate in clinical courses/experiences. Complete details on CNHS Mandatories are available on the College website.



## DEGREES

- Nursing AMP (p. 200)
- Nursing M.S. (p. 201)
- Nursing Practice DNP (p. 201)

## FACULTY

**Dale, Rosemary Louise;** Clinical Professor, Department of Nursing; EDD, Ball State University

**Garbarino, Jason;** Clinical Assistant Professor, Department of Nursing; DNP, University of Vermont

**Keiffer, Melanie;** Assistant Professor, Department of Graduate Nursing, DNP, Vanderbilt University

**Laurent, Jennifer S.;** Associate Professor, Department of Nursing; PHD, Duquesne University

**Lewis, Laura Foran;** Assistant Professor, Department of Nursing; PHD, University of Connecticut

**Martin, Lili;** Clinical Assistant Professor, Department of Nursing; DNP, University of Vermont

**Nagle, Rebecca;** Clinical Assistant Professor, Department of Nursing; DNP, University of Vermont

**Palumbo, Mary Val;** Professor, Department of Nursing; DNP, Rush Medical College

**Pelski, Jean;** Clinical Associate Professor, Department of Nursing; PHD, University of Massachusetts, Amherst

## NURSING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The Accelerated Master's Degree Entry Program (AMP) is designed to offer select UVM undergraduate nursing students the opportunity to obtain both their bachelor's degree and master's degree in nursing in a total of 6 years of study. Students apply to the program in the spring of their junior year, and MS-CNL courses begin during the student's senior year. Students enrolled in this program can have up to 9 credits of graduate level courses taken during their senior undergraduate year count towards both a bachelor's degree and the master's in nursing degree.

The Department of Nursing offers a graduate program leading to a Master of Science degree. The Clinical Nurse Leader program (CNL) prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, and to acquire the foundation for graduate study and continued professional development. The ability to work collaboratively on an interdisciplinary team, provide patient-centered care, employ evidence-based practice, access information technology, and apply quality improvement strategies are basic competencies expected of all graduates of this program.

The M.S. graduate curriculum includes 6 core courses essential for all students that address the theoretical basis of nursing care; professional issues and role development of CNLs, research utilization and evidence-based practice, quality and ethics of health care delivery, health policy and finance, genetics/genomics,

biostatistics and epidemiology. Students apply core content to their Clinical Nurse Leader program. Upon successful completion of program requirements students are eligible to complete a national CNL certification exam.

As a CNHS graduate nursing student, you are required to complete the CNHS Mandatories prior to matriculating into your program. Students must keep these requirements current throughout their program: Immunizations, CPR, HIPPA/OSHA training, annual PPD, and RN License. Some clinical sites require a Criminal Background check as well. It is a program requirement to be compliant with this process to participate in clinical courses/experiences. Complete details on CNHS Mandatories are available on the college website.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of science for Accelerated Students

The following criteria must be met to be considered for admission into the program:

- Minimum cumulative grade point average of 3.00
- Enrollment and good standing in the UVM undergraduate nursing program and at the junior level of the program
- Completion of the Graduate College Application Form, which must include 3 letters of recommendation, including one from a UVM nursing clinical instructor highlighting the candidate's clinical performance
- Current resume
- Students must be admitted through the Graduate College before taking any courses that will be applied to the master's degree requirements. Students will continue master's degree coursework in the summer following their undergraduate graduation
- GRE scores are not an admission requirement for application to the AMP in Nursing

### Minimum Degree Requirements for the Degree of Master of science

The following criteria must be met to complete your minimum degree requirements:

- Core, track, and elective courses
- Successful completion of comprehensive examination
- Grade point average of 3.00 or higher
- Completion and implementation of CNL Project

### Comprehensive Examination

The Comprehensive Examination is conducted by the Graduate Program in the Department of Nursing. The examination is designed to allow the student to demonstrate analysis and synthesis of knowledge gained through the program. The examination must be completed prior to the final track courses and practicums, and students may take it any time after the majority of core courses have been successfully completed. Students will be expected to orally present their CNL Project proposal, clearly articulating, synthesizing, and applying the MS Essentials and the CNL competencies and core

content addressed throughout the program of study as they relate to their CNL Project.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. In the event that the student does not achieve a satisfactory on the oral comprehensive exam, one opportunity to provide written evidence of satisfactory achievement of the goal of the comprehensive exam will be allowed.

### Requirements for Advancement to Candidacy for the Degree of Master of science

Meet all of the above criteria.

## NURSING M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Department of Nursing offers a graduate program leading to a Master of Science degree. The Clinical Nurse Leader program (CNL) prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, and to acquire the foundation for graduate study and continued professional development. The ability to work collaboratively on an interdisciplinary team, provide patient-centered care, employ evidence-based practice, access information technology, and apply quality improvement strategies are basic competencies expected of all graduates of this program.

The M.S. graduate curriculum includes 6 core courses essential for all students that address the theoretical basis of nursing care; professional issues and role development of CNLs, research utilization and evidence-based practice, quality and ethics of health care delivery, health policy and finance, genetics/ genomics, biostatistics and epidemiology. Students apply core content to their Clinical Nurse Leader program. Upon successful completion of program requirements students are eligible to complete a national CNL certification exam.

As a CNHS graduate nursing student, you are required to complete the CNHS Mandatories prior to matriculating into your program. Students must keep these requirements current throughout their program: Immunizations, CPR, HIPPA/OSHA training, annual PPD, and RN License. Some clinical sites require a Criminal Background check as well. It is a program requirement to be compliant with this process to participate in clinical courses/experiences. Complete details on CNHS Mandatories are available on the college website.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

The following criteria must be met to be considered for admission into the program:

- Bachelor's Degree in nursing or another field of study (for DCNL or ADN students)
- Eligibility for licensure as an RN in Vermont

- College grade point average of 3.00 or higher
- Undergraduate statistics course
- Previous undergraduate level physical assessment course
- Three letters of recommendation
- Nursing practice experience is an advantage

### Minimum Degree Requirements

The following criteria must be met to complete your minimum degree requirements:

- Core, track, and elective courses
- Successful completion of comprehensive examination
- Grade point average of 3.00 or higher
- Completion, implementation, and evaluation of CNL Project

### Comprehensive Examination

The Comprehensive Examination is conducted by the Graduate Program in the Department of Nursing. The examination is designed to allow the student to demonstrate analysis and synthesis of knowledge gained through the program. The examination must be completed prior to the final track courses and practicums, and students may take it any time after the majority of core courses have been successfully completed. Students will be expected to orally present their CNL Project proposal, clearly articulating, synthesizing, and applying the MS Essentials and the CNL competencies and core content addressed throughout the program of study as they relate to their CNL Project.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. In the event that the student does not achieve a satisfactory on the oral comprehensive exam, one opportunity to provide written evidence of satisfactory achievement of the goal of the comprehensive exam will be allowed.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Meet all of the above criteria.

## NURSING PRACTICE DNP

### OVERVIEW

The Department of Nursing offers a graduate program leading to a Doctor of Nursing Practice (DNP) degree. The program prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, and to acquire the foundation for doctoral study and continued professional development. The ability to work collaboratively on an interdisciplinary team, provide patient-centered care, employ evidence-based practice, access information technology, and apply quality improvement strategies are basic competencies expected of all graduates of this program. The DNP program prepares graduates to provide primary care as advanced practice registered nurses (APRNs) in one of two tracks: Adult-Gerontology Nurse Practitioner (AGNP), or Family Nurse Practitioner (FNP). Additionally, the program offers nurses with an earned Master's Degree in nursing the opportunity

to complete a post-MS DNP degree, either in primary care or as an executive nurse leader.

The DNP graduate curriculum includes nine core courses essential for all students that address the theoretical foundation of nursing care, professional issues and role development of APRNs, evidence based research utilization and practice, health policy and finance, ethics, health care informatics, quality of health care delivery, leadership of health care systems, genetics/ genomics, population-based health, biostatistics and epidemiology. Students apply core content to their DNP Program. Upon successful completion of program requirements APRN students are eligible to complete a national certification exam as either FNP or AGNP.

As a CNHS graduate nursing student, students are required to complete the CNHS mandates prior to matriculating into the program. Students must keep these requirements current throughout their program: Immunizations, CPR, HIPPA/OSHA training, annual PPD, and RN License. Some clinical sites require a criminal background check as well. It is essential to be compliant with this process to participate in clinical courses/experiences. Complete details on CNHS Mandatories are available on the college website.

The following Doctor of Nursing Practice programs are offered:

### **Direct Entry Program in Nursing (DEPN)**

The Direct Entry Program in Nursing (DEPN) is an accelerated, alternative-entry program is for those who have not graduated from a nursing program, and who hold a baccalaureate or higher degree in another field. Upon successful completion of the accelerated pre-RN licensure year, students complete the national examination for RN licensure (NCLEX) and continue into the MS- CNL or the DNP-Primary Care Nurse Practitioner track. A certificate of completion is awarded for the successful completion of the pre-licensure year. A BS degree is not conferred. It is not a stand-alone accelerated RN program. Year 1 includes 36.5 credits and 810 clinical hours of full-time, year-round coursework to prepare for the NCLEX-RN exam and gain registered nurse licensure in the State of Vermont (not transferable to other states until completion of the DNP).

### **Doctor of Nursing Practice (DNP)**

The Doctor of Nursing Practice (DNP) degree program offers two entry options; one for registered nurses with a baccalaureate or higher degree (in nursing or another field), and another for post- MS applicants who wish to pursue the DNP.

### **Post-Master's Doctor of Nursing Practice (DNP)**

For candidates who have earned a MS degree or higher in Nursing and wish to pursue a DNP. Within the Post Master DNP there are two tracks: Primary Care DNP and Executive Nurse Leader DNP.

## **SPECIFIC REQUIREMENTS**

### **Requirements for Admission to Graduate Studies for the Degree of Doctor of Nursing Practice**

The following criteria must be met to be considered for admission into the program:

- Bachelor's Degree in Nursing, or Bachelor's Degree in another field for the Direct Entry into Professional Nursing Program (DEPN), or Associate Degree in Nursing with a Baccalaureate Degree in another field
- Eligibility for licensure as an RN in Vermont
- Graduate Record Examination (GRE) scores within the past 5 years are required for DNP applicants (GRE is not required for post-MS DNP applicants with a MS degree in nursing).
- College grade point average of 3.00 or higher
- Undergraduate statistics course
- Previous basic physical assessment course
- Three letters of recommendation
- Practice experience preferred

### **Minimum Degree Requirements for the Degree of Doctor of Nursing Practice**

The following criteria complete the minimum degree requirements:

- Completion of core, track, and elective courses
- Completion of Comprehensive Examination
- Grade point average of 3.00 or higher
- Completion and implementation of DNP Project

### **Requirements for Admission to Graduate Studies for the Degree of Post Master's DNP primary care and Post Master's DNP Executive Nurse Leader**

- Master's Degree or higher in Nursing
- Eligibility for licensure as an RN in Vermont
- College grade point average of 3.00 or higher
- Three letters of recommendation
- Practice experience preferred
- An interview may be requested by the faculty

### **Minimum Degree Requirements for the Degree of Post Master's DNP Primary care and Post Master's DNP Executive Nurse Leader**

- Successful completion of core, track, and elective courses
- Grade point average of 3.00 or higher
- Completion of a DNP Project

### **DNP Project**

The project option is a scholarly academic experience of the graduate program where students develop and conduct an innovative project/ production relevant to advanced nursing practice with faculty supervision. It is anticipated that the DNP project will result in innovative practices that will improve health care delivery and patient outcomes. Students are required to present and defend the project orally upon its completion.

To register for the project, the student must have successfully completed the GRNS core courses, completed a Project Completion Form and be enrolled in DNP Project Seminar I. The project development and implementation will be completed over three

semesters, with evaluation and dissemination completed in the final semester of the program.

### Comprehensive Examination

The Comprehensive Examination is conducted by the Graduate Program in the Department of Nursing. The examination is designed to allow the student to demonstrate analysis and synthesis of knowledge gained through the program. Students may take the examination any time after the majority of the core courses have been successfully completed, and must be completed prior to the final track courses and practicums. Students will be expected to orally present their DNP Project proposal, clearly articulating, synthesizing, and applying the DNP Essentials and the NP competencies and core content addressed throughout the program of study as they relate to their DNP Project.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. In the event that the student does not achieve a satisfactory on the oral comprehensive exam, one opportunity to provide written evidence of satisfactory achievement of the goal of the comprehensive exam will be allowed and is to be submitted by two weeks following the oral attempt.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Nursing Practice, Post Master's DNP Nurse Practitioner, and Post Master's DNP Executive Nurse Leader

Meet all of the above criteria.

## NUTRITION AND FOOD SCIENCES

<http://www.uvm.edu/nfs/>

### OVERVIEW

The department mission is to study the relationship between nutrition, food science, health and fitness (preventive nutrition), and between diet and disease (therapeutic nutrition). Faculty research encompasses both basic and applied aspects of human nutrition, food science, food safety and food systems.

### DEGREES

- Nutrition and Food Sciences AMP (p. 203)
- Nutrition and Food Sciences M.S. (p. 204)

### FACULTY

**Belarmino Morgan, Emily;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, London School of Hygiene and Tropical Medicine

**Bertmann, Farryl;** Senior Lecturer, Department of Nutrition and Food Sciences; PHD, Arizona State University

**Etter, Andrea J.;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, Purdue University

**Guo, Ming Ruo;** Professor, Department of Nutrition and Food Sciences; PHD, University College Cork

**Kindstedt, Paul Stephen;** Professor, Department of Nutrition and Food Sciences; PHD, Cornell University

**Niles, Meredith;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, University of California-Davis

**Pope, Lizzy;** Assistant Professor, Department of Nutrition and Food Sciences; PHD, University of Vermont

**Trubek, Amy B.;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pennsylvania

## NUTRITION AND FOOD SCIENCES AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Nutrition and Food Sciences Master's degree entry program (ANFSMS) is designed to offer UVM Nutrition and Food Sciences (NFS) students an opportunity to earn both the bachelor's degree and the M.S. in Nutrition and Food Sciences in 5 years. Students entering the M.S. as accelerated students are only eligible to complete the non-thesis option of the M.S.

This is a 30 credit M.S. degree. Following formal admission by the Graduate College to the Accelerated Master's Program, students may count up to 9 graduate-level credits toward both the B.A./B.S. and M.S. The remaining 21 credits will be taken in the 5th year of study. Full-time graduate student status will begin the summer after undergraduate graduation and be maintained until completion of the M.S. in NFS.

The program is designed as a stepping stone to the pursuit of clinical or community practice opportunities in nutrition and dietetics or professional opportunities in the food industry.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Students apply for admission to the Nutrition and Food Sciences AMP program during the regular application cycle. Admission is restricted to students that are either entering the spring term of their junior year and or have yet to start the fall semester of their senior year.

Admission to the accelerated program requires the following:

- A declared major in NFS or DNFS
- A minimum of 3.0 cumulative GPA is required; a GPA of 3.3 or higher is preferred
- Completion of a college-level statistics course
- Completion of the Graduate College application form and 3 letters of recommendation
- A letter of support from a faculty member who is willing to serve as primary mentor during enrollment in the ANFSMS program. This may serve as the 3rd letter of recommendation
- Completion of the UVM Accelerated Entry into Master's Degree Permission Form (attached to the online application)

Students in the accelerated M.S. program have the option of taking courses for graduate credit before all requirements for the B.S./B.A. degree have been satisfied. However, these courses can only be double-counted if taken the semester following admittance to the ANFSMS (Students must be admitted through the Graduate College before taking any courses that will be applied toward the M.S. requirements).

A maximum of 9 credit hours may be counted for both the B.S. and M.S. degrees and courses are limited to those approved for graduate credit. You will be asked to list at least 2 of these courses on the UVM Accelerated Entry into Master's Degree Permission Form. The courses listed as approved for graduate credit are subject to change, and research credits, internships, independent study and practica cannot be counted toward the 9 credits.

### Minimum Degree Requirements for the Degree of Master of Science

Students must complete 30 credits, including a 3-6 credit final project under the direction of their graduate faculty mentor (this is a non-thesis track MS degree). Students taking a 200-level course approved for graduate credit as part of the ANFSMS program must notify the faculty member of the course that they are taking the course at the graduate level before the course begins. That notification must be copied to the Graduate College.

COURSE REQUIREMENTS		
STAT 211	QR: Statistical Methods I	3
NFS 350	Nutrition&Food Science Seminar	1
NFS 390	Master's Project Research	3-6
NFS 362	Intro to Research Methods	3
Elective Courses (chosen in consultation with the student's advisor and must be approved for graduate credit)		17-20

### Comprehensive Examination

Non-Thesis M.S. candidates will present an oral presentation on their final project by the end of the semester for which the final project credits have been assigned. The oral presentation will be attended by the Faculty Mentor and at least 2 additional members of the NFS Graduate Program. These 3 people form the student's Faculty Project Review Committee. 1 Graduate College faculty member from another department can substitute for one NFS faculty member. The student must create a flyer announcing the oral presentation 2 weeks before the presentation date and send it to their committee and to the NFS administrator for distribution. The following information should be included: project title, student's name and degree program, presentation date, time and location, and project description. This oral presentation and the Faculty Project Review Committee meeting that follows will constitute the student's M.S. Comprehensive Examination.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Students in the ANFSMS are expected to continue the high degree of academic performance that was evident when they were admitted to the program. A minimum cumulative undergraduate GPA of 3.0 is required for continuation in the ANFSMS, and undergraduate students whose cumulative GPA at any time falls below this minimum for more than one semester will be removed from the program. Once students in the ANFSMS receive their bachelor's degree and are admitted to the regular MS degree program, academic probation matters will be dealt with in the same manner as for other M.S. students.

## NUTRITION AND FOOD SCIENCES M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The department mission is to study the relationship between nutrition, food science, health and fitness (preventive nutrition), and between diet and disease (therapeutic nutrition). Faculty research encompasses both basic and applied aspects of human nutrition, food science, food safety and food systems.

The Department of Nutrition and Food Sciences offers thesis-based and non-thesis Master of Science degrees. The thesis-based M.S. degree, which requires the writing and defending of a thesis, is a course and research based program with 15-24 credits in course work and 6-15 credits of research. The minimum number of credits required is 30. A non-thesis M.S. degree also requires 30 credits: 24-27 credits in course work, and in consultation with their faculty mentor, the student chooses their final project for 3-6 credits. The non-thesis M.S. does not require a thesis or a thesis defense.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major in nutrition, dietetics, food science or a science-related field, and an undergraduate course in biochemistry.

A minimum undergraduate GPA of 3.0 is recommended. Students need to complete the Graduate College Application form that must include three letters of recommendation. Students must be admitted through the Graduate College before taking any courses that will be applied to the master's degree requirements.

#### Minimum Degree Requirements for the Degree of Master of Science

A minimum of 30 credits and successful completion of a written comprehensive exam are required for completion of a Master's Degree in Nutrition and Food Sciences. Students enrolled in the thesis-based program must also write, present and successfully defend their research thesis.

Students must meet the UVM Graduate College Requirements for the Master's Degree. A minimum of 15 graded credits must be taken

after matriculation into the graduate program. Required courses for both the thesis and non-thesis M.S. are as follows:

THESIS		
STAT 211	QR: Statistical Methods I	3
NFS 350	Nutrition&Food Science Seminar	1
NFS 391	Master's Thesis Research	6-15
NFS 362	Intro to Research Methods	3
NON-THESIS		
STAT 211	QR: Statistical Methods I	3
NFS 350	Nutrition&Food Science Seminar	1
NFS 390	Master's Project Research	3-6
NFS 362	Intro to Research Methods	3

Remaining elective courses for both the thesis and non-thesis courses should be chosen in consultation with the student's advisor and must be approved for graduate credit.

### Comprehensive Examination

Thesis M.S. candidates will present a seminar before the end of the second semester of the degree program. This seminar will focus on the background to the proposed M.S. thesis research and experimental design. The candidate will be expected to provide an abstract of the seminar and a link to one pertinent online article related to the seminar topic. The abstract (electronic version) and link to a pertinent article must be submitted to the course instructor no later than one week prior to the seminar date. The course instructor will distribute the abstract and link to the NFS faculty and students. Within 2 weeks following the seminar date, the candidate will meet with his/her thesis defense committee to discuss the student's performance with the seminar and provide feedback. This seminar and the committee meeting that follows will constitute the student's M.S. Comprehensive Examination.

Non-Thesis M.S. candidates will present an oral presentation on their final project by the end of the semester for which the final project credits have been assigned. The oral presentation will be attended by the Faculty Mentor and at least 2 additional members from the NFS Graduate Program. These 3 people form the student's Faculty Project Review Committee. 1 Graduate College faculty member from another department can substitute for one NFS faculty member. The student must create a flyer announcing the oral presentation 2 weeks before the presentation date and send it to their committee and to the NFS administrator for distribution. The following information should be included: project title, student's name and degree program, presentation date, time and location, and project description. This oral presentation and the Faculty Project Review Committee meeting that follows will constitute the student's M.S. Comprehensive Examination.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

## OCCUPATIONAL THERAPY

### OVERVIEW

The entry-level Occupational Therapy Doctorate Degree is designed to prepare students to become Occupational Therapy practitioners.

Graduates will learn how to help people attain their desired level of participation in life regardless of age, race, ethnicity, culture, or socioeconomic background. They will learn Occupational Therapy practice across the lifespan and across practice settings. They will become scholarly and innovative thinkers, and will articulate clearly through written and verbal communication the value of the profession.

The faculty members in the program are:

**Priganc, Victoria**; Associate Professor, Department of Rehabilitation and Movement Science; PHD, Nova Southeastern University

**Meyer, Margaret**; Assistant Professor, Department of Rehabilitation and Movement Science; OTD, Boston University

### DEGREES

- Occupational Therapy O.T.D. (p. 205)

### FACULTY

### OCCUPATIONAL THERAPY O.T.D.

All students must meet the requirements for the Doctor of Occupational Therapy Degree (p. 265).

### OVERVIEW

The entry-level Occupational Therapy Doctorate Degree is designed to prepare students to become Occupational Therapy practitioners.

Graduates will learn how to help people attain their desired level of participation in life regardless of age, race, ethnicity, culture, or socioeconomic background. They will learn Occupational Therapy practice across the lifespan and across practice settings. They will become scholarly and innovative thinkers, and will articulate clearly through written and verbal communication the value of the profession.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to the entry-level doctor of occupational therapy program

- Bachelor or master degree from an accredited university
- Minimum cumulative GPA 3.0/4.0
- Minimum prerequisite GPA 3.2/4.0
- 40 observation hours with an occupational therapist
- English proficiency exam (Duolingo, IELTS or TOEFL), if applicable

- Personal statement
- 3 letters of recommendation (1 academic letter; 2 professional letters, 1 of which is preferably by an occupational therapist)
- Transcripts
- Phone/virtual/face-to-face interview

**PREREQUISITE COURSES**

- General Psychology, 3 credits
- Abnormal Psychology, 3 credits
- Human Development, 3 credits
- Statistics, 3 credits
- Biology (in addition to A&P), 3 credits
- Human Anatomy, 3+ credits
- Human Physiology, 3+ credits
- Social Sciences (Anthropology, Humanities, Philosophy, Sociology), 6 credits
- Physics or Kinesiology, 3 credits

**Minimum Degree Requirements**

The entry-level Doctorate of Occupational Therapy degree requires successful completion of the following 98 graduate credits:

YEAR 1		
FALL		
OT 410	Foundations for OT Practice	2
OT 411	Functional Anatomy	4
OT 412	Mvt and Occup Performance	3
OT 413	Dev of Humans as Occ Beings	2
OT 414	Psych & MH Influence on Occup	3
OT 418	Analyze Activity & Performance	2
SPRING		
OT 425	Older Adults as Occup Beings	6
OT 420	Therapeutic Interventions	3
NSCI 302	Neuroscience	3
OT 424	Vis&Cog-Percep Infl Occupation	3
NH 396	Special Topics	3
SUMMER		
Fieldwork - Level I		2
OT 435	Cultural Immersion	2
OT 460	Cap I: Prof Scholar & Explor	1
OT 437	Research I: Identifying Gaps	2
YEAR 2		
FALL		

OT 445	Young Adults as Occup Beings	6
OT 448	Designing Creative Ther Interv	2
OT 440	Teaching and Advocacy	2
OT 447	Research II: Implementing	2
OT 449	OT Practice Management	3
OT 461	Cap II: Devel & Support Evide	1
SPRING		
OT 455	Children as Occup Beings	6
OT 459	Becoming Life Long Pract	3
OT 456	Living Life to the Fullest	3
OT 457	Research III: Disseminating	2
OT 462	Capstone III: Proposal Defense	1
SUMMER		
Fieldwork - Level II		8
YEAR 3		
FALL		
Fieldwork - Level II		8
SPRING		
OT 463	Capstone IV: Capstone Experien	8
<b>Total Credits</b>		<b>96</b>

Following successful completion of all didactic coursework, fieldwork, and the capstone project and experience, students will be eligible to sit for the National Board for Certification in Occupational Therapy (NBCOT). A felony conviction may affect a graduate’s ability to sit for the NBCOT certification examination or attain state licensure.

**Comprehensive Examination**

Successful completion of the capstone project and experience.

**Requirements for Advancement to Candidacy for the occupational therapy doctorate**

Successful completion of the capstone project and experience.

**PATHOLOGY**

<http://www.med.uvm.edu/pathology> (<http://www.med.uvm.edu/pathology/>)

**OVERVIEW**

The Department of Pathology is actively engaged in both undergraduate and graduate courses focusing on general and systemic pathology as well as mechanisms of environmental disease. Opportunities include courses on special techniques of translational pathology as well as molecular mechanisms of environmental disease.

Numerous research opportunities are available in collaboration with the dynamic and engaged faculty.

## DEGREES

- Pathology M.S. (p. 207)

## FACULTY

**Chang, Martin;** Associate Professor, Department of Pathology and Laboratory Medicine; M.D., PHD, University of Toronto

**Fung, Mark K.;** Professor, Department of Pathology and Laboratory Medicine; MD, PHD, University of Alabama School of Medicine

**Harm, Sarah;** Associate Professor, Department of Pathology and Laboratory Medicine, MD, Jefferson Medical College

**Stowman, Anne;** Assistant Professor, Department of Pathology and Laboratory Medicine, MD, University of Minnesota

**Taatjes, Douglas Joseph;** Professor, Department of Pathology and Laboratory Medicine; PHD, University of Basel

**Wilcox, Rebecca;** Associate Professor, Department of Pathology and Laboratory Medicine, MD, Oregon Health Sciences University

**Zhang, Bei;** Associate Professor, Department of Pathology and Laboratory Medicine; MD, Shandong University School of Medicine; PHD, Southern Illinois University School of Medicine; MLS, Thomas University

## PATHOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

## OVERVIEW

The Department of Pathology offers both a thesis and non-thesis-based Master of Science degree. The thesis-based M.S. is a course and research-based program, with 24 credits in coursework, and a minimum of 6 credits of research culminating in a written thesis and defense. It is available to all applicants. A non-thesis M.S. requires 30 credits in coursework, but does not require a thesis or thesis defense.

The non-thesis M.S. is available only to University of Vermont medical students in the Vermont Integrated Curriculum (VIC).

Research interests in the Department of Pathology are diverse, with special emphasis on Environmental Pathology and Cardiovascular Molecular Epidemiology.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Masters of Science

Students should apply for admission into the M.S. in pathology program by July 1. Admission into this program requires the following:

#### Thesis Track

- Satisfactory undergraduate or graduate coursework in chemistry, organic chemistry, and the biological sciences
- Satisfactory scores on the Graduate Record Examination (GRE) general exam or the Medical College Admission Test (MCAT); candidates with at least 2 years of clinical or other scientific

laboratory experience will be considered without GRE or MCAT scores

- Completion of the UVM Graduate College application
- 3 letters of recommendation that attest to the student's intellectual maturity, oral and verbal communication skills, and their aptitude for studies towards an advanced degree in this area

#### Non-Thesis Track

UVM medical students are eligible for selection to the program after the completion of the Foundations and Clinical Clerkship portions of the VIC.

- A detailed letter of intent and curriculum vitae are required for application.
- A grade of 81 or better in the Foundations of Clinical Science (FoCS) OR the combination of: Cardiovascular, Respiratory and Renal (CRR), Human Development and Reproductive Health (HDRH), Medical Neuroscience (MedNeuro) and Connections courses in Foundations.
- Completion of the UVM Graduate College application

Chosen applicants will be interviewed by selected faculty members. Preference will be given to students with outstanding academic records who are highly motivated.

#### Program Learning Outcomes for Students in Both Tracks

- Obtain, analyze and evaluate information from a variety of sources
- Synthesize and apply knowledge to solve problems in ethical ways
- Evaluate the credibility and validity of research methods and clinical testing
- Defend the rigor, or lack of, when evaluating an experimental design including the inclusion or exclusion of crucial biological variables (e.g., sex, age, weight)
- Recognize vital biologic or chemical resources used in both research studies and clinical decision making for patients
- Identify effective communication strategies and engage in effective communication practices as team players
- Serve as an advocate for rigor and reproducibility when faced with proposed research questions
- Reflect on experiences and identify areas of improvement as life-long learners

### Minimum Degree Requirements

A minimum of 30 credits with a minimum GPA of 3.00 are required for a M.S. in pathology, plus successful completion of a comprehensive oral exam for non-thesis track students, or successful defense of a research thesis for thesis track students. Students must also meet the Graduate College requirements for the Master's Degree.

Non-Thesis Track (Core curriculum - 30 credit hrs)		
PATH 330	Pathology Rotations (18 credits required)	3-9
PATH 300	Biomedical Research Design	1



PATH 308	Pathology Journal Club	1
PATH 309	Pathology Grand Rounds	1
PATH 310	Clinical Genomic Medicine	1
NSCI 327	Resp Conduct in Biomed Rsch	1
Additional approved courses		7

Thesis Track (Core curriculum- 30 credit hours)		
BIOC 201	Fundamentals of Biochemistry	3
CLBI 301	Cell Biology	3
NSCI 327	Resp Conduct in Biomed Rsch	1
PATH 300	Biomedical Research Design	1
PATH 307	Molecular Pathology	3
PATH 308	Pathology Journal Club	1
PATH 309	Pathology Grand Rounds	1
PATH 328	Techniques in Microscopy	3
PATH 391	Master's Thesis Research	6-15
Additional approved elective courses		8

### Comprehensive Examination

The comprehensive examination is fulfilled in the non-thesis track through an anatomic/clinical pathology competency exam and a graded grand rounds presentation covering a capstone or a paper research project. Preparation and defense of a thesis proposal fulfills the comprehensive examination for the thesis track.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Completion of core curriculum and passing the comprehensive examination.

## PHARMACOLOGY

<http://www.med.uvm.edu/pharmacology> (<http://www.med.uvm.edu/pharmacology/>)

### OVERVIEW

The objective of the Department of Pharmacology Master's Programs is to provide a broad knowledge base of pharmacological concepts, preparing students for careers in Pharmaceutical, biotechnology and related industries; or to increase their competitiveness to pursue additional graduate or professional degrees.

Research interests in the Department of Pharmacology are diverse, with special emphasis on cardiovascular and cerebrovascular pharmacology, physiology, neurovascular coupling, signal transduction, and medicinal chemistry/cancer chemotherapy.

The Department of Pharmacology offers thesis-based and non-thesis Master of Science degrees. The non-thesis M.S. degree

involves taking 30 credits of required and elective Pharmacology or Pharmacology-approved courses and does not require a thesis or thesis defense. The thesis-based M.S. degree is a course and research-based program, with 21 credits in coursework and 9 credits of research. Students may choose thesis advisors from within the Department of Pharmacology, or with approval from the Program Director, may choose faculty from outside of the Department. This gives students a wide range of options for selecting thesis advisors conducting pharmacology research. A thesis is written and there is a defense.

Students can enter the thesis or non-thesis Pharmacology Master's programs by 1 of 2 mechanisms: 1<sup>st</sup> is the Traditional Master's Degree Program involving an approximately 2-year program of study. This program is available to all applicants. 2<sup>nd</sup> is the Accelerated Entry Master's Degree Program (AMP). This program is available exclusively to UVM undergraduate students and is designed to provide the opportunity to initiate their Master's degree while still an undergraduate student and use up to 9 credits of graduate coursework towards both their bachelor's and master's degrees, thereby decreasing both the time and cost of completing the Master's degree.

In addition to the Pharmacology M.S. and Accelerated Master's Program (AMP), the Pharmacology faculty participate in interdisciplinary doctoral programs in Neuroscience, and Cellular, Molecular, and Biomedical Sciences found elsewhere in this Catalogue.

### DEGREES

- Pharmacology AMP (p. 208)
- Pharmacology M.S. (p. 210)

### FACULTY

**Carr, Frances Eileen;** Professor, Department of Pharmacology; PHD, University of Illinois Chicago

**Dostmann, Wolfgang R. G.;** Professor, Department of Pharmacology; PHD, University of Bremen; MD, University of Munich

**Erdos, Benedek;** Assistant Professor, Department of Pharmacology; MD, PHD, Semmelweis University, School of Medicine, Budapest, Hungary

**Howe, Alan K.;** Professor, Department of Pharmacology; PHD, Northwestern University

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Santa Cruz

**Nelson, Mark;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

### PHARMACOLOGY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The objective of the Department of Pharmacology Master's Programs is to provide a broad knowledge base of pharmacological concepts, preparing students for careers in pharmaceutical, biotechnology and related industries or to increase their competitiveness to pursue additional graduate or professional degrees. Research interests in the Department of Pharmacology are diverse, with special emphasis on cardiovascular and cerebrovascular pharmacology, physiology, neurovascular coupling, signal transduction, and medicinal chemistry/cancer chemotherapy.

This Accelerated Master's Degree Entry Program (AMP) is designed to offer select UVM undergraduate science majors the opportunity to obtain both their B.A./B.S. and a M.S. in Pharmacology in a total of 5 years of study. Following acceptance into the program by the Graduate College, students enrolled in this program can take up to 9 credits of graduate-level courses that will count towards both a Bachelor's degree and the Master's in pharmacology degree. Students would then be expected to complete all remaining M.S. requirements during a 5<sup>th</sup> year of study. Full-time graduate student status will start the summer after their undergraduate graduation. All other aspects and requirements of the AMP are identical to the traditional (non-AMP) Master's program.

The Department of Pharmacology offers thesis-based and non-thesis Master of Science degrees in the AMP. The non-thesis M.S. degree involves taking 30 credits of required and elective Pharmacology or Pharmacology-approved courses and does not require a thesis or thesis defense. The thesis-based M.S. degree is a course and research-based program, with 21 credits in coursework and 9 credits of research. Students may choose thesis advisors from within the Department of Pharmacology, or with approval from the Program Director, may choose faculty from outside of the Department. This gives students a wide range of options for selecting thesis advisors conducting pharmacology research. A thesis is written and there is a defense.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A course background in the sciences (biology, chemistry, physics, etc.) is recommended. Graduate Record Examination (GRE) scores are not required.

Admission to the program requires the following:

- A minimum cumulative grade point average of 3.00 is recommended.
- Completion of the Graduate College Application form that must include at least 3 letters of recommendation.

Students **MUST** be admitted through the Graduate College before taking any courses that will be applied to the Master's degree requirements.

## MINIMUM DEGREE REQUIREMENTS

All students must meet the UVM Graduate College Requirements for the Master's degree. A minimum of 30 credits and successful completion of a written comprehensive exam are required for completion of the Master's degree in Pharmacology. Students enrolled in the thesis-based program must also write, present and successfully defend their research thesis. Courses should be selected from the following lists or from pharmacology-related courses offered by other departments at UVM as approved by the program lists or from Pharmacology-related courses offered by other departments at UVM as approved by the Program Director to complete the 30 credit requirement. Please contact the Program Director for a current list of courses approved for the Pharmacology M.S.

Required courses:		
PHRM 201	Introduction to Pharmacology	3
PHRM 240	Molecules & Medicine	3
PHRM 290	Topics Molecular&Cell Pharm	3
PHRM 308	Integrative Physiol. & Pharm.	3
PHRM 381	Seminar	1
Required for thesis Master's:		
PHRM 391	Master's Thesis Research	9
Additional courses may be selected from the following or by approval of the Program Director:		
PHRM 200	Medical Cannabis	
PHRM 272	Toxicology	
PHRM 302	Pharmacological Techniques	
PHRM 305	Milestones in Pharmacology	
PHRM 373	Readings in Pharmacology	
BIOC 301	General Biochemistry	
BIOC 302	General Biochemistry	
MPBP 301	Human Physiology & Pharm I	
STAT 211	QR: Statistical Methods I	

### Comprehensive Examination

Students are required to pass a written comprehensive exam. The format is a take-home written exam. The questions are based on the required courses, which are common to the thesis and non-thesis tracks. Grading is on a 1-10 scale for each question. An average score of 7 or better is required to pass. If a passing grade is not obtained, 1 re-take is permitted.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

## PHARMACOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The objective of the Department of Pharmacology Master's Programs is to provide a broad knowledge base of pharmacological concepts, preparing students for careers in pharmaceutical, biotechnology and related industries or to increase their competitiveness to pursue additional graduate degrees. Research interests in the Department of Pharmacology are diverse, with special emphasis on cardiovascular and cerebrovascular pharmacology, physiology, neurovascular coupling, signal transduction, and medicinal chemistry/cancer chemotherapy.

The Department of Pharmacology offers thesis-based and non-thesis Master of Science degrees. The non-thesis M.S. degree involves taking 30 credits of required and elective Pharmacology or Pharmacology approved courses and does not require a thesis or thesis defense. The thesis-based M.S. degree is a course and research-based program, with 21 credits in coursework and 9 credits of research. Students may choose thesis advisors from within the Department of Pharmacology, or with approval from the Program Director may choose faculty from outside of the Department. This gives students a wide range of options for selecting thesis advisors conducting pharmacology research. A thesis is written and there is a defense.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

A course background in the sciences (biology, chemistry, physics, etc.) is recommended. Graduate Record Examination (GRE) scores are not required.

Admission to the program requires the following:

- A minimum cumulative grade point average of 3.00 is recommended.
- Completion of the Graduate College Application form that must include at least 3 letters of recommendation.

Students MUST be admitted through the Graduate College before taking any courses that will be applied to the Master's degree requirements.

#### MINIMUM DEGREE REQUIREMENTS

All students must meet the UVM Graduate College Requirements for the Master's degree. A minimum of 30 credits and successful completion of a written comprehensive exam are required for completion of the Master's degree in Pharmacology. Students enrolled in the thesis-based program must also write, present and successfully defend their research thesis. Courses should be selected from the following lists or from pharmacology-related courses offered by other departments at UVM as approved by the program lists or from Pharmacology-related courses offered by other departments at UVM as approved by the Program Director to complete the 30 credit

requirement. Please contact the Program Director for a current list of courses approved for the Pharmacology M.S. programs.

Required Courses:		
PHRM 201	Introduction to Pharmacology	3
PHRM 240	Molecules & Medicine	3
PHRM 290	Topics Molecular&Cell Pharm	3
PHRM 308	Integrative Physiol. & Pharm.	3
PHRM 381	Seminar	1
Required for thesis Masters:		
PHRM 391	Master's Thesis Research	9
Additional courses may be selected from the following or by approval of the Program Director:		
PHRM 200	Medical Cannabis	
PHRM 272	Toxicology	
PHRM 302	Pharmacological Techniques	
PHRM 305	Milestones in Pharmacology	
PHRM 373	Readings in Pharmacology	
BIOC 301	General Biochemistry	
BIOC 302	General Biochemistry	
MPBP 301	Human Physiology & Pharm I	
STAT 211	QR: Statistical Methods I	

### Comprehensive Examination

Students are required to pass a written comprehensive exam. The format is a take-home written exam. The questions are based on the required courses, which are common to the thesis and non-thesis tracks. Grading is on a 1-10 scale for each question. An average score of 7 or better is required to pass. If a passing grade is not obtained, 1 re-take is permitted.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Advancement to candidacy requires satisfactory completion of the comprehensive exam.

## PHYSICAL ACTIVITY AND WELLNESS SCIENCE

<https://www.uvm.edu/cnhs/rms> (<https://www.uvm.edu/cnhs/rms/>)

### OVERVIEW

The Master's program in Physical Activity and Wellness Science provides the competencies necessary to promote health and wellness, assist in reducing health risks, and improve quality of life for individuals and communities. The curriculum examines the science

underlying the relationship between physical (in)activity and chronic disease and emphasizes health interventions based on scientific data and established behavioral and learning theories. The program offers a cohesive set of courses pertaining to the planning, development, evaluation and dissemination of evidence-based, physical activity and wellness programming that prepares the student to become a health educator and physical activity practitioner in communities, workplaces, healthcare, and/or public health settings.

## DEGREES

Physical Activity and Wellness Science M.S. (p. 211)

## FACULTY

**Angelopoulos, Theodore J.;** Professor, Department of Rehabilitation and Movement Science; PHD, University of Pittsburgh

**Gell, Nancy M.;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, Auburn University

**Kasser, Susan;** Professor, Department of Rehabilitation and Movement Science; PHD, Oregon State University

**Tompkins, Connie L.;** Associate Professor, Department of Rehabilitation and Movement Science; PHD, University of New Orleans

**Tourville, Timothy;** Assistant Professor, Department of Rehabilitation and Movement Science, PHD; University of Vermont

## PHYSICAL ACTIVITY AND WELLNESS SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Master's program in Physical Activity and Wellness Science provides the competencies necessary to promote health and wellness, assist in reducing health risks, and improve quality of life for individuals and communities. The curriculum examines the science underlying the relationship between physical (in)activity and chronic disease and emphasizes health interventions based on scientific data and established behavioral and learning theories. The program offers a cohesive set of courses pertaining to the planning, development, evaluation and dissemination of evidence-based, physical activity and wellness programming that prepares the student to become a health educator and physical activity practitioner in communities, workplaces, healthcare, and/or public health settings.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

- UVM Graduate Application Form
- Undergraduate degree from an accredited college or university
- Minimum overall GPA of 3.0
- Undergraduate transcripts
- Recommended coursework: Anatomy & Physiology, Exercise Physiology, Research Methods and Statistics

- TOEFL scores (international students; minimum of 90)
- Statement of Career Interests
- 3 letters of recommendation

### Minimum Degree Requirements

UVM's Master's degree in Physical Activity and Wellness Science is a 30-credit, non-thesis graduate program. Although the program can be completed in 1 academic year (2 semesters), completing the program over 2-years (4 semesters) is recommended. The curriculum includes coursework in exercise assessment and prescription, physical activity epidemiology, research methods, exercise and energy balance, chronic disease and exercise, health and wellness promotion, and behavior change and theory.

A maximum of 6 credits may be transferred into the program. Transfer credit may be completed prior to admission to the program provided that the credit is approved by the student's graduate studies committee, course(s) content overlaps with program curriculum content, and the credit conforms to all other Graduate College requirements.

### Comprehensive Examination

Students must complete a comprehensive exam, integrating their knowledge of core course material in a written paper and/or oral format, by the end of their final semester in the program.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of all required courses and the comprehensive examination.

## PHYSICAL THERAPY

<http://www.uvm.edu/~cnhs/rms/>

### OVERVIEW

The UVM Doctor of Physical Therapy (DPT) program's mission is to prepare graduates to lead and collaborate in the quest of promoting the health of individuals, communities and society through movement and exercise in order to optimize function, activity, and participation across environments. UVM graduates provide ethical, evidence-based, client-centered services in a culturally sensitive manner as they serve society to enhance quality of life. Graduates are decision-makers in the primary care team who have a clear understanding of the importance of lifelong learning that will support their client, patient, and professional needs. Faculty model and support student learning of these expected educational outcomes.

The program's vision is to be recognized for leadership in its contribution to the creation, advancement, and dissemination of translational research while striving toward excellence to educate DPT scholars who collaborate to "transform society by optimizing movement," for the promotion of individual and population health of our communities and society.

## DEGREES

- Physical Therapy D.P.T. (p. 212)

## FACULTY

**Escorpizo, Reuben;** Clinical Associate Professor, Department of Rehabilitation and Movement Science; DPT, Des Moines University

**Failla, Matthew;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, University of Delaware

**Mohapatra, Sambit;** Associate Professor, Department of Rehabilitation and Movement Science; PHD, University of Illinois, Chicago

**Ouellette-Morton, Rebecca;** Clinical Associate Professor, Department of Rehabilitation and Movement Science; DPT, University of New England

**Peters, Denise;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, DPT, University of South Carolina

**Sargent, Elizabeth;** Clinical Assistant Professor, Department of Rehabilitation and Movement Science; SCD, Texas Tech University

**Westervelt, Karen C.;** Clinical Associate Professor, Department of Rehabilitation and Movement Science; PHD, Bond University-Robina, Queensland, Australia

## PHYSICAL THERAPY D.P.T.

### OVERVIEW

The Doctor of Physical Therapy (D.P.T.) program at the University of Vermont (UVM) consists of 102 graduate credits offered in a 2.5-year full-time program format, over 8 semesters inclusive of summers, that leads to a Doctor of Physical Therapy degree.

The program is well recognized for preparing D.P.T. graduates as primary care movement system experts who translate evidence into contemporary best practice. Graduates advocate to improve health outcomes and well-being at the individual and community level.

The movement system is the foundation of the curriculum design. Organized in a systems-based model, the curriculum integrates the basic and clinical sciences across the musculoskeletal, nervous, cardiovascular/pulmonary, integumentary and endocrine systems to facilitate student ability to develop as movement system experts. Additionally, the study of evidenced based practice, leadership and professional formation, health policy, business management, and social responsibility shape the students' professional role and identity as a Doctor of Physical Therapy.

Students engage in an array of active learning experiences with multiple opportunities for interprofessional education and community engagement. Integrated clinical experiences and 32 weeks of full time clinical internships broaden student professional preparation. Internships are offered throughout the U.S. in a variety of specialty areas and settings and assignments are based on students' educational needs and clinical site availability. Students are responsible for all costs associated with clinical internships.

Exceptional faculty role model clinical and research expertise across each of the specialty areas of physical therapist practice to facilitate student development as movement system experts.

The faculty member below is in addition to those who have been formally appointed as Graduate Faculty members:

**Dee, Justine;** Clinical Associate Professor, Department of Rehabilitation and Movement Science; M.S., University of Vermont, PT, Northeastern University

### PROGRAM MISSION AND VISION

The UVM DPT program mission is to prepare D.P.T. graduates to lead and collaborate in the quest of promoting the health of individuals, communities and society through movement and exercise in order to optimize function, activity, and participation across environments. UVM graduates are movement system experts who provide ethical, evidence-based, client-centered services in a culturally sensitive manner as they serve society to enhance quality of life. Graduates are decision makers in the primary care team who have a clear understanding of the importance of lifelong learning that will support their client, patient and professional needs. The program's vision is to be recognized for leadership in its contribution to the creation, advancement, and dissemination of translational research while striving toward excellence to educate D.P.T. scholars who collaborate to "transform society by optimizing movement," and promote individual and population health of our communities and society.

### PROFESSIONAL LICENSURE

Upon successful completion of the program, graduates are eligible to sit for the national licensure examination administered through the Federation of State Boards of Physical Therapy.

### ACCREDITATION

The DPT program at UVM is accredited by the Commission on Accreditation in Physical Therapy Education, 1111 North Fairfax Street, Alexandria, VA, 22314.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Physical Therapy

Applicants must complete the prerequisite course requirements and a baccalaureate degree in any major from UVM or any accredited institution. Applicants with a baccalaureate degree from institutions outside the U.S. will also be considered.

Applicants to the D.P.T. program must have a cumulative GPA of 3.00 or higher in their undergraduate studies. All applicants must complete the following prerequisite courses with a cumulative GPA of 3.30 or higher prior to entry into the DPT program:

- 2 semesters of anatomy/physiology
- 2 semesters of college chemistry with labs
- 2 semesters of physics with labs
- 2 semesters of biology (not botany or zoology)
- 1 semester of psychology
- 1 semester of statistics

**APPLICATION PROCESS:**

All Applicants must complete the Common Application through the Physical Therapist Centralized Application Service (PTCAS), a division of the American Physical Therapy Association. Follow all instructions on the site. Application materials should be submitted directly to PTCAS and must include:

- 3 letters of recommendation, one of which must come from an academic faculty member
- Official Transcript(s) from all U.S. and Canadian schools attended. PTCAS and the UVM D.P.T. program accept prerequisite credits from accredited institutions only. For international applicants, transcripts must be translated and evaluated by an official service and sent to the CNHS Office of Student Services

Complete the supplemental UVM Graduate College Application form. Include the following information:

- Upload a document that reads: "See essay on the PTCAS application."
- Application Fee
- Note: No transcripts, letters of recommendation or other materials submitted in the PTCAS application need to be submitted to the University of Vermont.
- If applying to the combined DPT/PhD in Neuroscience program select the DPT/NGP option on the supplemental application. See website for details.

Complete the D.P.T. Prerequisite Course Completion form.

**Minimum Degree Requirements**

The UVM D.P.T. program requires successful completion of 102 graduate credits.

Curriculum for Class of 2022, 2023 and 2024:

YEAR ONE		
SUMMER		
ANNB 300	Human Gross Anatomy	6
DPT 401	Health Systems I - Policy	2
DPT 450	Professional Form/Leadership I	1
FALL		
DPT 405	Clinical Medicine	4
DPT 406	Exercise Science	3
DPT 410	Fundamentals of Clinical Pract	3
DPT 411	Movement System I	3
DPT 414	Clinical Reasoning	2
DPT 415	Psychsoc Aspcts Hlth Wellbeing	3
SPRING		

NSCI 302	Neuroscience	3
DPT 407	Pharmacology and Nutrition	1
DPT 408	Fundamentals Critical Inquiry	3
DPT 412	Movement System II	4
DPT 420	Musculoskeletal Management I	4
DPT 451	Prof Formation/Leadshp II-ICE	2
YEAR TWO		
SUMMER		
DPT 421	Musculoskeletal Management II	4
DPT 423	Neurological Management I	4
DPT 426	Cardiovasc and Pulmonary Mgt	3
DPT 452	Prof Formatn/Leadshp III-ICE	2
DPT 493	Doctoral Research Project I	1
FALL		
DPT 402	Health Sys II-Quality Improvmt	2
DPT 422	Musculoskeletal Management III	3
DPT 424	Neurological Management II	3
DPT 427	Integmnt, Endocrine, Multi Sys	3
DPT 494	Doctoral Research Project II	2
DPT 460	Clinical Edu Experience I	2
SPRING		
DPT 403	Health Sys III-Business Mgt	2
DPT 404	Health Sys IV-Health Promotion	3
DPT 416	Rehabilitation Technology	3
DPT 425	Neurological Management III	3
DPT 453	Prof Form/Leadshp IV-ICE/IPE	2
DPT 495	Doctoral Research Project III	2
YEAR THREE		
SUMMER		
DPT 413	Movement System III	4
DPT 461	Clinical Edu Experience IIA	2
DPT 496	Special Topics	2
Comprehensive Exam		
FALL		
DPT 462	Clinical Edu Experience IIB	2
DPT 463	Clinical Edu Experience III	4

Students must also:

- Pass all clinical internships and clinical education coursework expectations during their clinical experience and receive no more than one U grade in a clinical education course (that was successfully retaken for a S grade)
- Illustrate evidence of professional behaviors commensurate with professional doctoral practice in physical therapy

### LIMITED WAIVER OPTION

The DPT program faculty, under special circumstances, may allow a waiver of up to 6 credits based on prior knowledge. A course waiver form inclusive of prior knowledge supporting documentation must be submitted to the Chair of the DPT Curriculum Committee and Program Director (PD) at least 2 weeks prior to the semester where the potentially waived course is offered. The DPT Curriculum Committee will review all requests for recommendation to the PD.

Students will receive notification of decision in writing and the Graduate College will be notified when a waiver has been approved. The student assumes responsibility for all content of any approved course waiver.

### Comprehensive Examination

The examination takes the form of an individual student written portfolio. Should students not pass the comprehensive examination, they will have 1 additional opportunity to remediate and provide evidence of achievement of the learning outcomes of the comprehensive examination prior to being able to graduate from the program.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Physical Therapy

Successful completion of all graded graduate credits with a 3.00 GPA or better, received no more than 2 passing course grades below a B, and passed the comprehensive examination.

## PHYSICS

<http://www.uvm.edu/~physics/>

### OVERVIEW

The Department of Physics offers research opportunities in theoretical and experimental condensed matter physics, astronomy and astrophysics, and soft condensed matter physics and biophysics.

Research in theoretical condensed matter physics focuses on the dynamics of quantum systems with application to electronic, magnetic, optical, structural, and thermal properties of nanomaterials including fullerene-derived solids (buckyballs) and carbon nanotubes. Basic research also includes the investigation of low energy scattering of atoms and molecules from surfaces and systems with many internal degrees of freedom, and the development of new methods for studying quantum many-body systems, such as new extensions of density functional theory to van der Waals systems. In addition, high performance computational techniques including quantum Monte Carlo and exact diagonalization are used to study strongly-interacting quantum systems with a focus on the types of emergent phenomena that are ubiquitous in complex systems. This

includes investigations of entanglement in quantum fluids and gases in the presence of confinement, disorder, and dissipation.

The physics of recently discovered Graphene and its derivatives is another major direction of theoretical research. These materials exhibit unconventional electronic, magnetic, mechanical, and transport properties, and efforts are under way to understand the role of quantum many-body effects both from fundamental standpoint and in relation to nanodevice applications.

Additional theoretical studies include strongly-correlated electron systems, such as complex oxides and cuprates and high-temperature superconductors. Of particular interest are frustrated quantum magnets with novel ground states, as well as conducting cuprates which exhibit complex interplay of charge and spin phenomena. Such systems also tend to undergo quantum phase transitions, and the study of quantum critical phenomena is a major research direction.

Theoretical studies of the optical properties of materials include the electronic structure of defect complexes in ionic crystals, the application of subtracted dispersion relations to optical data analysis, and the separation of inter- and intra-band effects in the infrared spectra of metals. Related studies are concerned with theories of X-ray scattering, of X-ray optical properties, and of X-ray optical elements.

Research in materials physics includes studies of the kinetics of thin film growth and surface processing, applied to materials with interesting and useful physical properties such as organic semiconductors and magnetic materials. Many of the research projects involve real-time X-ray or electron diffraction structural studies of surface phenomena, combined with computer simulation of relevant surface processes. Available is an ultra-high vacuum thin-film deposition laboratory dedicated to these studies, and regular use is made of synchrotron X-ray facilities in the U.S.

Additional research in materials physics includes studies of fundamental magnetic and spin-dependent electronic properties of semiconductor nanostructures that employ high magnetic field optical spectroscopy imaging techniques. The physics department hosts 1 of the few laboratories in New England where time-resolved, spin-dependent spectroscopy imaging at magnetic fields as high as 5 Tesla may be carried out.

Astrophysical research centers on experimental radio astronomy, with particular emphasis on pulsars and the interstellar medium. Observations are carried out using major instruments of the U.S. National Observatories and generally involve computer analysis and interpretation.

Research in biophysical ultrasound is directed toward an understanding of the physical principles involved when ultrasound interacts with living systems. This often involves collaboration with the College of Medicine. Acoustical and optical tweezers permit manipulating single cells without touching them. New forms of ultrasonic transducers and biosensors are being developed in collaboration with the Department of Electrical Engineering, as part of the Materials Science program. Biophysical research includes studies on the development and employment of novel uses of in situ

atomic force microscopy for biological applications, specifically high-resolution structural studies of membrane proteins, investigation of the packing of genetic materials on bilayer membranes, and studies on how DNA-bilayer interactions affect the use of cationic lipids as gene-delivery means. Other research in biological physics and protein dynamics involves combining the detail of atomic-resolution X-ray crystallography with the sensitivity of optical and IR spectroscopy. The department has access to a state-of-the-art protein crystallography diffractometer and organizes regular trips to synchrotrons in the U.S. and Europe.

Opportunities for collaborative research with other university departments and groups include those with Chemistry, the Materials Science program, Molecular Physiology and Biophysics, the Cellular, Molecular and Biomedical Sciences program, Computer Science, Electrical Engineering, Civil and Environmental Engineering, Mechanical Engineering, Medical Radiology, and Geology.

The department participates in a doctoral program in Materials Science.

## DEGREES

- Physics AMP (p. 215)
- Physics M.S. (p. 216)
- Physics Ph.D. (p. 217)

## FACULTY

**Clougherty, Dennis Paul;** Professor, Department of Physics; PHD, Massachusetts Institute of Technology

**Del Maestro, Adrian G.;** Adjunct Professor, Department of Physics; PHD, Harvard University

**Furis, Madalina Ioana;** Associate Professor, Department of Physics; PHD, University of Buffalo

**Headrick, Randall L.;** Professor, Department of Physics; PHD, University of Pennsylvania

**Kotov, Valeri N.;** Associate Professor, Department of Physics; PHD, Clarkson University

**Vanegas, Juan;** Assistant Professor, Department of Physics; PHD; University of California Davis

**White, Matthew S.;** Assistant Professor, Department of Physics; PHD; University of Colorado Boulder

**Wu, Junru;** Professor Emeritus, Department of Physics; PHD, University of California Los Angeles

**Yang, Jie;** Associate Professor, Department of Physics; PHD, Princeton University

## PHYSICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The Department of Physics offers research opportunities in Theoretical and Experimental Condensed Matter physics, Astronomy and Astrophysics, and Soft Condensed Matter Physics and Biophysics.

Research in theoretical condensed matter physics focuses on the dynamics of quantum systems with application to electronic, magnetic, optical, structural, and thermal properties of nanomaterials including fullerene-derived solids (buckyballs) and carbon nanotubes. Basic research also includes the investigation of low energy scattering of atoms and molecules from surfaces and systems with many internal degrees of freedom and the development of new methods for studying quantum many-body systems, such as new extensions of density functional theory to van der Waals systems. In addition, high performance computational techniques including quantum Monte Carlo and exact diagonalization are used to study strongly interacting quantum systems with a focus on the types of emergent phenomena that are ubiquitous in complex systems. This includes investigations of entanglement in quantum fluids and gases in the presence of confinement, disorder and dissipation.

The physics of recently discovered Graphene and its derivatives is another major direction of theoretical research. These materials exhibit unconventional electronic, magnetic, mechanical, and transport properties, and efforts are under way to understand the role of quantum many-body effects both from fundamental standpoint and in relation to nanodevice applications.

Additional theoretical studies include strongly-correlated electron systems, such as complex oxides and cuprates and high-temperature superconductors. Of particular interest are frustrated quantum magnets with novel ground states, as well as conducting cuprates which exhibit complex interplay of charge and spin phenomena. Such systems also tend to undergo quantum phase transitions, and the study of quantum critical phenomena is a major research direction.

Theoretical studies of the optical properties of materials include the electronic structure of defect complexes in ionic crystals, the application of subtracted dispersion relations to optical data analysis, and the separation of inter- and intra-band effects in the infrared spectra of metals. Related studies are concerned with theories of X-ray scattering, of X-ray optical properties, and of X-ray optical elements.

Research in materials physics includes studies of the kinetics of thin film growth and surface processing, applied to materials with interesting and useful physical properties such as organic semiconductors and magnetic materials. Many of the research projects involve real-time X-ray or electron diffraction structural studies of surface phenomena, combined with computer simulation of relevant surface processes. Available is an ultra-high vacuum thin-film deposition laboratory dedicated to these studies, and regular use is made of synchrotron X-ray facilities in the U.S.

Additional research in materials physics includes studies of fundamental magnetic and spin-dependent electronic properties of semiconductor nanostructures that employ high magnetic field optical spectroscopy imaging techniques. The physics department hosts 1 of the few laboratories in New England where time-resolved, spin-dependent spectroscopy imaging at magnetic fields as high as 5 Tesla may be carried out.

Astrophysical research centers on experimental radio astronomy, with particular emphasis on pulsars and the interstellar medium.



Observations are carried out using major instruments of the U.S. National Observatories and generally involve computer analysis and interpretation.

Research in biophysical ultrasound is directed toward an understanding of the physical principles involved when ultrasound interacts with living systems. This often involves collaboration with the College of Medicine. Acoustical and optical tweezers permit manipulating single cells without touching them. New forms of ultrasonic transducers and biosensors are being developed in collaboration with Electrical Engineering, as part of the Materials Science Program. Biophysical research includes studies on the development and employment of novel uses of in situ atomic force microscopy for biological applications, specifically high-resolution structural studies of membrane proteins, investigation of the packing of genetic materials on bilayer membranes, and studies on how DNA-bilayer interactions affect the use of cationic lipids as gene-delivery means. Other research in biological physics and protein dynamics involves combining the detail of atomic-resolution X-ray crystallography with the sensitivity of optical and IR spectroscopy. The department has access to a state-of-the-art protein crystallography diffractometer and organizes regular trips to synchrotrons in the U.S. and Europe.

Opportunities for collaborative research with other university departments and groups include those with Chemistry, the Materials Science Program, Molecular Physiology and Biophysics, the Cellular, Molecular and Biomedical Sciences Program, Computer Science, Electrical Engineering, Civil and Environmental Engineering, Mechanical Engineering, Medical Radiology, and Geology.

The department participates in a doctoral program in Materials Science.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Students must apply for the Accelerated Master's Entry Program (AMP) during spring semester of their junior year. Students interested in the AMP can request information in writing from the physics department. Recommendation for admission will be based upon the student's prior academic record with particular attention paid to performance in upper-division 200-level physics courses. Following formal Graduate College admission to the Accelerated Master's Program, up to 9 credits of approved graduate course work may be taken that may be counted toward both the undergraduate and graduate degree requirements. The graduate credits taken prior to completion of the bachelor's must be in graded coursework only; independent study, research credits, internships and practica will not count towards the master's degree. In addition, the courses taken must be approved by the student's graduate advisor.

### Minimum Degree Requirements for the Degree of Master of Science

A total of 30 credits including 15 credits of graded course work and:

A minimum of 6 credits of thesis research	6
At least 9 credits of physics courses at the 300-level	9

### Comprehensive Examination

At the start of their second semester at UVM, students are expected to sit for the written part of the Comprehensive Exam which covers Classical mechanics, Quantum Mechanics, Electricity and Magnetism, as well as Thermal Physics and Mathematical Physics.

Students are given 2 opportunities to pass the comprehensive exam. In addition to the written portion, there is also an oral portion that consists of a Master's thesis proposal given after the start of a thesis research project.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of all required courses and the comprehensive exam.

## PHYSICS M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

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Opportunities for collaborative research with other university departments and groups include those with Chemistry, the Materials Science program, Molecular Physiology and Biophysics, the Cellular, Molecular and Biomedical Sciences program, Computer Science,

Electrical Engineering, Civil and Environmental Engineering, Mechanical Engineering, Medical Radiology, and Geology.

The department participates in a doctoral program in Materials Science.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Undergraduate majors in science, engineering, or mathematics are considered for admission to the program. Satisfactory scores on the Graduate Record Examination (general) are required.

### Minimum Degree Requirements for the Degree of Master of Science

A total of 30 credits including at least 15 credits of graded coursework and:

A minimum of 6 credits of thesis research	6
At least 9 credits of physics courses at the 300-level	9

### Comprehensive Examination

At the start of their second semester at UVM, students are expected to sit for the written part of the Comprehensive Exam which covers classical mechanics, quantum mechanics, electricity and magnetism, as well as thermal physics and mathematical physics.

Students are given 2 opportunities to pass the comprehensive exam. In addition to the written portion, there is also an oral portion that consists of a master's thesis proposal given after the start of a thesis research project.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of all required courses and the comprehensive exam.

## PHYSICS PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265).

## OVERVIEW

The Department of Physics offers research opportunities in theoretical and experimental condensed matter physics, astronomy and astrophysics, and soft condensed matter physics and biophysics.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Undergraduate majors in physics are considered for admission to the program. Satisfactory scores on the Graduate Record Examination (general) are required.

### Minimum Degree Requirements

75 credits, including:

6 Core Graduate Courses		
PHYS 301	Mathematical Physics	3
PHYS 311	Advanced Dynamics	3
PHYS 313	Electromagnetic Theory	3
PHYS 323	Contemporary Physics	3
PHYS 362	Quantum Mechanics II	3
PHYS 365	Statistical Mechanics	3
All of these courses must be completed with a grade B or better within the first 2 years of graduate study.		
To accommodate the needs of the specific subfields in physics such as astrophysics, biological physics, condensed-matter physics and materials physics, 3 elective courses (9 credits) have to be chosen to fulfill the breadth requirement with a grade of B or higher. Elective courses must be completed within the first 3 years of the program, as the fourth year (and beyond if needed) should be dedicated to progress towards the Ph.D. dissertation.		
A minimum of 20 credits of Doctoral Dissertation Research (PHYS 491)		20
A minimum of 3 credits of Teaching College Physics (PHYS 305)		3

### Comprehensive Examination

At the start of their second semester at UVM, students are expected to sit for the written part of the Comprehensive Exam which covers classical mechanics, quantum mechanics, electricity and magnetism, as well as thermal physics and mathematical physics.

Students are given 2 opportunities to pass the comprehensive exam. In addition to the written portion, there is also an oral portion that consists of a Ph.D. dissertation proposal given after the start of a dissertation research project.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Successful completion of all required courses and the comprehensive exam.

## PLANT AND SOIL SCIENCE

<http://www.uvm.edu/cals/pss> (<http://www.uvm.edu/~pss/>)

### OVERVIEW

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of agricultural systems and environmental quality in plant/soil ecosystems affecting the people of Vermont, the region, and the world. The department will provide excellence in education, research, and extension that will foster environmentally, economically, and socially sound practices.

The department offers a Master of Science (M.S.) degree in all fields in plant science and soil science and a Doctor of Philosophy (Ph.D.) degree in plant science and soil science. A thesis, based on original research, is required for the M.S. degree, and completion of the requirements normally takes 2.5 years. A dissertation, based on

original research, is required for the Ph.D. degree, and completion of the requirements typically takes 3 to 4 years.

The department is comprised of faculty representing the disciplines of agroecology, agronomy, entomology, horticulture, landscape design, plant pathology, and soil science. Research faculty are involved in studying plant, soil or insect interactions within environments managed for food, fiber, waste utilization, or for landscape purposes. The objectives of these studies are: (1) to develop fundamental knowledge of environmental impacts and interactions and (2) to apply knowledge to better manage systems and promote environmental health. Specifically, departmental projects have included:

- Biological control of insect pests – entomopathogenic fungi
- Integrated pest management (IPM) in greenhouse and field situations
- Agro-ecological practices in Vermont and international communities
- Ecological landscape design
- Green stormwater infrastructure for improving water quality
- Design and analysis of experiments and surveys
- Field and forage crop management and utilization, forage quality, pasture and grazing management, and pest/weed management
- Analytical procedures for testing soils and environmental samples
- Effects of nitrogen (from acid rain) on forest soils and bog ecosystems
- Interaction between soil manganese oxides and heavy metals
- Nutrient dynamics and management in agricultural systems
- Invasive earthworms
- Nematodes and microarthropods as environmental indicators for terrestrial and wetland soils
- Development of sustainable apple production systems
- Evaluation and identification of woody and herbaceous landscape plants adapted to environmental conditions in Vermont/New England
- Diversified horticulture which involves the planning, production, handling, and marketing of horticultural crops with emphasis on multiple, diverse crops produced with environmentally and economically sound techniques.

### DEGREES

- Plant and Soil Science M.S. (p. 219)
- Plant and Soil Science Ph.D. (p. 220)

### FACULTY

**Bishop-von Wettberg, Eric;** Assistant Professor, Department of Plant and Soil Science; PHD, Brown University

**Bradshaw, Terence;** Research Assistant Professor, Department of Plant and Soil Science; PHD, University

**Chen, Yolanda H.;** Associate Professor, Department of Plant and Soil Science; PHD, University of California Berkeley

**Darby, Heather Marie;** Extension Professor; Department of Extension Programming and Faculty Support; PHD, Oregon State University

**Faulkner, Joshua;** Research Assistant Prof; Department of Ext - Programming and Faculty Support; PHD, Cornell University  
**Corres, Josef H.;** Associate Professor; Department of Plant and Soil Science; PHD, University of Manchester  
**Grubinger, Vernon;** Extension Professor; Department of Extension - Programming and Faculty Support; PHD; Cornell University  
**Hazelrigg, Ann;** Extension Assistant Professor, Extension; PHD, University of Vermont; MS, Cornell University  
**Hurley, Stephanie E.;** Associate Professor, Department of Plant and Soil Science; DDES, Harvard University  
**Mendez, Victor E.;** Professor; Department of Plant and Soil Science; PHD, University of California Santa Cruz  
**Merrill, Scott;** Research Assistant Professor, Department of Plant and Soil Science; PHD, Colorado State University  
**Neher, Deborah;** Professor; Department of Plant and Soil Science; PHD, University of California Davis  
**Parker, Bruce Lawrence;** Professor; Department of Plant and Soil Science; PHD, Cornell University  
**Ross, Donald Savage;** Research Professor Emeritus; Department of Plant and Soil Science; PHD, University of Vermont  
**Skinner, Margaret;** Research Professor; Department of Plant and Soil Science; PHD, University of Vermont  
**Starrett, Mark C.;** Associate Professor; Department of Plant and Soil Science; PHD, North Carolina State University-Raleigh

## PLANT AND SOIL SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of agricultural systems and environmental quality in plant/soil ecosystems affecting the people of Vermont, the region, and the world. The department will provide excellence in education, research, and extension that will foster environmentally, economically, and socially sound practices.

The department offers graduate programs leading to the Master of Science (M.S.) degree in all fields in plant science and soil science. A thesis, based on original research, is required for this degree. Completion of the requirements normally takes 2.5 years for the M.S. degree.

The department is composed of faculty representing the disciplines of agroecology, agronomy, entomology, horticulture, landscape design, plant pathology, and soil science. Research faculty are involved in studying plant, soil or insect interactions within environments managed for food, fiber, waste utilization, or for landscape purposes. The objectives of these studies are: (1) to develop fundamental knowledge of environmental impacts and interactions and (2) to apply knowledge to better manage systems and promote environmental health. Specifically, departmental projects have included:

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- Ecological landscape design
- Green stormwater infrastructure for improving water quality
- Design and analysis of experiments and surveys
- Field and forage crop management and utilization, forage quality, pasture and grazing management, and pest/weed management
- Analytical procedures for testing soils and environmental samples
- Effects of nitrogen (from acid rain) on forest soils and bog ecosystems
- Interaction between soil manganese oxides and heavy metals
- Nutrient dynamics and management in agricultural systems
- Invasive earthworms
- Nematodes and microarthropods as environmental indicators for terrestrial and wetland soils
- Development of sustainable apple production systems
- Evaluation and identification of woody and herbaceous landscape plants adapted to environmental conditions in Vermont/New England
- Diversified horticulture which involves the planning, production, handling, and marketing of horticultural crops with emphasis on multiple, diverse crops produced with environmentally and economically sound techniques

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major in an appropriate agricultural, environmental, biological, or physical science. GREs are recommended but not required.

#### Minimum Degree Requirements for the Degree of Master of Science

Total Minimum Requirements	30
A minimum of 15 credits in graded coursework in Plant and Soil Science and closely related fields	15-24
Remainder of credits in thesis research and seminar	6-15
Enrollment and satisfactory participation in 1 semester of departmental seminar	1
All master's students must take part in the department's undergraduate teaching program	

Students are required to engage in hypothesis driven scientific research. They are expected to document their research efforts in a thesis. They are expected to defend their research. The defense comprises a seminar open to members of the University community and an oral exam conducted by a committee of faculty.

#### Comprehensive Examination

Comprehensive examinations are typically taken after 1 year in residence. The decision on the type of comprehensive exam (written or oral) will be made by the major professor after consultation with

the student. The comprehensive examination is not the same as an oral thesis defense and must be satisfactorily passed before defending the thesis.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

Satisfactory completion of 1 academic year of graduate study in the Department of Plant and Soil Science and a written or oral comprehensive examination.

**PLANT AND SOIL SCIENCE PH.D.**

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

**OVERVIEW**

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of agricultural systems and environmental quality in plant/soil ecosystems affecting the people of Vermont, the region, and the world. The department will provide excellence in education, research, and extension that will foster environmentally, economically, and socially sound practices.

The department offers graduate programs leading to the Doctor of Philosophy (Ph.D.) in all fields in plant science and soil science. A dissertation, based on original research, is required for this degree. Completion of the requirements normally takes 3 to 4 years for the Ph.D. degree.

The Department is comprised of faculty representing the disciplines of agroecology, agronomy, entomology, horticulture, landscape design, plant pathology, and soil science. Research faculty are involved in studying plant, soil or insect interactions within environments managed for food, fiber, waste utilization, or for landscape purposes. The objectives of these studies are: (1) to develop fundamental knowledge of environmental impacts and interactions and (2) to apply knowledge to better manage systems and promote environmental health. Specifically, departmental projects have included:

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- Development of sustainable apple production systems
- Evaluation and identification of woody and herbaceous landscape plants adapted to environmental conditions in Vermont/New England
- Diversified horticulture which involves the planning, production, handling, and marketing of horticultural crops with emphasis on multiple, diverse crops produced with environmentally and economically sound techniques.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy**

A Master of Science degree in an appropriate agricultural, environmental, biological, or physical science. GREs are recommended but not required.

Students admitted into Master of Science program in the Department may transfer to a Ph.D. program after 1 year. Students petition the Department’s Graduate committee.

**Minimum Degree Requirements for the Degree of Doctor of Philosophy**

Credit hours to be earned in partial fulfillment of the Ph.D. requirements	75
Up to 24 credits of graduate-level coursework may be eligible for transfer to meet the credit requirements	
Minimum graded course work credits in Plant and Soil Science and closely related disciplines (e.g. botany, chemistry, forestry, microbiology, biochemistry or geology)	30
Remainder in research credits and seminars	Variable
Satisfactory participation in department seminars during residency is required. Ph.D. students are required to enroll in at least 2 PSS seminar courses (non-graded) during their tenure at UVM.	2
Doctoral students must take part in the department's undergraduate teaching program and in outreach activities related to their research efforts. They are expected to teach for 2 semesters and conduct outreach for 2 semesters	

**Comprehensive Examination**

Comprehensive examinations are typically taken after completion of the majority of all coursework. A written AND oral comprehensive examination must be passed by the candidate at least 6 months before the dissertation is submitted. It is the student’s responsibility to schedule an examination time that is satisfactory for all committee members. The written comprehensive examination is taken first followed by the oral examination. The comprehensive examination is not the same as an oral dissertation defense and must be satisfactorily passed before defending the dissertation. A unanimous vote of approval by the members of the Studies Committee is required for the student to pass the preliminary oral examination. Approval may be conditional, depending upon completion of specified additional work. If the oral and or written comprehensive examination is not

passed, the student is permitted to retake the examination once. Failure to pass the second examination will result in dismissal from the graduate program.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Satisfactory completion of Comprehensive Examination and Dissertation Proposal.

## PLANT BIOLOGY

<https://www.uvm.edu/cals/plantbiology> (<https://www.uvm.edu/cals/plantbiology/>)

### OVERVIEW

The Plant Biology Department offers a Ph.D. that provides training in basic scientific research in diverse aspects of plant biology. These include physiology, developmental genetics, molecular regulation of gene expression, cell biology, plant-microbe interactions, ecological genomics, systematics and biogeography, and ecology of plant population and community dynamics. Information on specific faculty research programs may be found on the department's web page. The department also offers the project-based Field Naturalist M.S., which is a unique field-based experience that develops the potential of tomorrow's conservation leaders by emphasizing scientific integration, oral and written communication, and environmental problem solving.

### DEGREES

- Field Naturalist (Plant Biology) M.S. (p. 154)
- Plant Biology M.S. (p. 222) (Not currently accepting students)
- Plant Biology Ph.D. (p. 222)

### FACULTY

**Barrington, David Stanley;** Professor, Department of Plant Biology; PHD, Harvard University

**Beckage, Brian;** Professor, Department of Plant Biology; PHD, Duke University

**Delaney, Terrence Patrick;** Associate Professor, Department of Plant Biology; PHD, University of Washington Seattle

**Harris, Jeanne M.;** Associate Professor, Department of Plant Biology; PHD, University of California Berkeley

**Keller, Stephen Robert;** Assistant Professor, Department of Plant Biology; PHD, University of Virginia

**Lintilhac, Philip;** Research Associate Professor, Department of Plant Biology; PHD, University of California Berkeley

**Molofsky, Jane;** Professor, Department of Plant Biology; PHD, Duke University

**Paris, Catherine Ann;** Senior Lecturer, Department of Plant Biology; PHD, University of Vermont

**Preston, Jill C.;** Assistant Professor, Department of Plant Biology; PHD, University of Missouri

**Stratton, Donald Arthur;** Senior Lecturer, Department of Plant Biology; PHD, SUNY Stony Brook

**Sundue, Michael A.;** Research Assistant Professor, Department of Plant Biology; PHD, CUNY Graduate Center / The New York Botanical Garden

**Tierney, Mary Lauretta;** Associate Professor, Department of Plant Biology; PHD, Michigan State University

**van den Berg, Abby Katrien;** Research Assistant Professor, Department of Plant Biology; PHD, University of Vermont

## FIELD NATURALIST (PLANT BIOLOGY) M.S.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The Field Naturalist Program is a unique field-based experience that develops the potential of tomorrow's conservation leaders by emphasizing scientific integration, oral and written communication, and environmental problem solving. Students receive a solid grounding in field-related sciences and are trained to integrate scientific disciplines into a coherent whole at the landscape level. Students also develop competence in evaluating field sites from a number of perspectives and/or criteria, translating scientific insights into ecologically sound decisions, and communicating effectively to a wide range of audiences.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science, Field Naturalist Option

- Sustained interest and engagement in the environment
- A track record of academic and professional achievement in science or environment
- Compelling recommendations
- At least two years of job, professional, or life experience after college

#### Minimum Degree Requirements

All students must successfully complete a total of 30 credit hours including a set of core courses in the field sciences and professional writing as well as elective courses in the life sciences, earth sciences, and ecology, to be chosen in consultation with the student's advisor and studies committee. Satisfactory completion of an oral comprehensive examination is required. A Field Naturalist student's degree culminates in satisfactory completion of a field project for a sponsoring organization that includes a professional report, a literature review, two oral presentations, and a journal publication or an article for a general audience.

#### Comprehensive Examination

An oral examination takes place in the student's second year. During this examination the student identifies, inventories and assesses the pieces, patterns, and processes of a previously unvisited landscape, and presents findings in a manner that would be meaningful to staff, officers, and scientists of a professional conservation organization.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Satisfactory completion of an oral comprehensive examination.

## PLANT BIOLOGY M.S.

The Plant Biology department is not currently accepting students into the M.S. degree program.

## PLANT BIOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265)

### OVERVIEW

Ph.D. students in the Department of Plant Biology have the opportunity to join research programs covering a diverse set of disciplines including physiology, developmental genetics, molecular regulation of gene expression, cell biology, plant-microbe interactions, ecological genomics, systematics and biogeography, and ecology of plant population and community dynamics. Graduate students become members of a collegial academic community where they are trained to become cutting-edge researchers and effective educators in the plant sciences. In addition, the University of Vermont has a vigorous research community in the life sciences, allowing students to interact and collaborate with colleagues across campus.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A bachelor's or master's degree in Biology, Chemistry, or a related field

Some research experience

Clarity of goals for graduate school

#### Minimum Degree Requirements

All students must successfully complete a total of 75 credits, including a minimum of 30 credits of program-related course work and 20 credits of dissertation research. First-year students participate in at least two rotations in research laboratories before committing to one laboratory for completion of dissertation research. Satisfactory completion of the written and oral components of a comprehensive examination are required for advancement to candidacy. A student's Ph.D. degree is culminated by satisfactory completion of a dissertation, a public seminar, and a private defense with their studies committee. In addition to research, all students must participate in a minimum of two courses of supervised teaching.

#### Comprehensive Examination

A written and oral examination is completed by end of the student's second year in the program. The examination requirements can be met in two different ways:

1. The written exam consists of questions from each of the student's committee members, and after successful completion an oral exam is scheduled.

2. The written exam takes the form of a grant proposal; the oral exam starts out focusing on the proposal and then broadens out to be more comprehensive.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Satisfactory completion of the written and oral components of a comprehensive examination are required for advancement to candidacy.

## PSYCHOLOGY

<http://www.uvm.edu/~psych/>

### OVERVIEW

The Master of Arts in Experimental or Clinical Psychology is aimed at students who wish to pursue a doctorate and want to strengthen their credentials to be competitive for doctoral programs, students who wish to pursue careers that require research skills, or students who wish to gain an understanding of research as it pertains to intervention and prevention.

The Ph.D. program in Experimental Psychology admits students in 4 broad areas of concentration ("clusters"): Biobehavioral Psychology; Developmental Psychology; Social Psychology; and Behavioral Psychopharmacology.

The Ph.D. program in Clinical Psychology places equal emphasis on research and clinical training. The Clinical Psychology program is fully accredited by the American Psychological Association.

The Ph.D. program in Clinical/Developmental Psychology provides students with training in the area of developmental psychopathology. Students completing the Clinical/Developmental degree meet the requirements of the Clinical program and those of the Developmental cluster in the Experimental program.

Further information about graduate programs can be obtained electronically from the Department of Psychological Science website, which contains details of requirements, funding opportunities, clinical and research facilities, specialty areas, ongoing research, and faculty.

### DEGREES

- Psychology AMP (p. 223)
- Psychology M.A. (p. 225)
- Psychology Ph.D. (p. 226)

### FACULTY

**Abaied, Jamie L.;** Associate Professor, Department of Psychological Science; PHD, University of Illinois Urbana-Champaign

**Achenbach, Thomas Max;** Professor, Department of Psychiatry; PHD, University of Minnesota Twin Cities

**Althoff, Robert;** Associate Professor, Department of Psychiatry; PHD, University of Illinois Urbana-Champaign

**Bouton, Mark Earhart;** Professor, Department of Psychological Science; PHD, University of Washington

**Burt, Keith B.;** Associate Professor, Department of Psychological Science; PHD, University of Minnesota Twin Cities

**Cepeda-Benito, Antonio;** Professor, Department of Psychological Science; PHD, Purdue University

**Dumas, Julie Anna;** Associate Professor, Department of Psychiatry; PHD, University of North Carolina

**Falls, William A.;** Dean, College of Arts and Sciences, Professor, Department of Psychological Science; PHD, Yale University

**Fondacaro, Karen Marie;** Clinical Professor, Department of Psychological Science; PHD, University of Vermont

**Forehand, Rex L.;** Professor, Department of Psychological Science; PHD, University of Alabama

**Gaalema, Diann E.;** Assistant Professor, Department of Psychiatry; PHD, Georgia Institute of Technology

**Garavan, Hugh P.;** Professor, Department of Psychiatry; PHD, Bowling Green State University

**Green, John Thomas;** Professor, Department of Psychological Science; PHD, Temple University

**Hammack, Sayamwong E.;** Professor, Department of Psychological Science; PHD, University of Colorado

**Harder, Valerie Susan;** Assistant Professor, Department of Pediatrics; PHD, Johns Hopkins University

**Heil, Sarah H.;** Professor, Department of Psychiatry; PHD, Dartmouth College

**Higgins, Stephen Thomas;** Professor, Department of Psychiatry; PHD, University of Kansas

**Hoza, Betsy;** Professor, Department of Psychological Science; PHD, University of Maine

**Hudziak, James Joseph;** Professor, Department of Psychiatry; MD, University of Minnesota Twin Cities

**Hughes Lansing, Amy;** Assistant Professor, Department of Psychological Science, PHD, University of Utah

**Klemperer, Elias;** Assistant Professor, Department of Psychiatry, PHD, University of Vermont

**Lafko Breslend, Nicole;** Research Assistant Professor, Department of Psychological Science; PHD, University of Vermont

**Murray-Close, Dianna Katharine;** Professor, Department of Psychological Science; PHD, University of Minnesota Twin Cities

**Peck, Kelly;** Assistant Professor, Department of Psychiatry; PHD, University of Mississippi

**Pinel, Elizabeth C.;** Professor, Department of Psychological Science; PHD, University of Texas Austin

**Potter, Alexandra S.;** Associate Professor, Department of Psychiatry; PHD, University of Vermont

**Price, Matthew;** Associate Professor, Department of Psychological Science; PHD, Georgia State University

**Rawson, Richard;** Research Professor, Department of Psychiatry; PHD, University of Vermont

**Rellini, Alessandra;** Associate Professor, Department of Psychological Science; PHD, University of Texas Austin

**Rohan, Kelly Joanna;** Professor, Department of Psychological Science; PHD, University of Maine

**Schermerhorn, Alice C.;** Associate Professor, Department of Psychological Science; PHD, University of Notre Dame

**Shoulberg, Erin K.;** Research Assistant Professor, Department of Psychological Science; PHD, University of Vermont

**Sigmon, Stacey C.;** Associate Professor, Department of Psychiatry; PHD, University of Vermont

**Stickle, Timothy R.;** Associate Professor, Department of Psychological Science; PHD, University of Arizona

**Thraillkill, Eric A.;** Research Assistant Professor, Department of Psychological Science; PHD, Utah State University

**Todd, Travis;** Research Assistant Professor, Department of Psychological Science, PHD, University of Vermont

**Toufexis, Donna J.;** Associate Professor, Department of Psychological Science; PHD, McGill University

## PSYCHOLOGY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

An Accelerated Master's degree in Psychology can be earned in one additional year after the Bachelor's degree. Students apply to the Accelerated Master's Entry Program in Psychology in their junior year and are accepted prior to their senior year. A thesis-based and a non-thesis based option is offered. For students who wish to pursue research-related careers and/or increase their competitiveness for Ph.D. programs, the thesis option is recommended. For students who need a M.A. for a non-research related career, for example in education, law, or business, the non-thesis option is recommended.

For the thesis-based option, applicants are required to identify a thesis mentor among the faculty in the Department of Psychological Science, and to complete 3 or more undergraduate research credits with the prospective mentor prior to application.

Following formal admission to the Accelerated Master's Entry Program, up to 9 credits of subsequent Psychology (PSYS) coursework approved for graduate credit can be taken in the senior year and counted towards both the B.A./B.S. and the M.A. (see course requirements for the M.A. in Experimental Psychology and for the M.A. in Clinical Psychology).

Learning goals for Accelerated Master's Program in Psychology students are:

- Development of a foundational understanding in the area of research specialization.
- Development of effective skills in communicating Psychological Science.
- Thesis option: Development of strong research skills

NOTE: Our goal is not to train licensed therapists pursuing a career in clinical practice. Hence, this program's curriculum does not provide any supervised practicum or internship hours necessary for licensure. Students interested in a career as a licensed therapist should pursue that goal via the Master's program in Counseling through the College of Education and Social Services.



**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of MASTER OF SCIENCE FOR ACCELERATED MASTER'S STUDENTS**

A major or its equivalent in undergraduate psychology is recommended, with a recommended minimum overall GPA of 3.3 and a GPA of 3.5 in the major. For the thesis-based option, applicants to the concentration in Experimental Psychology should have coursework in experimental psychology, and applicants to the concentration in Clinical Psychology should have completed abnormal psychology. 3 letters of recommendation are required, and letter-writers should comment on the readiness of the applicant for a graduate program. For the thesis-based option, one of the 3 letters of recommendation must be from the prospective faculty mentor and there must be completion of 3 or more undergraduate research credits with the prospective mentor prior to admission. The Graduate Record Examination is not required.

While students are in the undergraduate phase of their AMP, the graduate curriculum is listed as a secondary curriculum in their student record. After graduation with the B.A. or B.S. degree, the M.A. curriculum becomes the primary curriculum. No more than 9 credits of graduate coursework taken prior to completion of the B.A./B.S. will count towards the graduate degree. No exceptions are made.

**Minimum Degree Requirements**

Students pursue the thesis-based option with either a Experimental Psychology or Clinical Psychology concentration. The non-thesis based option does not have a concentration. For students pursuing the thesis-based option in Experimental Psychology, 9-15 credits must be accumulated in Master's Thesis research, in addition to successful defense of an empirical Master's Thesis. For students pursuing the thesis-based option in Clinical Psychology, 9 credits must be accumulated in Master's Thesis research, in addition to successful defense of an empirical Master's Thesis. Detailed information on courses of study is available on the department website.

**THESIS-BASED OPTION: EXPERIMENTAL PSYCHOLOGY CONCENTRATION**

CATEGORY A: RESEARCH (6 credits)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	
PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: EXPERIMENTAL (minimum of 6 credits)		
At least 2 of the following:		
PSYS 315	Biobehavioral Proseminar	
PSYS 330	Proseminar in Exp Social Psych	
PSYS 350	Developmental Proseminar	

CATEGORY C: ELECTIVES (minimum of 3 credits)		
At least 1 additional 300-level Psychology course.		
CATEGORY D: MASTER'S THESIS RESEARCH		
PSYS 391	Master's Thesis Research	9-15

**THESIS-BASED OPTION: CLINICAL PSYCHOLOGY CONCENTRATION**

CATEGORY A: RESEARCH (6 credits)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	
PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: CLINICAL (minimum of 9 credits)		
At least 1 course from each pair below is required		
PSYS 370	Child Psychopathology	3
or PSYS 371	Adult Psychopathology	
PSYS 374	Behavior Therapy: Children	3
or PSYS 375	Adult Cognitive & Behav Thrpy	
PSYS 372	Child & Adolescent Psyc Assess	3
or PSYS 373	Adult Psychological Assessment	
CATEGORY C: ELECTIVES (6 credits)		
2 additional 300-level Psychology courses.		6
Students may substitute 1 of the following 2 courses for one of the additional 300-level Psychology courses:		
PSYS 281	Advanced Fit Kids: Applied Res	
PSYS 296	Advanced Special Topics (Advanced Fit Kids: Special Populations)	
CATEGORY D: MASTER'S THESIS RESEARCH		
PSYS 391	Master's Thesis Research	6-9

**NON-THESIS OPTION**

CATEGORY A: STATISTICS AND RESEARCH METHODS (6 CREDITS)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	
PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: ELECTIVES (24 CREDITS)		
8 additional 300-level Psychology courses		

**Comprehensive Examination**

For the thesis-based option, a written thesis proposal and an oral examination serves as the comprehensive examination. For the non-thesis option, a written examination based on coursework serves as the comprehensive examination. The Comprehensive Examination requirement should be completed by the end of the first semester following completion of the bachelor’s degree.

**Requirements for Advancement to Candidacy for the Degree of (name of degree here)**

Satisfactory completion of the comprehensive examination.

**PSYCHOLOGY M.A.**

All Experimental and Clinical PHD students must meet the Requirements for the Master’s Degree (p. 260) prior to advancement to candidacy for the degree of Doctor of Philosophy.

**OVERVIEW**

The terminal Master of Arts in Experimental or Clinical Psychology is aimed at students who wish to pursue a doctorate and want to strengthen their credentials to be competitive for doctoral programs, students who wish to pursue careers that require research skills, or students who wish to gain an understanding of research as it pertains to intervention and prevention. A thesis-based and a non-thesis based option is offered. For students who wish to pursue research-related careers and/or increase their competitiveness for PhD programs, the thesis option is recommended. For students who need a Master’s degree for a non-research related career, for example in education, law, or business, the non-thesis option is recommended.

For the thesis-based option, applicants are required to identify a thesis mentor among the faculty in the Department of Psychological Science.

Learning goals for Master of Arts in Psychology students are:

- Development of a foundational understanding in the area of research specialization.
- Development of effective skills in communicating Psychological Science.
- Thesis option: Development of strong research skills

NOTE: It is not the program's goal to train licensed therapists pursuing a career in clinical practice. Hence, this program’s curriculum does not provide any supervised practicum or internship hours necessary for licensure. Students interested in a career as a licensed therapist should pursue that goal via the Master’s program in Counseling through the College of Education and Social Services.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Arts**

A major or its equivalent in undergraduate psychology is recommended, with a recommended minimum overall GPA of 3.3 and a GPA of 3.5 in the major. For the thesis-based option, applicants to the concentration in Experimental Psychology should

have coursework in experimental psychology, and applicants to the concentration in Clinical Psychology should have completed abnormal psychology. 3 letters of recommendation are required, and letter-writers should comment on the readiness of the applicant for a graduate program. For the thesis-based option, 1 of the 3 letters of recommendation must be from the prospective faculty mentor and there must be completion of 3 or more undergraduate research credits with the prospective mentor prior to admission. Satisfactory scores on the Graduate Record Examination are required. Subject scores (Psychology) are not required but are strongly recommended for students applying without a psychology major. An interview is required of top applicants.

**Minimum Degree Requirements**

Students pursue the thesis-based option with either a Experimental Psychology or Clinical Psychology concentration. The non-thesis based option does not have a concentration. For students pursuing the thesis-based option in Experimental Psychology, 9-15 credits must be accumulated in Master’s Thesis research, in addition to successful defense of an empirical Master’s Thesis. For students pursuing the concentration in Clinical Psychology, 9 credits must be accumulated in Master’s Thesis research, in addition to successful defense of an empirical Master’s Thesis. Detailed information on courses of study is available on the department website.

**THESIS-BASED OPTION: EXPERIMENTAL PSYCHOLOGY CONCENTRATION**

CATEGORY A: RESEARCH (6 credits)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	
PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: EXPERIMENTAL (minimum of 6 credits)		
At least 2 of the following:		
PSYS 315	Biobehavioral Proseminar	
PSYS 330	Proseminar in Exp Social Psych	
PSYS 350	Developmental Proseminar	
CATEGORY C: ELECTIVES (minimum of 3 credits)		
At least 1 additional 300-level Psychology course		3
CATEGORY D: MASTER'S THESIS RESEARCH		
PSYS 391	Master's Thesis Research	9-15

**THESIS-BASED OPTION: CLINICAL PSYCHOLOGY CONCENTRATION**

CATEGORY A: RESEARCH (6 credits)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	

PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: CLINICAL (minimum of 9 credits)		
At least 1 course from each pair below is required:		
PSYS 370	Child Psychopathology	3
or PSYS 371	Adult Psychopathology	
PSYS 374	Behavior Therapy: Children	3
or PSYS 375	Adult Cognitive & Behav Thrpy	
PSYS 372	Child & Adolescent Psyc Assess	3
or PSYS 373	Adult Psychological Assessment	
CATEGORY C: ELECTIVES (6 credits)		
2 additional 300-level Psychology courses.		
Students may substitute 1 of the following 2 courses for one of the additional 300-level Psychology courses:		
PSYS 281	Advanced Fit Kids: Applied Res	
PSYS 296	Advanced Special Topics (Advanced Fit Kids: Special Populations)	
CATEGORY D: MASTER'S THESIS RESEARCH		
PSYS 391	Master's Thesis Research	6-9

### NON-THESIS OPTION

CATEGORY A: STATISTICS AND RESEARCH METHODS (6 credits)		
1 of the following combinations:		
PSYS 304 & PSYS 305	Adv Statistical Methods I and Adv Statistical Methods II	
PSYS 303 & PSYS 304	Seminar in Psyc Research Meth and Adv Statistical Methods I	
CATEGORY B: ELECTIVES (24 credits)		
8 additional 300-level Psychology courses		

### Comprehensive Examination

For the thesis-based option, a written thesis proposal and an oral examination serves as the comprehensive examination. For the non-thesis option, a written examination based on coursework serves as the comprehensive examination. The Comprehensive Examination requirement should be completed by the end of the first semester of the second year in the program.

### Requirements for Advancement to Candidacy for the Degree of Master of Arts

Satisfactory completion of the comprehensive examination.

## PSYCHOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 265).

### OVERVIEW

The Ph.D. program in Experimental Psychology admits students in 4 broad areas of concentration ("clusters"): Biobehavioral Psychology; Developmental Psychology; Social Psychology; and Behavioral Psychopharmacology.

The Ph.D. program in Clinical Psychology places equal emphasis on research and clinical training. The Clinical Psychology program is fully accredited by the American Psychological Association.

The Ph.D. program in Clinical/Developmental Psychology provides students with training in the area of developmental psychopathology. Students completing the Clinical/Developmental degree meet the requirements of the Clinical program and those of the Developmental cluster in the Experimental program.

Additional clinical, research, and adjunct faculty supervise students in clinical and research placements.

Further information about graduate programs can be obtained electronically from the Department of Psychological Science website, which contains details of requirements, specialty areas, ongoing research, and faculty.

Applicants interested in the Ph.D. must apply for the Ph.D. degree only. Students whose goal is a terminal master's degree should apply through the M.A. program.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A major or its equivalent in undergraduate psychology is recommended. All applicants must have completed coursework including introductory psychology, statistics, and research methods. Applicants to the Experimental program should have coursework in experimental psychology, and applicants to the Clinical program should have completed abnormal psychology. The Graduate Record Examination is not required or accepted. Applicants must submit a writing sample of a research project or paper on which they were the primary author. An interview is required of top applicants.

#### Minimum Degree Requirements for the Degree of Doctor of Philosophy

The Experimental program requires 75 credits and the Clinical program requires a minimum of 80 credits. A minimum of 20 credits must be accumulated in dissertation research and the remainder in course credits numbered in the 200 through 300 sequences of the psychology curriculum, or acceptable courses at 200- or 300-level from other curricula. The Clinical Ph.D. program requires satisfactory completion of a 1-year pre-doctoral internship. Detailed information on courses of study is available on the department website. Satisfactory performance on the department final oral examination (dissertation defense) is required. There is no foreign

language requirement. Although the requirement differs, both programs have a required master's and a required preliminary examination.

### Comprehensive Examination

In the Experimental Psychology program, the comprehensive exam ("preliminary exam") is taken following the successful defense of a master's thesis. The examination consists of a 2-day written examination on select primary literature within the student's broad research area. The details of the examination are decided upon by a committee of faculty members within the student's research area.

In the Clinical Psychology program, the comprehensive exam is proposed following the successful defense of a master's thesis. The examination consists of either a literature review (or meta-analysis) on a topic relevant to the research program of the student or an NRSA F31 application submitted to the National Institutes of Health. Both options involve a proposal and an oral defense. Students in the Clinical/Developmental program complete the comprehensive exams for both the clinical and developmental programs.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

For the Experimental program, satisfactory completion of the minimum degree requirements for the Master of Arts degree or equivalent; for the Clinical program, satisfactory performance on the Ph.D. comprehensive examination.

## PUBLIC ADMINISTRATION

<http://www.uvm.edu/~mpa/>

### OVERVIEW

The Master of Public Administration Program at the University of Vermont joins vigorous study of the foundations of public administration with the practice of public administration in the real world. Vermont's small size, open local and state government, and wealth of nonprofit organizations make for an ideal environment in which to directly engage with the public administration field. More information on the M.P.A. program can be found on the Master of Public Administration website.

### DEGREES

- Public Administration AMP (p. 227)
- Public Administration M.P.A. (p. 228)

### FACULTY

**Conner, David S.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University  
**Farley, Joshua C.;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University  
**Heiss, Sarah Noel;** Associate Professor, Department of Community Development and Applied Economics; PHD, Ohio University  
**Koliba, Christopher J.;** Professor, Department of Community Development and Applied Economics; PHD, Syracuse University  
**Kolodinsky, Jane Marie;** Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**McMahon, Edward;** Adjunct Associate Professor, Department of Community Development and Applied Economics; EDD, University of Vermont

**McRae, Glenn;** Adjunct Lecturer, Department of Community Development and Applied Economics; PHD, The Union Institute & University

**Reynolds, Travis;** Assistant Professor, Department of Community Development and Applied Economics, PHD, University of Washington

**Shrum, Trisha R.;** Assistant Professor; Department of Community Development and Applied Economics; PHD, Harvard University – John F. Kennedy School of Government

**Tobin, Daniel;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Pennsylvania State University

**Zia, Asim;** Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## PUBLIC ADMINISTRATION AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

The Accelerated Master's Entry Program in Public Administration (AMP-PA) offers University of Vermont students the opportunity to secure a sound undergraduate and graduate program of study in five rather than a minimum of six years. The program closely integrates both programs of study, and enhances competitiveness in a marketplace stressing broad undergraduate and focused professional graduate education. The AMP-PA welcomes students majoring in administrative, behavioral, health, environmental, organizational, social science and related disciplines requiring graduate work in administration, or planning and policy capacities in the public service. Application to the program is typically made during a student's junior year. More information on the AMP-PA Program can be found on the Master of Public Administration website. Inquiries can be made through email [mpa@uvm.edu](mailto:mpa@uvm.edu) or by phone (802) 656-0009.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Public Administration for Accelerated Students

The Accelerated Master's Entry Program requires that students fulfill the same entrance requirements as for all candidates for the Master of Public Administration (MPA) Program and be accepted in order to matriculate and advance to candidacy. The following criteria must be met to gain admission to the AMP-PA program:

- A cumulative grade point average of 3.0 at the beginning of the second semester the candidate's junior year
- Three letters of recommendation attesting to the candidate's academic performance
- A strong motivation and academic potential for graduate work articulated in a statement of purpose

Required academic prerequisites, which include course work in economics, statistics, and American government, must also be completed. These prerequisites can be completed at any accredited institution of higher education. Admission into the MPA program is not contingent on completion of these prerequisites, but they must be completed within the first year of course work.

Applicants to the AMP-PA program must submit the standard Graduate College Application form. Completed applications will be reviewed in the month of May and a formal decision on admission will be rendered by the PA faculty by no later than May 15 of each year to afford potential new AMP-PA students the opportunity to enroll in Summer Session.

Following formal Graduate College admission to the Accelerated Master's Program, up to 9 credits of approved graduate course work may be taken that may be counted toward both the undergraduate and graduate degree requirements.

**Minimum Degree Requirements**

Successful completion of thirty-six credits, including:

Core Courses:		
PA 301	Foundations of Public Admin	3
PA 302	Org Theory & Behavior	3
PA 303	Research & Evaluation Methods	3
PA 305	Public and Nonprofit Budgeting	3
PA 306	Policy Systems	3
PA 326	Community Economic Development	3
PA 375	Public Administration Capstone	3
PA 380	Internship	3 or 6
Total Credits		24
An approved sequence of elective courses which may include up to twelve credits of course work from approved disciplines related to public administration		12

The Capstone is designed to provide M.P.A. students with a summative experience that ties learning competencies to evidence drawn from their course of study. This course is required for all M.P.A. students as it also incorporates the spirit of the Comprehensive Exam within the curriculum. Students in their final spring semester of the program are eligible to take this. This course counts as the “comprehensive exam” for the M.P.A. at UVM.

The Internship experience is a key opportunity to put into practice the concepts and theories of public administration. It is critical in gaining experience, building credentials and networking for future professional opportunities. A three-credit internship is required of all students, and students may apply up to 6 credits of internship experience toward the degree.

A six-credit thesis option is also available to all students and strongly recommended for students interested in continuing on to a Ph.D. A

student doing a thesis selects a three member thesis review committee to evaluate her/his work. Students who would like to pursue this option should talk to their assigned advisor upon entering the program to allow plenty of time for the planning and writing of a thesis.

**Comprehensive Examination**

The Comprehensive Examination requirement is met when a student completes the Capstone during their final spring semester. The Capstone is designed to provide M.P.A. students with a summative experience that ties learning competencies to evidence drawn from their course of study.

**Requirements for Advancement to Candidacy for the Degree of Master of Public Administration**

Thirty six (36) academic credits are needed (12 courses) to earn an M.P.A. degree. These eight courses are required core courses:

- PA 301 Foundations of Public Administration
- PA 302 Organizational Theory and Behavior
- PA 303 Research and Evaluation Methods
- PA 305 Public and Non-Profit Budgeting
- PA 306 Policy Systems
- PA 326 Community and Economic Development
- PA 375 M.P.A. Capstone
- PA 380 Internship

Students, with guidance from their advisor, select additional courses within the M.P.A. program or other academic units at the University of Vermont to round out their academic experience. A full-time student will finish the M.P.A. Program course work in 2 years, and a part-time student, 2 – 5 calendar years. While the M.P.A. Program at UVM does not offer explicit specializations, a student may pursue courses with a common thread or focus and can tailor their course selections to work toward that focus. Students may also choose to pursue a Certificate of Graduate Studies as an additional credential to fulfill elective requirements.

**PUBLIC ADMINISTRATION M.P.A.**

All students must meet the Requirements for the Master's Degree (p. 260)

**OVERVIEW**

The Master of Public Administration (M.P.A.) Program at the University of Vermont joins vigorous study of the foundations of public administration with the practice of public administration in the real world. Vermont's small size, open local and state government, and wealth of nonprofit organizations make for an ideal environment in which to directly engage with the public administration field. More information on the M.P.A. program can be found on the Master of Public Administration website. Inquiries can be made through email: mpa@uvm.edu or by phone (802) 656-0009.

**Mission**

The Master of Public Administration Program is housed within the Department of Community Development and Applied Economics

at the University of Vermont. The UVM M.P.A. Program inspires, equips, and elevates action-oriented leaders with the attitude, knowledge, and skills needed to foster a resilient sustainable society by drawing on the traditions and innovative spirit of Vermont communities.

**Traditions**

The M.P.A. program at UVM capitalizes on these unique traditions that have direct implications to Vermont and beyond to the public administration needs of a changing nation and world.

- The recognition and importance of community building
- The tradition of grassroots democracy
- A history of strong local governance with citizen input
- A record of fiscal conservatism combined with "progressive" positive change
- A citizen legislature with limited staff support
- An emphasis on efficiency, effectiveness, accountability, and sustainability
- Administrators serving their publics as "reflective practitioners"
- A history of cooperation between private and public sectors for the public good
- A vigorous non-profit sector, supported by citizens and organizations
- A deep commitment to inclusion and cultural diversity

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Public Administration**

- A sound academic record, including a baccalaureate degree from an accredited undergraduate institution
- Three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing the M.P.A.
- Resume or Curriculum Vitae
- Past experience in public service will be considered.
- Persons currently employed in administrative positions are encouraged to apply.
- Completion of these prerequisite courses: economics, American government, and statistics. Admission is not contingent upon prerequisites. Prerequisites must be completed by the end of the first semester of enrollment in the program.
- For international students whose native language is not English or who have not completed undergraduate degrees in English, scores from the Test of English as a Foreign Language (TOEFL), the English Language Testing System (IELTS), or Duolingo must be submitted. Institution code for test scores for UVM is 3920.

**Minimum Degree Requirements**

Successful completion of 36 credits, including:

Core Courses:		
PA 301	Foundations of Public Admin	3

PA 302	Org Theory & Behavior	3
PA 303	Research & Evaluation Methods	3
PA 305	Public and Nonprofit Budgeting	3
PA 306	Policy Systems	3
PA 326	Community Economic Development	3
PA 375	Public Administration Capstone	3
PA 380	Internship	3 or 6
An approved sequence of elective courses which may include up to 12 credits of course work from approved disciplines related to public administration		12

The Capstone is designed to provide M.P.A. students with a summative experience that ties learning competencies to evidence drawn from their course of study. This course is required for all M.P.A. students as it also incorporates the spirit of the Comprehensive Exam within the curriculum. Students in their final spring semester of the program are eligible to take this. This course counts as the "comprehensive exam" for the Master of Public Administration at UVM.

**INTERNSHIP**

The Internship experience is a key opportunity to put into practice the concepts and theories of public administration. It is critical in gaining experience, building credentials and networking for future professional opportunities. A 3-credit internship is required of all students, and students may apply up to 6 credits of internship experience toward the degree.

**THESIS OPTION**

A 6-credit thesis option is also available to all students and strongly recommended for students interested in continuing on to a Ph.D. A student doing a thesis selects a 3 member thesis review committee to evaluate her/his work. If this is an option you would like to pursue, talk to your assigned advisor upon entering the program to allow plenty of time for the planning and writing of a thesis. Students enrolled in the thesis option must take 6 credits of PA 391, which are counted towards the 36 credit requirement.

**Comprehensive Examination**

The Comprehensive Examination requirement is met when a student completes the Capstone during their final spring semester. The Capstone is designed to provide M.P.A. students with a summative experience that ties learning competencies to evidence drawn from their course of study.

**Requirements for Advancement to Candidacy for the Degree of Master of Public Administration**

36 academic credits are needed (12 courses) to earn an M.P.A. degree. These 8 courses are required core courses:

- PA 301 Foundations of Public Administration
- PA 302 Organizational Theory and Behavior
- PA 303 Research and Evaluation Methods

- PA 305 Public and Non-Profit Budgeting
- PA 306 Policy Systems
- PA 326 Community and Economic Development
- PA 375 M.P.A. Capstone
- PA 380 Internship

Students, with guidance from their advisor, select additional courses within the M.P.A. program or other academic units at the University of Vermont to round out their academic experience. A full-time student will finish the M.P.A. Program course work in 2 academic years, and a part-time student, between 2 - 5 calendar years. While the M.P.A. Program at UVM does not offer explicit specializations, a student may pursue courses with a common thread or focus and can tailor their course selections to work toward that focus. Students may also choose to pursue a Certificate of Graduate Studies as an additional credential to fulfill elective requirements.

## PUBLIC HEALTH

<https://www.uvm.edu/publichealth/>

### OVERVIEW

The University of Vermont Program in Public Health is an innovative, online, interdisciplinary, accredited Public Health Program offering the Master of Public Health (M.P.H.) degree and Certificates of Graduate Study. The program is designed as a collaboration of disciplines, through its faculty and community of students, that is both academic and applicable to health needs of actual populations, in both health care and community settings. Graduates will experience a comprehensive foundation of population health sciences to prepare them as they enter health care fields, public health practice, or further advanced study in public health and related sciences.

The UVM public health program offers a generalist M.P.H. degree. Graduates will complete sufficient course work to attain depth and breadth in the 6 core areas of public health knowledge (Public Health and Health Policy, Biostatistics, Epidemiology, Environmental Health Sciences, Health Policy and Management, and Social and Behavioral Sciences), as well as interdisciplinary/cross-cutting areas. All graduate professional public health degree students will develop skills in basic public health concepts and demonstrate the skills and integration of knowledge, and application of these concepts through a culminating project experience.

The University of Vermont offers 4 online Certificates of Graduate Study, Public Health, Global and Environmental Health, Epidemiology and Health Care Management and Policy. Each is a concise, 6-course curriculum that introduces students to the program area. Completing any Certificate of Graduate Study will provide students with competency in core areas of public health as well as 18 applicable credits for which the grade received was a B or higher should they decide to pursue the M.P.H. degree at UVM.

After successful completion students will be prepared to:

1. Practice in a changing health care environment that requires accountability for the health of entire populations and skills to prevent illness and promote health.
2. Engage in public health practice, with knowledge and skills needed for effective participation in work of government public health agencies or non-profit health-related organizations.
3. Apply knowledge and skills from a strong foundation of population health sciences in preparation for further graduate study at the doctoral level in public health and related fields.

### DEGREES

- Public Health AMP (p. 230)
- Public Health CGS (p. 231)
- Public Health M.P.H. (p. 232).
- Global and Environmental Health CGS (p. 233)
- Epidemiology CGS (p. 234)
- Health Care Management and Policy CGS (p. 234)

### FACULTY

**Carney, Jan Kirk;** Professor, Department of Medicine-Pulmonary; MD, University of Cincinnati; MPH, Harvard University

**Delaney, Thomas;** Assistant Professor, Department of Pediatrics; PHD, University of Denver

**Gleason, Kelsey;** Assistant Professor, Department of Medicine-Pulmonary; SC.D, Harvard University

**Harder, Valerie Susan;** Associate Professor, Department of Pediatrics; PHD, Johns Hopkins University

**Hart, Victoria;** Assistant Professor, Department of Medicine; PHD, University of Massachusetts

**Maltby, Hendrika J.;** Professor, Department of Nursing; PHD, Curtin University of Technology

### PUBLIC HEALTH AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

### OVERVIEW

Qualified undergraduate students who plan to earn a Master of Public Health (M.P.H.) degree may enroll in the Accelerated Master's Entry Program (AMP), which enables students to begin working on the M.P.H. while still an undergraduate. This online degree is designed for highly motivated UVM undergraduate students wishing to complete both their undergraduate degree and M.P.H. degree in 5 years.

Students apply to the program in the 2<sup>nd</sup> semester of their junior year and no later than June 1 before the start of their senior year. Following acceptance by the Graduate College, students enrolled in the program apply 9 public health graduate credits during their senior year toward both the undergraduate degree and the M.P.H. These credits must be earned after the student has been accepted into the Graduate College and are subject to approval of the student's academic advisor.

Following the completion of their bachelor's degree, students typically take the additional credits required to complete the M.P.H. during a 5<sup>th</sup> year of study, including the Summer session.

**SPECIFIC REQUIREMENTS**

**REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE ACCELERATED Master's program**

Student applications must take place during the Spring of their junior year, no later than June 1 before the start of their senior year. Requirements for admission to the program include:

- A minimum GPA of 3.00
- One semester of college biology or other science course
- One semester of algebra, statistics, or a more advanced math course
- AMP Permission form, signed by the student's undergraduate advisor and the M.P.H. Program Director
- Completion of the Graduate College Application form that must include at least one letter of recommendation from a UVM faculty member

**MINIMUM DEGREE REQUIREMENTS**

The M.P.H. degree requires 42 total credits and includes 18 credits of core courses (6 courses), 9 required advanced course credits (3 courses), 9 elective credits (3 courses), and a required culminating project experience of 6 credits. Students will need to maintain a 3.00 grade point average in order to complete the program.

18 Credits in National Competency Core Courses (6 Courses):		
PH 301	Public Health & Health Policy	3
PH 302	Epidemiology I	3
PH 303	Biostatistics I:App Rsch in PH	3
PH 304	Environmental Public Health	3
PH 317	Mgmt in Hlth Services&Med Care	3
or PH 305	Pol,Org & Finance in Hlth Care	
PH 306	Social&Behavioral Public Hlth	3
9 credits in required advanced core courses (3 courses):		
PH 307	Epidemiology 2	3
PH 308	Environmental Public Health 2	3
PH 310	Public Health Law and Ethics	3
6 credits of required culminating project experience:		
PH 392	Culminating Project Experience	1-6
9 elective course credits (3 courses) from the approved list, including but not limited to:		
PH 309	Public Health Biostatistics II	
PH 311	Global Public Health	
PH 312	Food Systems & Public Hlth	

PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
PH 318	Improving Health in Population	
PH 321	Controversies in HlthEconomics	
PH 322	One Health: Zoonoses	
PH 324	Public Health Informatics	
PH 325	Investigating DiseaseOutbreaks	
PH 326	Legal Issues in Health Care	
PH 328	Health in Humanitarian Crises	
PH 330	Exploring Healthcare Systems	
PH 331	Climate Change Emergencies	
PH 332	Maternal and Child Health	
PH 333	Global Mental Health	
PH 395	Special Topics	

**COMPREHENSIVE EXAMINATION**

The program requires a comprehensive assessment of students' understanding of public health and ability to synthesize and apply knowledge learned through the program of study. This requirement is fulfilled by the M.P.H. Culminating Project Experience. This experience includes the Applied Practice Experience (APE) and the Integrative Learning Experience (ILE), each with specific objectives and competencies measured by faculty assessment.

The APE is assessed by the faculty and the site preceptor at the agency or organization where the student experience takes place. The ILE includes self, peer, and mentor evaluations. Course faculty determine whether a students' overall culminating project experience meets objectives and requirements, and achieves a passing grade.

**REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF Public Health**

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

**PUBLIC HEALTH CGS**

All students must meet the Requirements for the Certificates of Graduate Study (CGS) (p. 259)

**OVERVIEW**

Public health is a dynamic and challenging, multidisciplinary field blending public policy, research, and population health sciences. The focus of public health is on promoting healthy practices and preventing disease among entire populations, rather than on treating individual illness.

The University of Vermont's online Certificate of Graduate Study in Public Health enables students to explore current public health



and health policy issues while gaining a strong foundation in population health sciences including epidemiology, biostatistics, and environmental health. The program is designed for medical and graduate students, health practitioners, public health professionals, researchers and others who wish to increase their knowledge in the vital field of public health. It also prepares graduates for advanced study at the master's and doctoral levels.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

Students are required to have a bachelor's degree from an accredited college or university, and have completed 1 college-level course in mathematics and 1 college-level course in science.

#### Minimum Degree Requirements

The Certificate of Graduate Study in Public Health requires 18 credits including 5 courses (15 credits) from 5 core content areas and 1 elective course (3 credits).

5 required core competency courses (15 credits):		
PH 301	Public Health & Health Policy	3
PH 302	Epidemiology I	3
PH 303	Biostatistics I:App Rsch in PH	3
PH 304	Environmental Public Health	3
PH 317	Mgmt in Hlth Services&Med Care	3
or PH 305	Pol,Org & Finance in Hlth Care	
Choose 1 elective (3 credits) from a list of approved elective courses, including but not limited to:		3
PH 306	Social&Behavioral Public Hlth	
PH 307	Epidemiology 2	
PH 308	Environmental Public Health 2	
PH 309	Public Health Biostatistics II	
PH 310	Public Health Law and Ethics	
PH 311	Global Public Health	
PH 312	Food Systems & Public Hlth	
PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
PH 318	Improving Health in Population	
PH 321	Controversies in HlthEconomics	
PH 322	One Health: Zoonoses	
PH 324	Public Health Informatics	
PH 325	Investigating DiseaseOutbreaks	
PH 326	Legal Issues in Health Care	

PH 328	Health in Humanitarian Crises	
PH 330	Exploring Healthcare Systems	
PH 331	Climate Change Emergencies	
PH 332	Maternal and Child Health	
PH 333	Global Mental Health	
PH 395	Special Topics	

More information on the Certificate of Graduate Study in Public Health is available on the College of Medicine website.

### PUBLIC HEALTH M.P.H.

All students must meet the Requirements for the Master's Degree (p. 260)

### OVERVIEW

The UVM online public health program offers a generalist M.P.H. degree. Graduates will complete sufficient course work to attain depth and breadth in the 6 core areas of public health knowledge (Public Health and Health Policy, Biostatistics, Epidemiology, Environmental Health Sciences, Health Policy and Management, and Social and Behavioral Sciences), as well as interdisciplinary/cross-cutting areas. All graduate professional public health degree students will develop skills in basic public health concepts and demonstrate the skills and integration of knowledge, and application of these concepts through a practice and a culminating project experience.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Public Health

Students are required to have a bachelor's degree from an accredited college or university, 1 semester of college biology or other science course, and 1 course in college algebra, statistics, or a more advanced math course, and submit a resume or CV and statement of experiences and goals. TOEFL will be required for international applicants.

#### UVM PUBLIC HEALTH CERTIFICATE GRADUATE:

If you completed the Certificate of Graduate Study in Public Health, the Certificate of Graduate Study in Global and Environmental Health, the Certificate of Graduate Study in Epidemiology, or the Certificate of Graduate Study in Healthcare Management & Policy at UVM, then all 18 credits for which the grade received was a B or higher can be applied toward the M.P.H. Students who choose this option may not transfer additional courses from UVM or other universities.

#### GRADUATE LEVEL COURSES IN PUBLIC HEALTH:

If you completed graduate level courses in Public Health at UVM or at another University, then the traditional transfer of credit policy applies for matriculation into the M.P.H. You can transfer in 9 relevant credits from UVM or another university and an additional 6 relevant credits taken at UVM, provided the grade received for any transferred course is a B or higher. The program director will

determine whether each course is relevant. The grades do not transfer.

### Minimum Degree Requirements

The M.P.H. degree requires 42 total credits and includes 18 credits of core courses (6 courses), 9 required advanced course credits (3 courses), 9 elective credits (3 courses), and a required culminating project experience of 6 credits. Students will need to maintain a 3.00 grade point average in order to complete the program.

18 Credits in National Competency Core Courses (6 Courses):		
PH 301	Public Health & Health Policy	3
PH 302	Epidemiology I	3
PH 303	Biostatistics I:App Rsch in PH	3
PH 304	Environmental Public Health	3
PH 317	Mgmt in Hlth Services&Med Care	3
or PH 305	Pol,Org & Finance in Hlth Care	
PH 306	Social&Behavioral Public Hlth	3
9 credits in required advanced core courses (3 courses):		
PH 307	Epidemiology 2	3
PH 308	Environmental Public Health 2	3
PH 310	Public Health Law and Ethics	3
6 credits of required culminating project experience:		
PH 392	Culminating Project Experience	1-6
9 elective course credits (3 courses) from the approved list, including but not limited to:		
PH 309	Public Health Biostatistics II	
PH 311	Global Public Health	
PH 312	Food Systems & Public Hlth	
PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
PH 318	Improving Health in Population	
PH 321	Controversies in HlthEconomics	
PH 322	One Health: Zoonoses	
PH 324	Public Health Informatics	
PH 325	Investigating DiseaseOutbreaks	
PH 326	Legal Issues in Health Care	
PH 328	Health in Humanitarian Crises	
PH 330	Exploring Healthcare Systems	
PH 331	Climate Change Emergencies	
PH 332	Maternal and Child Health	

PH 333	Global Mental Health	
PH 395	Special Topics	

### Comprehensive Examination

The program requires a comprehensive assessment of students' understanding of public health and ability to synthesize and apply knowledge learned through the program of study. This requirement is fulfilled by the M.P.H. Culminating Project Experience. This experience includes the Applied Practice Experience (APE) and the Integrative Learning Experience (ILE), each with specific objectives and competencies measured by faculty assessment.

The APE is assessed by the faculty and the site preceptor at the agency or organization where the student experience takes place. The ILE includes self, peer, and mentor evaluations. Course faculty determine whether a students' overall culminating project experience meets objectives and requirements, and achieves a passing grade.

### Requirement for Advancement to Candidacy for the Degree of Master of Public Health

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## GLOBAL AND ENVIRONMENTAL HEALTH CGS

All students must meet the Requirements for the Certificates of Graduate Study (CGS) (p. 259)

### OVERVIEW

The field of environmental health continues to become more global in response to globalization and changing public health issues. Infectious diseases are not bound by borders and are often related to environmental change. Examples like COVID-19 and Zika emphasize the local and global nature of disease, and climate change with its impact on weather, disease, food, water, vectors and emergency response.

The University of Vermont's online Certificate of Graduate Study in Global and Environmental Health is an 18-credit program that gives students the opportunity to explore the global nature of environmental health issues including the built environment, infectious disease, climate change, and one health interrelationships between human and animal health. The program is designed for medical and graduate students; health practitioners; public health professionals and researchers; environmental specialists, engineers and scientists; and others who wish to increase their knowledge in global and environmental public health. It also prepares graduates for advanced study at the masters and doctoral level.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Certificate of Graduate Study**

Students are required to have a bachelor’s degree from an accredited college or university, and have completed 1 college-level course in mathematics and 1 college-level course in science.

**Minimum Degree Requirements**

The Certificate of Graduate Study in Global and Environmental Health requires 18 credits including 3 courses (9 credits) from core content areas and 3 elective courses (9 credits).

3 required core competency courses:		
PH 304	Environmental Public Health	3
PH 308	Environmental Public Health 2	3
PH 302	Epidemiology I	3
Choose 3 elective courses from the list of approved courses, including but not limited to:		9
PH 301	Public Health & Health Policy	
PH 312	Food Systems & Public Hlth	
PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
PH 322	One Health: Zoonoses	
PH 325	Investigating DiseaseOutbreaks	
PH 328	Health in Humanitarian Crises	
PH 331	Climate Change Emergencies	
PH 333	Global Mental Health	

**EPIDEMIOLOGY CGS**

All students must meet the Requirements for the Certificates of Graduate Study (CGS) (p. 259)

**OVERVIEW**

Epidemiology is often called the “language” of public health, and is the foundation science of public health programs. Epidemiology has many uses and applications. The Centers for Disease Control and Prevention describes epidemiology as “the study of the origin and causes of diseases in a community. It is the scientific method of investigation problem-solving used by disease detectives: epidemiologists, laboratory scientists, statisticians, physicians and other health care providers, and public health professionals—to get to the root of health problems and outbreaks in a community.” (CDC. The Importance of Epidemiology 2011).

The University of Vermont’s Certificate of Graduate Study in Epidemiology is an online and concise, 6-course (18 graduate credits) immersion into the field of epidemiology and related quantitative population health science. This certificate introduces students to the

foundations and language of public health and health policy through the study of epidemiology. Completing this course of study will provide students with competency in epidemiology and quantitative public health science.

The program is designed for medical and graduate students, health practitioners, public health professionals and researchers, and others who wish to increase their knowledge in the vital field of epidemiology. It also prepares graduates for advanced study at the master’s and doctoral level.

**SPECIFIC REQUIREMENTS**

**REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE CERTIFICATE OF GRADUATE STUDY**

Students are required to have a bachelor’s degree from an accredited college or university, and have completed 1 college-level course in mathematics and 1 college-level course in science.

**MINIMUM DEGREE REQUIREMENTS**

The Certificate of Graduate Study in Epidemiology requires 18 credits including 4 courses (12 credits) from 4 core content areas and 2 elective courses (6 credits) from an approved list of electives.

4 required core competency courses:		
PH 302	Epidemiology I	3
PH 307	Epidemiology 2	3
PH 303	Biostatistics I:App Rsch in PH	3
PH 309	Public Health Biostatistics II	3
Choose 2 elective courses from the list of approved electives, including but not limited to:		6
PH 301	Public Health & Health Policy	
PH 310	Public Health Law and Ethics	
PH 315	Public Health Surveillance	
PH 318	Improving Health in Population	
PH 322	One Health: Zoonoses	
PH 324	Public Health Informatics	
PH 325	Investigating DiseaseOutbreaks	

**HEALTH CARE MANAGEMENT AND POLICY CGS**

All students must meet the Requirements for the Certificates of Graduate Study (CGS) (p. 259)

**OVERVIEW**

The Certificate of Graduate Study in Health Care Management and Policy is an online, 6-course (18 credits) program introducing students to health care management, finance, and policy. This program provides an overview of US health care policies, organizational structures, and financing systems. These concepts are

examined from economic, social, legal, ethical, political, and global perspectives. Contemporary health care organizations and policies are analyzed with respect to concepts and principles of change theory, ethical decision making, and policy processes and analysis. Financing of health care systems, with emphasis on the roles of health care providers and impact on consumers, will also be examined. The distinct strategic and leadership challenges faced by managers in healthcare and public health organizations is examined through the lenses of consumers, employers, practitioners, insurers, regulators, and public policy-makers.

The program is designed for working professionals in health care and public health; nursing students, medical students and other graduate students; recent baccalaureate graduates with an interest in a non-clinical health degree; and employees and managers of healthcare-related programs and organizations.

**SPECIFIC REQUIREMENTS**

**REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE CERTIFICATE OF GRADUATE STUDY**

Students are required to have a bachelor’s degree from an accredited college or university, and have completed 1 college-level course in mathematics and 1 college-level course in science.

**MINIMUM DEGREE REQUIREMENTS**

The Certificate of Graduate Study in Health Care Management and Policy requires 18 credits including 3 courses (9 credits) from 3 core content areas and 3 elective courses (9 credits) from an approved list of electives.

3 required core competency courses:		
PH 317	Mgmt in Hlth Services&Med Care	3
or PH 305	Pol,Org & Finance in Hlth Care	
PH 324	Public Health Informatics	3
PH 326	Legal Issues in Health Care	3
Choose 3 elective courses from the list of approved electives, including but not limited to:		9
PH 301	Public Health & Health Policy	
PH 302	Epidemiology I	
PH 306	Social&Behavioral Public Hlth	
PH 310	Public Health Law and Ethics	
PH 311	Global Public Health	
PH 318	Improving Health in Population	
PH 321	Controversies in HlthEconomics	

**RESILIENCY-BASED APPROACHES WITH FAMILIES, SCHOOLS, AND COMMUNITIES**

<https://www.uvm.edu/cess/doe>

**OVERVIEW**

The Certificate of Graduate Study in Resiliency-Based Approaches (CGS RBA) prepares educators and health/human service professionals to address the complex challenges associated with trauma and adversity using restorative, strength-based, and collaborative approaches that build resilience, so that children, youth, and families can thrive and learn within and beyond school borders.

Degrees

Resiliency-Based Approaches with Families, Schools, and Communities CGS (p. 235)

**FACULTY**

**DeMink-Carthew, Jessica;** Assistant Professor, Department of Education, PHD; University of Maryland

**Garnett, Bernice Raveche;** Associate Professor, Department of Education; SCD, Harvard University

**Haines, Shana Jackson;** Associate Professor, Department of Education; PHD, University of Kansas

**Jiron, Haley Woodside;** Associate Professor, Department of Education; PHD, SUNY Albany

**Strolin-Goltzman, Jessica S.;** Professor, Department of Education; PHD, University of Albany

**RESILIENCY-BASED APPROACHES WITH FAMILIES, SCHOOLS, AND COMMUNITIES CGS**

All students must meet the Requirements for the Certificates of Graduate Study (p. 259)

**OVERVIEW**

The program is built to address the growing need to improve workforce capacity for professionals who can successfully implement resiliency building strategies addressing the heightened incidence of trauma and adverse childhood experiences.

Students in the program gain a deep socio-ecological understanding of the structural solutions inherent in equity, culturally sustaining partnerships, and resilience; the impact of trauma and adversity; and a toolbox of skills for fostering resilience through building and restoring relationships with families, schools, and communities.

Along with core coursework, students can specialize in either of two pathways:

- Trauma-responsive and Restorative Practices (TRP)
- Family-school-community partnerships and interprofessional collaboration (FSC)

All coursework is online, though some electives may be met with on campus courses.

The CGS can stand alone as a defined certificate of graduate study or can stack into a master’s degree program in Counseling, Curriculum & Instruction, Educational Leadership, Social Work, and Special Education, or a doctoral degree in Educational Leadership and Policy Studies. To be a stackable credential, students must apply and be accepted into the CGS before the last 9 credits are taken. Students then apply to an appropriate master’s or doctoral program to use the CGS credits towards that degree.

**SPECIFIC REQUIREMENTS**

**REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE CERTIFICATE OF GRADUATE STUDY**

- Completed bachelor’s degree
- Official transcripts from each college or university where credit has been earned
- Three letters of recommendation
- A personal statement of purpose
- Test scores for English proficiency for applicants whose native language is not English
- Application fee of \$20

**HOW TO APPLY**

All applications and materials must be submitted through the UVM Graduate Admissions online application ([https://www.uvm.edu/graduate/application\\_instructions/](https://www.uvm.edu/graduate/application_instructions/)). Please carefully review the instructions before completing the application.

**FOR EXTERNAL APPLICANTS TO THE CERTIFICATE PROGRAM:** Applicants seeking to enroll in only a Certificate of Graduate Study program must complete the online UVM Graduate Application and all associated requirements. This application will need to include official transcripts from an accredited university as well as 3 letters of recommendation. A bachelor's degree is required for admittance.

**FOR CURRENT UVM GRADUATE STUDENTS:** Students currently enrolled in a UVM master's or doctoral program must complete the online UVM Graduate Application. Letters of recommendation and transcripts are not required, and an application fee waiver can be provided.

**MINIMUM DEGREE REQUIREMENTS**

To earn the certificate of graduate study, students must complete 15 credits including 6 credits of foundational courses, 6 credits of applied courses in a specialization pathway, and a 3 credit of capstone course. Students choose one of the following specialization pathways: Trauma-responsive and Restorative Practices (TRP) or Family-school-community and Interprofessional Collaboration (FSC). The capstone will apply skills and learning from earlier coursework.

Foundational Courses (2 required)		
EDSP 330	The Trauma Lens	3

EDSP 332	Resilnce Equity&Intrprof Prac	3
EDCI 331	Society, Stress and the Brain	3
Trauma-responsive and Restorative Practices Pathway:		
EDSS 200	Contemporary Issues (Social Justice Education)	0-6
EDSP 333	Trauma Informed System Change	3
EDSP 334	Restorative&Trma Pract w/Child	3
Family-School-Community & Interprofessional Collaborations Pathway:		
EDSP 387	Collaborative Consultation	3
EDSP 299	Global Resilience Fam-Schl-Com	3
ECLD 205	Fmly Schl & Cmty Collaboration	3
EDSP 332	Resilnce Equity&Intrprof Prac (If not taken as foundations course)	3
Applied Coursework/Capstone Course		
EDSP 333	Trauma Informed System Change	3
EDLP 459	Mixed Method Research	3
SWSS 316	Integrative Appr Transform SW	3
CNSL 389	Counseling Internship	1-3
Other courses may be approved with permission of CGS core faculty		
Students must take 3 of the following courses: EDSP 330; EDSP 332; EDSP 333; EDSP 334		

**SOCIAL WORK**

<https://www.uvm.edu/cess/socialwork> (<https://www.uvm.edu/cess/socialwork/>)

**OVERVIEW**

The Master of Social Work program at the University of Vermont prepares students for advanced social work practice with individuals, families, groups, organizations, and communities in the post-modern environment. The curriculum emphasizes strengths-oriented, relational practice guided by principles of social justice and human rights and a conceptual framework of critical social construction. The Master of Social Work program is fully accredited by the Council on Social Work Education (CSWE).

The professional foundation curriculum is designed to assist students to explore and develop generalist knowledge, values, and skills for professional practice. Students take 30 credits of foundation course work, including 1 elective. The curriculum comprises course work in 5 areas: Human Behavior in the Social Environment (HBSE), Social Welfare Policy, Social Work Practice, Field Practica, and Research.

The concentration year curriculum is designed to extend and integrate student knowledge, values, and skills for advanced practice in a single concentration, Transformative Social Work. This is accomplished through focused study in a student-generated,

individualized area of interest. All core curriculum courses in the concentration year are considered advanced practice courses in Transformative Social Work, in that all emphasize the application of complex social ideas and the production of transformative roles and methods.

Students select 4 focus courses to direct their studies toward a particular population or field of social work practice. In addition, the concentration curriculum consists of two advanced practice courses, a field practicum, an advanced research course, and a "capstone course" aimed at integrating the student's application of transformative social work in the area of interest.

## DEGREES

- Social Work M.S.W. (p. 237)

## FACULTY

**Comerford, Susan Ann;** Associate Professor, Department of Social Work; PHD, Case Western Reserve University

**Fook, Jan;** Professor, Department of Social Work; PHD, University of Southampton, UK

**Solomon, Brenda M.;** Associate Professor, Department of Social Work; PHD, Syracuse University

**Velez, Christine;** Assistant Professor, Department of Social Work; PHD, Portland State University

## SOCIAL WORK M.S.W.

All students must meet the Requirements for the Master's Degree (p. 260)

## OVERVIEW

The Department of Social Work offers a full-time and part-time course of study toward the M.S.W. degree. An Advanced Standing option is also available for eligible students who have completed an undergraduate degree in social work from a bachelor's program accredited by CSWE within 7 years of admission.

To request a program bulletin or additional information, please contact the Department of Social Work at (802) 656-8800, MSWAdmit@uvm.edu, or visit the program's Master's Degree in Social Work website.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Social Work

- A baccalaureate degree completed in good standing from an accredited college or university.
- No minimum grade point average (GPA) is required; however, the applicant must show evidence of academic ability to undertake graduate study in social work. The applicant's GPA is one indicator of performance and will be considered in the review process.
- Evidence of a strong liberal arts background, with a minimum of eighteen credits in general liberal arts course work that supports graduate education in social work.

- Prior work or volunteer experience in human services is preferred.
- International students must submit TOEFL or IELTS scores (from tests taken within two years of the date of application).

## REQUIREMENTS FOR ADVANCED STANDING

- A BSW degree or a B.S. in social work, earned from a social work program accredited by the Council on Social Work Education (CSWE) within 7 years of admission to the M.S.W. program.
- Prior academic performance that supports graduate study in social work.
- Satisfactory undergraduate social work field practicum evaluations.

## HOW TO APPLY

All applications are submitted online through the Graduate College Admissions site.

The following materials are required for application:

- Completed application form (online).
- Written Statement of Purpose that describes the applicant's preparation and goals for pursuing graduate study in social work (submit online).
- Official transcripts from each college or university attended.
- Resume of work and professional experience.
- 3 letters of recommendation and completed recommender forms (recommendations from at least one academic source and one from human service related employment are strongly encouraged).
- Non-refundable application fee of \$65.00 for online application.

## Minimum Degree Requirements

The Master of Social Work degree requires 60 credits of graduate study, unless students are admitted with Advanced Standing status. Advanced Standing status is granted solely to students who have earned a bachelor's degree in a program accredited, or acknowledged as being equivalent to a Bachelor's in Social Work, by the Council on Social Work Education, and allows for a shorter course of study at 39 credits. Both regular track and advanced standing students must complete all required and elective credits in social work courses.

The policies and standards for maintaining program accreditation do not permit the granting of academic credit toward graduation for life experience.

## REGULAR TRACK M.S.W.

Foundation Courses		
SWSS 212	Social Work Practice I	3
SWSS 213	Social Work Practice II	3
SWSS 216	Th Found of Hum Beh&Soc Envr I	3
SWSS 217	Th Found Hum Beh&Soc Envr II	3
SWSS 220	Soc Welfare Pol & Services I	3
SWSS 221	Soc Welfare Pol & Services II	3

SWSS 227	Found of Social Work Research	3
SWSS 290	Foundation Yr Field Practicum (taken twice credits will double)	3-4
An approved elective (Elective and Focus courses require advanced approval of faculty advisor)		3
Concentration Year Courses		
SWSS 314	Transformative Social Work I	3
SWSS 315	Transformative Social Work II	3
SWSS 316	Integrative Appr Transform SW	3
SWSS 327	Adv Social Work Research	3
SWSS 390	Spec Practice Field Practicum (taken twice credits will double)	3-4
Four approved focus courses (Elective and Focus courses require advanced approval of faculty advisor)		12

### ADVANCED STANDING M.S.W.

Summer Session Courses		
SWSS 380	Prof Issues in Social Work	4
Two approved focus courses (Elective and Focus courses require advanced approval of faculty advisor)		6
Concentration Year Courses		
SWSS 314	Transformative Social Work I	3
SWSS 315	Transformative Social Work II	3
SWSS 316	Integrative Appr Transform SW	3
SWSS 327	Adv Social Work Research	3
SWSS 390	Spec Practice Field Practicum (two 4 credit courses - credit will be double)	4
Three approved focus courses (Elective and Focus courses require advanced approval of faculty advisor)		9

### Comprehensive Examination

The Graduate College requirement for a comprehensive exam is met by the Department of Social Work's Capstone course, SWSS 316. M.S.W. Candidates complete an integrating capstone paper.

### Requirements for Advancement to Candidacy for the Degree of Master of Social Work

To achieve Advanced Candidacy and be eligible to take SWSS 316 (the Capstone course), a student must have successfully completed 45 credit hours, including all core courses, with a minimum GPA of 3.00.

## SPECIAL EDUCATION

<https://www.uvm.edu/cess/doe> (<https://www.uvm.edu/cess/doe/>)

## OVERVIEW

This nationally accredited graduate program is designed to prepare students to collaborate with families, educators, and other professionals and service agencies in the development, implementation, and evaluation of instructional programs and supports for learners with disabilities in inclusive school and community settings. There are two primary areas of emphasis in this program, with each pathway having its own requirements:

- **Special Education (K-Age 21):** Students are prepared to collaborate with families, educators and other professionals in the design, implementation and evaluation of instruction for learners with disabilities in inclusive elementary, middle or high school classrooms.
- **Early Childhood Special Education:** Students are prepared to provide individualized, family-centered special education services to young children with disabilities and their families through both direct and collaborative delivery systems coordinated with social service agencies in integrated home, preschool and community settings in rural areas.

Within these two tracks there are different special education licensure pathways as well as a non-licensure option.

## DEGREES

- Special Education AMP (p. 238)
- Special Education M.Ed. (p. 239)

## FACULTY

**Garwood, Justin D.;** Assistant Professor, Department of Education; PHD, University of North Carolina at Chapel Hill

**Giangreco, Michael Francis;** Professor, Department of Education; PHD, Syracuse University

**Haines, Shana Jackson;** Associate Professor, Department of Education; PHD, University of Kansas

**Hurley, Jennifer Jo;** Associate Professor, Department of Education; PHD, Vanderbilt University

**Kervick, Colby T.;** Assistant Professor, Department of Education; EDD, University of Vermont

**Meyer, Lori;** Assistant Professor, Department of Education; PHD, University of Illinois

**Shepherd, Katharine;** Professor, Department of Education; EDD, University of Vermont

**Vannest, Kimberly;** Professor, Department of Education; PHD, Louisiana State University, Baton Rouge

## SPECIAL EDUCATION AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The Accelerated Entry into Master's Degree Entry Program (AMP) in Special Education is designed for UVM undergraduates to complete up to 9 credits towards their graduate degree while earning their undergraduate degree. Students in this program receive the same M.Ed. as the traditional state-approved Special Education

M.Ed., but they complete the degree one year after earning their undergraduate degree. There are two pathways in the AMP in Special Education: Early Childhood Special Education and K- age 21 Special Education.

1. K-age 21 Special Education: Students are prepared to collaborate with families, educators and other professionals in the design, implementation and evaluation of instruction for learners with disabilities in inclusive regular elementary, middle or high school classrooms. Students typically apply to this program during the fall of their junior year. Upon acceptance into the program, students meet with advisors to determine their course sequence. During the last 3 semesters of their undergraduate degree, students enroll in 2 or 3 required classes (6 or 9 credits) that count towards their undergraduate and graduate degrees. Additional information can be requested from the program coordinator. A non-licensure option is also available and the program plan can be tailored to students' interests.
2. Early Childhood Special Education: Students are prepared to provide individualized, family-centered special education services to young children with disabilities and their families through both direct and collaborative delivery systems coordinated with social service agencies in integrated home, preschool and community settings. Students apply to this program in the fall semester of their junior year or senior year and take ECSP 310, EDSP 202, and ECSP 355 during the spring of their junior or senior year. All 9 credits count towards the B.S. and Master's degrees. The remaining 24 graduate credits are completed during one year of graduate school.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the AMP in Special education**

Candidates for the Accelerated Master Entry Program in Special Education must be UVM undergraduates. Students apply during their Junior (K- age 21 Special Education option) or Senior (Early Childhood Special Education option) year. Applicants are evaluated based on their GPA (must be least a 3.00), 3 letters of recommendation, essay, official copy of undergraduate transcript, interview, and UVM Accelerated Entry into Master's Degree permission form: available from the Graduate College or CESS Student Services.

**Minimum Degree Requirements**

Specific courses are required for each area (K- age 21 Special Education, Early Childhood Special Education).

**SPECIFIC REQUIREMENTS FOR THE SPECIAL EDUCATION K-AGE 21 TRACK INCLUDE:**

EDSP 201	D2:Foundations of Special Ed	3
EDSP 202	Severe Disabil Char&Intervent	3
EDSP 224	Meeting Inst Needs/All Stdnts	3
EDSP 280	Assessment in Special Ed	3

EDSP 310	Curr & Tech Spec Ed: Literacy	3
EDSP 311	Curr & Tech Spec Ed: Math	3
EDSP 318	Behavior Analysis in Spec Ed	3
EDSP 322	Intern: Triadic Model Consult	6
EDSP 323	Intern: Systems Development	3-6
EDSP 387	Collaborative Consultation	3

**SPECIFIC REQUIREMENTS FOR THE EARLY CHILDHOOD SPECIAL EDUCATION TRACK INCLUDE:**

ECSP 202	D2:EI for Infants and Toddlers	3
EDSP 202	Severe Disabil Char&Intervent	3
ECSP 310	Curriculum in ECSP	3-4
ECSP 311	Assessment in EI/ECSE	3
EDSP 318	Behavior Analysis in Spec Ed	3
ECSP 355	Implementation Science in ECSP	3
ECSP 320	Seminar in EI/ECSE	3
ECSP 386	Internship: EI/ECSE	9
EDSP 387	Collaborative Consultation	3

**Comprehensive Examination**

The comprehensive examination for both pathways is an oral examination taken in the last semester of study. Students meet with faculty to present their knowledge and application of key learning related to program requirements.

**Requirements for Advancement to Candidacy for the Degree of master of education**

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses. Program requires 30-36 credits depending on licensure requirements.

**SPECIAL EDUCATION M.ED.**

All students must meet the Requirements for the Master of Education Degree (p. 261)

**OVERVIEW**

There are 2 primary areas of emphasis within the M.ED.: Special Education K-age 21 and Early Childhood Special Education. Within those 2 tracks there are different special education licensure pathways as well as a non-licensure option.

1. K-age 21 Special Education: Students are prepared to collaborate with families, educators and other professionals in the design, implementation and evaluation of instruction for learners with disabilities in inclusive general elementary, middle or high school classrooms. Within this track are varied licensure options.



2. Early Childhood Special Education: Students are prepared to provide individualized, family-centered special education services to young children with disabilities and their families through both direct and collaborative delivery systems coordinated with social service agencies in integrated home, preschool and community settings.

Additional information on the above tracks and/or about the different licensure options should be requested from the program coordinator.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Education

Candidates for the degree of Master of Education in Special Education must have a bachelor's degree and a GPA of at least a 3.00 in the bachelor's degree. Preference is given to candidates with 2 years of teaching and/or related experience working with people with disabilities.

Candidates for the degree of Master of Education in Special Education, Early Childhood Special Education track, must have a bachelor's degree and a GPA of at least a 3.00 in the bachelor's degree. Preference is given to candidates with 2 years of teaching and/or related experience working with individuals with disabilities.

### Minimum Degree Requirements

Specific courses are required for each area (K-age 21 and Early Childhood Special Education). Students seeking licensure must meet additional requirements, and specific programs plans will be developed in adherence to a student's desired licensure.

### SPECIFIC REQUIREMENTS FOR THE K-AGE 21 SPECIAL EDUCATION TRACK INCLUDE:

EDSP 201	D2:Foundations of Special Ed	3
EDSP 202	Severe Disabil Char&Intervent	3
EDSP 224	Meeting Inst Needs/All Stdnts	3
EDSP 280	Assessment in Special Ed	3
EDSP 310	Curr & Tech Spec Ed: Literacy (Literacy)	3
EDSP 311	Curr & Tech Spec Ed: Math (Numeracy)	3
EDSP 318	Behavior Analysis in Spec Ed	3
EDSP 322	Intern: Triadic Model Consult	6
EDSP 323	Intern: Systems Development	3-6
EDSP 387	Collaborative Consultation	3

### SPECIFIC REQUIREMENTS FOR THE EARLY CHILDHOOD SPECIAL EDUCATION TRACK INCLUDE:

ECSP 202	D2:EI for Infants and Toddlers	3
EDSP 202	Severe Disabil Char&Intervent	3

ECSP 310	Curriculum in ECSP	3
ECSP 311	Assessment in EI/ECSE	3
EDSP 318	Behavior Analysis in Spec Ed	3
ECSP 320	Seminar in EI/ECSE	3
ECSP 355	Implementation Science in ECSP	3
ECSP 386	Internship: EI/ECSE	9
EDSP 387	Collaborative Consultation	3

## COMPREHENSIVE EXAMINATION

The comprehensive examination for both pathways is an oral examination taken in the last semester of study. Students meet with faculty to present their knowledge and application of key learning related to program requirements.

### Requirements for Advancement to Candidacy for the Degree of Master of Education

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses. Program requires 30-36 credits depending on licensure requirements.

## STATISTICS

<https://www.uvm.edu/cems/mathstat> (<https://www.uvm.edu/cems/mathstat/>)

## OVERVIEW

The Statistics Program offers biostatistics, statistics, data science and probability courses for the entire university community along with traditional degree programs and individually designed degree programs emphasizing statistics applied to other fields. The degree programs are designed primarily for students who plan careers in data science, business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical methods and data science. The program faculty is deeply involved in consulting and collaborative research in a wide variety of fields, including industry, agriculture, and in the basic and clinical medical sciences. These research activities along with the research of other quantitative UVM faculty offer students unique opportunities to apply their classroom training to "real world" problems. Qualified students with the goal of learning statistics to use in a specialized area of application are especially encouraged to take advantage of these cooperative arrangements.

Program faculty have active statistics research efforts in areas such as bioinformatics, statistical genetics, Bayesian models, survival data analysis, discriminant analysis, bootstrap methods, machine learning, predictive modeling, networks, categorical data analysis, measurement error models, and experimental design. Students seeking the traditional graduate degree in statistics (along with course work in mathematics and computer science, if desired) have excellent opportunities to participate in the faculty's research.

## DEGREES

- Statistics AMP (p. 241)
- Statistics M.S. (p. 242)

## FACULTY

**Bagrow, James;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Chaudhuri, Paramita Saha;** Assistant Professor, Department of Mathematics and Statistics; PHD, University of Washington

**Cole, Bernard;** Professor, Department of Mathematics and Statistics; PHD, Boston University

**Jefferys, William;** Adjunct Professor, Department of Mathematics and Statistics; PHD, Yale University

**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

**Young, Jean-Gabriel;** Research Assistant Professor, Department of Computer Science, PHD, Université Laval

## STATISTICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 259)

## OVERVIEW

The Statistics Program offers biostatistics, statistics, data science and probability courses for the entire university community along with traditional degree programs and individually designed degree programs emphasizing statistics applied to other fields. The degree programs are designed primarily for students who plan careers in data sciences, business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical methods and data science. The program faculty is deeply involved in consulting and collaborative research in a wide variety of fields, including industry, agriculture, and in the basic and clinical medical sciences. These research activities along with the research of other quantitative UVM faculty offer students unique opportunities to apply their classroom training to "real world" problems. Qualified students with the goal of learning statistics to use in a specialized area of application are especially encouraged to take advantage of these cooperative arrangements.

Program faculty have active statistics research efforts in areas such as bioinformatics, statistical genetics, Bayesian models, survival data analysis, discriminant analysis, bootstrap methods, machine learning, predictive modeling, networks, categorical data analysis, measurement error models, and experimental design. Students seeking the traditional graduate degree in statistics (along with course work in mathematics and computer science, if desired) have excellent opportunities to participate in the faculty's research.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Students should discuss the possibility of an Accelerated Master's Entry Program in statistics with the respective program director as soon as they think they may be interested in this program. Students must declare their wish to enter the Accelerated Master's Entry Program in writing to the statistics program director (it is recommended that this happen before the end of their junior year). They would apply to the Graduate College for admission, noting their interest in the Accelerated Master's Entry Program. They can receive concurrent undergraduate and graduate credit for 1 or 2 graduate level courses, once admitted. No graduate credit can be counted for statistics courses earned prior to admission to the graduate program. If declared for graduate credit, a third graduate level course can transfer to graduate degree requirements provided those credits are not used to satisfy undergraduate degree requirements.

### Minimum Degree Requirements for the Degree of Master of Science

OPTION A (THESIS)		
A 30 credit program requiring 24 credits of statistics course work. The program must include:		
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 360	Linear Models	3
6 additional course credits are required. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		6
6 credits of thesis research is required:		
STAT 391	Master's Thesis Research	6

OPTION B (NON-THESIS)		
A 30 credit program requiring 27 credits of course work. The program must include:		
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 360	Linear Models	3

9 additional course credits are required. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		9
The research project requirement is met by taking three semester hours of:		
STAT 381	Statistical Research	3
or STAT 385	Consulting Practicum	

BOTH OPTIONS		
Under both options, students must have or acquire knowledge of the material in STAT 211. The student is expected to participate in the colloquium series of the program and in the Statistics Student Association Journal Club. The student must pass the comprehensive examination.		

**Comprehensive Examination**

The comprehensive exam is a 3-hour exam that includes a mixture of questions spanning theoretical and applied statistics, probability, study design, and interpretation of analytical results. The questions are formatted as either numerical computation, derivation, or essay. The student can take the exam a maximum of two times. The exam is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261.

**Requirements for Advancement to Candidacy for the Degree of Master of Science**

Successful completion of any prerequisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.00 or greater is also required.

**STATISTICS M.S.**

All students must meet the Requirements for the Master's Degree (p. 260)

**OVERVIEW**

The Statistics Program offers biostatistics, statistics, data science and probability courses for the entire university community along with traditional degree programs and individually designed degree programs emphasizing statistics applied to other fields. The degree programs are designed primarily for students who plan careers in data science, business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical methods and data science. The program faculty is deeply involved in consulting and collaborative research in a wide variety of fields, including industry, agriculture, and in the basic and clinical medical sciences. These research activities along with the research of other quantitative UVM faculty offer students unique opportunities to apply their classroom training to "real world" problems. Qualified students with the goal of learning statistics to use in a specialized area of application are especially encouraged to take advantage of these cooperative arrangements.

Program faculty have active statistics research efforts in areas such as bioinformatics, statistical genetics, Bayesian models, survival

data analysis, discriminant analysis, bootstrap methods, machine learning, predictive modeling, networks, categorical data analysis, measurement error models, and experimental design. Students seeking the traditional graduate degree in statistics (along with course work in mathematics and computer science, if desired) have excellent opportunities to participate in the faculty's research.

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Master of Science**

A baccalaureate degree. 3 semesters of calculus, a course in matrix methods, and 1 semester of statistics. Provisional acceptance can be given prior to the completion of these requirements. Computer programming experience is highly recommended.

Current undergraduate students at the University of Vermont should contact the program director for details on the Accelerated Master's Program.

**Minimum Degree Requirements for the Degree of Master of Science**

OPTION A (THESIS)		
A 30 credit program requiring 24 credits of statistics course work. The program must include:		
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 360	Linear Models	3
6 additional course credits are required. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		6
6 credits of thesis research is required:		
STAT 391	Master's Thesis Research	6

OPTION B (NON-THESIS)		
A 30 credit program requiring 27 credits of course work. The program must include:		
STAT 221	QR: Statistical Methods II	3
STAT 223	QR:Appld Multivariate Analysis	3
STAT 231	QR: Experimental Design	3
STAT 251	QR: Probability Theory	3
STAT 261	QR: Statistical Theory	3
STAT 360	Linear Models	3

9 additional course credits are required. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		9
The research project requirement is met by taking 3 semester hours of:		
STAT 381	Statistical Research	3
or STAT 385	Consulting Practicum	
BOTH OPTIONS		
Under both options, students must have or acquire knowledge of the material in STAT 211. The student is expected to participate in the colloquium series of the program and in the Statistics Student Association Journal Club. The student must pass the comprehensive examination.		

### Comprehensive Examination

The comprehensive exam is a 3-hour exam that includes a mixture of questions spanning theoretical and applied statistics, probability, study design, and interpretation of analytical results. The questions are formatted as either numerical computation, derivation, or essay. The student can take the exam a maximum of two times. The exam is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Successful completion of any prerequisite courses, and at least 15 graded graduate credits earned in compilation of the graduate GPA, including all core courses. A GPA of 3.00 or greater is also required.

## SUSTAINABLE DEVELOPMENT POLICY, ECONOMICS, AND GOVERNANCE

### OVERVIEW

<https://www.uvm.edu/~cdae> (<https://www.uvm.edu/~cdae/>)

### OVERVIEW

The Sustainable Development Policy, Economics, and Governance (SDPEG) Ph.D. program offers a transdisciplinary doctoral education in the policies, practices and theories of sustainable development. By offering a core curriculum that includes applied policy and economic analysis, governance and process design, social science methods, and professional skills development, the program produces graduates capable of conducting original, applied research that is designed to support sustainability and resiliency across social, ecological, and technical systems.

This degree will prepare students to assume positions as policy leaders in government, higher education, public and private sector organizations, non-governmental organizations, and research institutes with the expertise and vision to inform local, state, national, and international policy.

## DEGREES

- Sustainable Development Policy, Economics, and Governance Ph.D. (p. 243)

## FACULTY

**Baker, Daniel H.**; Associate Professor, Department of Community Development and Applied Economics; PHD, University of Vermont

**Bartlett, Robert V.**; Professor, Department of Political Science; PHD, Indiana University

**Bose, Pablo**; Associate Professor, Department of Geography; PHD, York University

**Conner, David S.**; Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Farley, Joshua C.**; Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**Heiss, Sarah Noel**; Associate Professor, Department of Community Development and Applied Economics; PHD, Ohio University

**Koliba, Christopher J.**; Professor, Department of Community Development and Applied Economics; PHD, Syracuse University

**Kolodinsky, Jane Marie**; Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**McMahon, Edward**; Adjunct Associate Professor, Department of Community Development and Applied Economics; EDD, University of Vermont

**Reynolds, Travis**; Assistant Professor, Department of Community Development and Applied Economics; PHD, University of Washington

**Rowangould, Gregory**; Associate Professor, Department of Civil and Environmental Engineering; PHD, University of California, Davis

**Seguino, Stephanie**; Professor, Department of Economics; PHD, American University

**Shrum, Trisha R.**; Assistant Professor; Department of Community Development and Applied Economics; PHD, Harvard University – John F. Kennedy School of Government

**Tobin, Daniel**; Assistant Professor, Department of Community Development and Applied Economics; PHD, Pennsylvania State University

**Wang, Qingbin**; Professor, Department of Community Development and Applied Economics; PHD, Iowa State University

**Zia, Asim**; Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## SUSTAINABLE DEVELOPMENT POLICY, ECONOMICS, AND GOVERNANCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (<http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforthedoctorofphilosophydegree/>)

### OVERVIEW

The Sustainable Development Policy, Economics, and Governance (SDPEG) Ph.D. program offers a transdisciplinary doctoral education in the policies, practices and theories of sustainable development. By offering a core curriculum that includes applied

policy and economic analysis, governance and process design, social science methods, and professional skills development, the program produces graduates capable of conducting original, applied research that is designed to support sustainability and resiliency across social, ecological, and technical systems.

This degree will prepare students to assume positions as policy leaders in government, higher education, public and private sector organizations, non-governmental organizations, and research institutes with the expertise and vision to inform local, state, national, and international policy.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

- Completion of a master's degree in public policy, public administration, economics, natural resources, engineering, ecology, food systems, political science or a closely related field, including social sciences, professional fields, and STEM (In certain cases, applicants without a prior master's degree will be considered.)
- Completion of undergraduate level statistical methods course
- Completion of 1 graduate level course in research methodology
- Completion of 1 graduate or upper undergraduate level course in micro or macro economics
- Resume or Curriculum Vitae
- Applicants must submit evidence of experience and success in the research process such as writing sample(s), and/or evidence of research experience(s) (e.g., term papers, class projects, research reports and/or other descriptions of past research experience from academic or professional lives).
- January 15th application deadline for funding consideration. Otherwise rolling admissions.
- Prior to applying, applicants are encouraged to establish contact with at least 1 participating faculty member whose research aligns with their interests.
- The Graduate Record Exam (GRE) is optional.
- For international students whose native language is not English or who have not completed undergraduate or master's degrees in English, scores from the Test of English as a Foreign Language (TOEFL), the English Language Testing System (IELTS), or Duolingo must be submitted.

### Minimum Degree Requirements

The degree requires a total of 75 credits. A minimum of 51 credits must be completed in residence. The residency requirement is completed by courses that are taken for graduate credit through the University of Vermont, and are taken after the student has been admitted to the Graduate College.

The program's course of study includes a 30-credit core, the option to transfer in up to 24 credits of prior master's degree credits or the pursuit of a pre-approved Certificate of Graduate Study (15 to 18 credits of electives that are approved by student advisor), and 21 dissertation research credits.

The 30 credit core includes:

<b>Policy &amp; Governance Foundations</b>		
PA 306	Policy Systems	3
CDAE 371	Sustain Dev Policy & Gov	3
<b>Economics Suite</b>		
CDAE 370	Political Econ of Sustain Dev	3
CDAE 354	Advanced Microeconomics	3
<b>Social Science Analytics Foundations</b>		
CDAE 351	Research & Evaluation Methods	3
CDAE 359	Applied Econometrics	3
Additional Research Methods (Social Science, Statistics, GIS, Complex Systems, or Epidemiology)		3
<b>Professional Development Foundations</b>		
CDAE 376	Communicating Science	3
PA 380	Internship	3
Doctoral Seminars (CDAE 400) must be taken 3 times		3
<b>Total Credits</b>		<b>30</b>

Doctoral students enrolled in the program are encouraged to pursue 1 of UVM's certificates of graduate study including, but not limited to: Ecological Economics, Community Resilience and Planning, Agroecology, Public Health, Sustainable Enterprise, and Complex Systems and Data Science.

### Comprehensive Examination

A written comprehensive examination must be passed by the candidate at least 6 months before the dissertation is submitted. Upon submission of written comprehensive exam, an oral comprehensive exam is required within 1 month's time of submission.

The oral comprehensive exam defense must be passed as well as the written exam in order to officially "pass" the comprehensive exam. Success in the written and oral comprehensive examination is a prerequisite for standing for the Dissertation Oral Defense Examination and to officially reach "doctoral candidate" status.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Students will advance to candidacy following completion of the core curriculum, passage of a written and oral comprehensive exam, passage of the written dissertation and oral dissertation defense exam, and acquisition of teaching experience in the field of sustainable development policy, economics and governance. A GPA of 3.0 must be maintained.

## ACADEMIC AND ENROLLMENT POLICIES

This section of the Graduate Catalogue includes academic and enrollment policies and information for graduate students.

- Change of Graduate Program (p. 245)
- Conferral of Graduate Degrees (p. 245)
- Continuous Graduate Registration (p. 245)
- Enrollment Policies and Procedures (p. 246)
- Grading Policies (p. 248)
- Inactivation, Deactivation and Reactivation (p. 249)
- Leave of Absence (p. 249)
- Requirements for Visiting Graduate Students (p. 250)
- Rights and Responsibilities (p. 250)
- Time Limits for Graduate Degree Completion (p. 251)
- Transfer Credit and Credit by Examination (p. 251)
- Withdrawal from a Graduate Degree Program (p. 253)

## CHANGE OF GRADUATE PROGRAM

If an admitted student wishes to change to a different graduate program offered at UVM, a request must be made by the student, in writing, to the Dean of the Graduate College. Upon receipt of the request and any new supporting materials, the student's file will be forwarded to the desired program for review. That program may require additional materials or a new complete application for consideration. If both the faculty of the desired program and the Dean of the Graduate College approve, the formal transfer of program is made in the Graduate College office with notification to the former program, new program, student, and registrar. To complete the process, the student should provide an outline indicating all credits earned in the previous program that will count towards the new program and the components necessary to complete the new program (such as the comprehensive exam or required courses). This outline should be signed by the student and the program director of the new program and sent to the Dean of the Graduate College. The time limit for completion of the degree runs from the date of matriculation in the new program; however, all credits applied to the program must be earned within 3 years of completion for a micro-Certificate of Graduate Study; 5 years of completion for a Certificate of Graduate Study; 7 years of completion for master's and doctoral (professional) degree; and 9 years for the Doctor of Philosophy degree.

## CONFERRAL OF GRADUATE DEGREES

Degrees are conferred in August, October, January, and May of each year. Diplomas are issued at Commencement in May and mailed in August, October, and January.

It is the graduate student's responsibility to make sure that their name has been submitted to their department or program and to the Graduate College dean's office for graduation by completing an Intent to Graduate form by the published date for the cycle in which they plan to complete their degree requirements: June 1st (for August graduation); August 1st (for October graduation); October 1st (for January graduation); and February 1st (for May graduation).

## GRADUATE STUDENT COMMENCEMENT WALK POLICY

Only graduate students who have completed all degree requirements are eligible to walk in the UVM Graduate College Commencement Ceremony held each May. For thesis and dissertation students, degree requirements include the passing of an oral defense examination and the submission of a final copy of their thesis or dissertation approved by the Graduate College through ProQuest.

## CONTINUOUS GRADUATE REGISTRATION

Students who are actively working toward their degree completion and have completed enrollment in all credits required for the degree, but have not completed all graduation requirements, must enroll each semester for Continuous Registration and pay a flat \$100 - \$300 tuition fee for Continuous Registration each semester (Fall and Spring) until all degree requirements are completed, including resolving incomplete grades, passing the comprehensive examination, or completing a thesis or dissertation.

Continuous Registration is graded SP/UP. Continuous Registration credits appear in the credit totals on a student's transcript but do not count towards the credits required to earn the graduate degree.

Students who are working at the full-time level of nine or more credit equivalency register for GRAD 903 in their discipline, pay a Continuous Registration fee of \$300, and must pay the Health Center fee required of full-time students (\$371.50). Students working at less than full time, but at least half time (five to eight credit equivalency) register for GRAD 902 in their discipline, pay a Continuous Registration fee of \$200, and must pay the Health Center fee (\$371.50) if they elect to purchase the UVM health insurance. Students working at less than half time (one quarter to four credit equivalency) register for GRAD 901 in their discipline and pay a Continuous Registration fee of \$100.

The following chart describes the characteristics of each level of registration:

	<b>Effort Expectation</b>	<b>Credit Equivalency</b>	<b>Attributes of Enrollment Designation</b>
GRAD 901	Less than Half Time - 1-16 hours effort per week	1/4 TO 4 <sup>1</sup>	Catcard, library, fitness center and bus privileges
GRAD 902 <sup>2</sup>	At least Half Time, but less than Full Time - 20-32 hours effort per week	5-8	Catcard, library, fitness center and bus privileges; loan deferral, eligible to enroll in UVM Student Health insurance, federal financial aid eligibility, eligible for GTA/GRA funding
GRAD 903 <sup>3</sup>	Full Time - at least 36 hours effort per week	9 or more	Catcard, library, fitness center and bus privileges; loan deferral, health insurance required <sup>4</sup> , federal financial aid eligibility, eligible for GTA/GRA funding, ski pass eligibility

<sup>1</sup> Typically, students would register for 1-4 credits for an effort of 4-16 hours/week. However, for minimal required effort, such as sitting for a comprehensive exam a couple of days into the semester with no other requirements, students may register for 1/4 credits.

<sup>2</sup> Students funded as a half time GTA, GRA or GA (10 hours per week) must be enrolled in at least 5 credits, so must register for GRAD 902 or GRAD 903.

<sup>3</sup> Students funded as a full time GTA, GRA or GA (20 hours per week) must be enrolled in at least 9 credits, so must register for GRAD 903.

<sup>4</sup> Students enrolled in GRAD 903 must provide proof of health insurance coverage or purchase UVM Student Health Insurance and must pay the UVM Student Health fee if UVM Student Health Insurance is chosen.

## ENROLLMENT POLICIES AND PROCEDURES

### REGISTRATION

Consult the UVM Academic Calendar (<https://www.uvm.edu/registrar/academic-calendars/>) and the Registration Schedule (<https://www.uvm.edu/registrar/registration-schedule/>) for registration dates. Students register for courses at the time and in the manner designated by the university registrar. Early registration is encouraged for both new and presently enrolled graduate students. Students may not register for courses unless tuition and fees for any current and prior semesters have been paid.

Students should consult with their program advisor before using web registration. All charges for the ensuing semester must be paid, or otherwise provided for, before registration is complete.

### GRADUATE COURSE LEVELS

Courses that may apply towards a graduate program are numbered 200 and above. Not all 200-level courses are eligible for graduate credit. The 200-level courses that are eligible for graduate credit when taken by graduate students are included in the Graduate Catalogue course list. These courses have a different level of expectation for graduate students taking the course than for undergraduate or non-degree students. Graduate students enrolled in a 200-level course approved for graduate credit must take the course for graduate credit. Undergraduate and non-degree students receive undergraduate credit for these courses. Courses numbered 400 or above are limited to candidates for doctoral degrees; courses numbered 300 to 399 are limited to graduate students unless permission to enroll is given by the appropriate instructor, department or program.

### COURSE LOADS

Generally, full-time graduate students enroll for 9 to 12 credit hours per semester, with normal maximum enrollment being 15 credits per semester and 9 hours summer. Enrollment in excess of 15 credits requires written approval from the student's advisor and the Dean of the Graduate College.

### AUDITING CLASSES

Students wishing to regularly attend a course, but not receive credit, may register as an auditor, with the approval of the Dean of the Graduate College and the instructor. Auditors have no claim on the time or service of the instructor. Students must meet minimum levels of performance set by the instructor at the time of registration in order to receive an audit grade. Tuition is charged at the applicable rate. Under no circumstances will changes be made after the add/drop period to allow credit for courses audited. Tuition scholarships funded by the academic units or the Graduate College do not cover tuition for audited courses.

### PHYSICAL EDUCATION CLASSES

Students may not enroll in physical education classes without prior approval by the Dean of the Graduate College. Graduate College or

academic unit tuition scholarships do not cover tuition or any fees for physical education activities.

### ADD/DROP

Courses may be added through the first 5 instructional days of the semester without instructor permission, unless indicated. Adding a course between the 6th and 10th instructional day will be at the discretion of the faculty member and will occur by means of a faculty override. Courses may be dropped through the first 10 instructional days of the semester. During summer and winter sessions, the add/drop period varies from course to course depending on when the class begins and how long it runs. Withdrawing from a course after add/drop will result in a partial or no tuition refund; being added to a new course after add/drop will result in a tuition charge.

### WITHDRAWAL FROM COURSES

From the 11th day of instruction until the 2nd business day after the 60% point in the semester, students may withdraw from courses. To do so, students must use the registration system to withdraw from the course. The student's advisor(s) and dean(s) will be notified. The instructor(s) will be aware of the withdrawal by the Withdraw status on the class roster and the presence of a grade of W on the grade roster.

Between the 2nd business day after the 60% point in the semester and the last day of classes, students may withdraw from 1 or more courses only by demonstrating to the Graduate College studies committee, through a written petition, that they are unable to continue in the course(s) due to circumstances beyond their control. Such petition must contain conclusive evidence, properly documented, of the illness or other situation preventing completion of the course(s). Acceptable reasons do not include dissatisfaction with performance or expected grade, dissatisfaction with the course or instructor, or desire to change major or program. If the petition is approved, a grade of W will be assigned and recorded on the student's permanent record. If the petition is denied, the instructor(s) will assign a final grade in accordance with the same criteria applied to all other students in the course(s). Final decisions rest with the Graduate College.

Withdrawals will be permitted after the last day of classes only when the student was incapacitated before the end of the term and unable to process a late withdrawal request. To be considered, the request must be made within 60 days of the end of the term in which the course was taken, or before the end of the add/drop period of the subsequent term attended, whichever is sooner. Final decisions rest with the Graduate College.

In all instances, withdrawal grades remain on the permanent academic record, but will not affect the grade-point average. Withdrawn courses are included in the number of credits used for billing purposes.

### DEFINITION OF A CREDIT HOUR

The Faculty Senate has defined a University of Vermont credit hour as follows:

1. One hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester hour of credit or the equivalent amount of work over a different amount of time; or
2. At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.
3. "Direct faculty instruction" must include regular and substantive faculty/student contact regardless of delivery mode (for example, face-to-face, hybrid, distance/online).

Semester courses must span the full term (15 weeks in fall and spring) of the semester in which they are offered, with a minimum of 45 hours of total effort per credit. Part-of-Term courses in the semester or summer must span the full part-of-term in which they are offered and distribute the 45 hours of effort per credit over a shorter time window.

### UNDERGRADUATE STUDENT COURSE ENROLLMENT FOR GRADUATE CREDIT (NON-ACCELERATED MASTER'S STUDENTS)

UVM Senior undergraduates may enroll for up to 6 graduate credits at UVM under the following circumstances: course must be available for graduate credit and is not an independent study, practicum, internship, or research credit course; approval to take the course for graduate credit is obtained from the Dean of the Graduate College and the dean of the undergraduate school or college in which the student is enrolled prior to taking the course; and the course must not be computed as part of the bachelor's degree. Students may request graduate credit for a course by completing the form found on the Faculty and Current Student Resources page of Graduate College website. Graduate credit can be used as transfer credit into a UVM graduate program if the course is deemed appropriate by the student's advisor for the particular graduate program and the student earned a grade of B or better. The transfer is credit only (not grade) and does not count towards the minimum graded credit required after matriculation into the graduate program. Generally, other institutions will not accept such credit, earned before award of the bachelor's degree, in transfer to their graduate programs.

### NON-DEGREE STUDENT COURSE ENROLLMENT FOR GRADUATE CREDIT

Graduate Credit earned at UVM after completion of the bachelor's degree but prior to admission to a graduate program is transfer credit; only the credit and not the grade is transferred and is subject to the transfer of credit policy.

Non-degree students who enroll in 200-level courses for the purpose of transferring the credits into a graduate degree may do so for up to 6 credits under the following circumstances: The 200-level course is available to earn for graduate credit, and is not an independent study, practicum, internship, or research credit course; approval to take the course for graduate credit is obtained from the Dean of the Graduate College prior to taking the course by completing the form



found on the Graduate College website; the student earns a grade of B or better. The course may then be used as transfer credit into a UVM graduate program if it is deemed appropriate by the student's graduate program. The transfer is credit only and does not factor into the graduate GPA. These credits also do not count towards the minimum graded credits required after matriculation into the graduate program, and may not be able to transfer as graduate credit to another university. All courses requested to transfer are subject to the Graduate College's transfer of credit policy.

Non-degree students who enroll in courses at the 300- or 400-level may transfer the credits into a graduate degree provided they meet the transfer of credit policy.

## DISTANCE EDUCATION STUDENT STATUS

A distance education student is a student whose primary affiliation with UVM is as a student matriculated in a distance education degree or academic certificate program where the majority of content is delivered at a distance. There may be a minimal residency component of the program that is exclusively available to the matriculated distance education students. A distance student may not register for an on-campus course; however a residential student may register for courses offered through a distance program on a space availability basis.

Students are billed according to their primary affiliation with UVM. These categories are residential or distance and may be program specific. When tuition differs between these categories, tuition is billed according to the primary affiliation of the student for any courses taken.

## DISMISSAL

**Academic:** Students whose academic progress is deemed unsatisfactory at any time may be dismissed from the Graduate College by the dean upon consultation with the student's department or program. In addition, students may be dismissed if they receive two grades or more below a B (3.00), or they receive a U (Unsatisfactory) or UP (Unsatisfactory Progress) in Thesis or Dissertation Research, Seminar or Clinical Practicum. Students will be dismissed from the graduate program if they fail the comprehensive examination on both the first and second attempt or if they fail a thesis or dissertation defense on both the first and second attempt.

**Professional:** Students whose professional integrity is deemed unsatisfactory at any time may be dismissed from the Graduate College by the dean upon consultation with the student's department or program. Breaches of professional integrity include, but are not limited to, violations described in the Misconduct in Research and Other Scholarly Activities policy, violation of the Code of Academic Integrity, and actions that violate the standards of professional practice in the discipline of study or in duties associated with an assistantship.

A student has the right to appeal a dismissal on the following grounds: 1) procedural error unfairly and materially affected the dismissal decision, 2) material evidence has been discovered that was not reasonably available at the time of the dismissal, or 3) there was

clear abuse of discretion in the dismissal decision. The appeals process begins at the program level with the Program Director. If unsuccessful, the appeal may be made to the Dean of the Graduate College, whose decision is final. Students may have a support person accompany them to any meetings related to the appeal. This person may not be legal counsel.

## GRADING POLICIES

Grades are reported and recorded as letter grades. Graduate Students do not receive a grade of D. Student grade point averages (GPA) are calculated from quality point equivalents noted here:

Grade		Points/Credits
A+	Excellent	4.00
A	Excellent	4.00
A-	Excellent	3.67
B+	Good	3.33
B	Good	3.00
B-	Good	2.67
C+	Fair	2.33
C	Fair	2.00
C-	Fair	1.67
F	Failure	0.00
AF	Administrative Failure due to a missing grade. <sup>1</sup>	
XF	Failure resulting from academic dishonesty. <sup>2</sup>	

<sup>1</sup> The AF grade is equivalent to the grade of F in the determination of grade point averages and academic standing (Effective spring, 2017).

<sup>2</sup> The XF grade is equivalent to the grade of F in the determination of grade point averages and academic standing. (Effective fall, 2005)

A candidate for a graduate degree must complete the program with a minimum overall grade-point average of 3.00.

A course may be repeated for credit only when failed and only once. Both grades remain on the student's transcript, but only the second grade will be considered when determining GPA. Students who retake a failed course must notify the Graduate College when the retake is complete so Graduate College staff can work with the Registrar's Office to remove the failed course from the student's GPA calculations.

In certain instances, grades are assigned that will appear on the transcript, but will not be used in grade point calculation. These grades are:

AU	Audit (see below)
INC	Incomplete (see below)
S/U	Satisfactory/Unsatisfactory (see below)

SP/UP	Satisfactory Progress/ Unsatisfactory Progress (see below)
W	Withdrawn
AUP	Administrative Unsatisfactory Progress

AU: Students wishing to regularly attend a course, but not receive credit, may register as an auditor, with the approval of the dean and the instructor. Auditors have no claim on the time or service of the instructor. Students must meet minimum levels of performance set by the instructor at the time of registration in order to receive an audit grade. Tuition is charged at the applicable rate. Under no circumstances will changes be made after the add/drop period to allow credit for courses audited. Graduate College tuition scholarships do not cover courses taken for Audit.

INC: This grade may be assigned when course work is not completed for reasons beyond the student's control. Incompletes require the approval of the Graduate College dean. The incomplete course requirement will be satisfied at the earliest possible date, but not longer than the beginning of the corresponding semester of the next academic year. In cases of laboratory assignments, the student must complete all work the first time that the laboratory experience is offered again. Instructors will fill out an electronic incomplete grade exception request to the Graduate College dean and include the reason for the incomplete as well as the completion date agreed to by the student and instructor. It is the student's responsibility to learn from the Graduate College dean whether the request has been approved, the expected date of completion, and, from the instructor, the nature of all outstanding requirements.

Incompletes may be approved for the following reasons: medical, personal tragedy or academic.

S/U: These grades are used in courses where the A-F grade is inappropriate, such as in seminars, internships, practica, etc. For graduate students, S and U are used to indicate levels of performance for credits received in research and may be used to indicate levels of performance in a Seminar. There are no quality points associated with the letter grades of S and U.

SP/UP: These grades are used in courses with a linkage in credits to multiple semesters such as thesis and dissertation research. Neither SP nor UP will be included in the student's GPA. The grade of SP will be assigned when a student has made satisfactory progress during a semester prior to the final semester of the linked courses; credit will be awarded with the grade of SP. The grade of UP will be assigned when the student's progress has been unsatisfactory and no credit will be awarded. For course work, the faculty member may change the grade of SP to a letter grade once the final grade for the multiple semester work is completed; the change must occur for all students in the course. A grade of SP cannot be changed to a UP or F based on a student not completing the final semester's work satisfactorily. UP is a final grade. It can stand as it is, or it can be changed to an F. Grades of SP or UP for thesis or dissertation credits may not be changed to letter grades.

## GRADE REPORTING

Grades must be reported to the Registrar's office as soon as possible after the course is completed but not later than 72 hours after the final examination for that course. If the final exam is on the Friday of exam week, grades are due by noon on the following Tuesday.

## INACTIVATION, DEACTIVATION AND REACTIVATION

### INACTIVATION AND REACTIVATION

Students who do not register in any fall or spring semester will be inactivated by the Registrar and will be unable to enroll for classes and their CATCards will be deactivated. To be reactivated please contact the Graduate College; there is no fee for reactivation following inactivation for less than one year.

### DEACTIVATION AND REACTIVATION

Deactivation is equivalent to withdrawal from a graduate program. Students who do not enroll in their program following the termination date of a Leave of Absence will be deactivated from the Graduate College. Students who, prior to completing enrollment for all credit requirements for a graduate program, do not enroll for one or more credits for a period of one calendar year and are not on an approved Leave of Absence will be considered to have withdrawn from the degree program and deactivated from the college.

Students who have completed all credits required for their degree, but have not completed all graduation requirements, do not enroll in continuous registration (GRAD 901, GRAD 902 or GRAD 903) for a period of one calendar year and are not on an approved Leave of Absence will be considered to have withdrawn from the degree program and deactivated from the college.

Reactivation into a program following deactivation requires the approval of the program and the Graduate College. Students seeking reactivation must complete the Reactivation Form and pay a \$40 Reactivation fee and, if reactivation is approved, all other outstanding fees. At the program's discretion, a new application may be required for students requesting to return after 1 or more years away.

## LEAVE OF ABSENCE

A Leave of Absence may be awarded for a period of up to one year. Students must request a leave of absence prior to the beginning of the semester in which the leave will take effect. The leave suspends the 5 year time limit for master's and certificate of graduate study students for the duration of the leave. It does not suspend the time limit for the completion of individual courses.

The time limits for degree completion are

- micro-Certificate of Graduate Study: 3 years
- Certificate of Graduate Study and Master's degrees: 5 years
- Doctoral (professional): 7 years
- Doctoral (PhD): 9 years

All credit used for the degree, including transfer credit and credit by examination, and irrespective of a Leave of Absence, must be earned within 3 (micro-certificate of graduate study); 5 (certificate of graduate study); 7 (master's or professional doctorate); or 9 (PhD) years of graduation.

## PROCEDURE

Students request a Leave of Absence from their graduate program coordinator or chair prior to the start of classes in the semester during which the leave is being taken. If the program approves the request, the student and chair or program faculty complete the Leave of Absence form available on the Resources page of the Graduate College (<http://www.uvm.edu/graduate/>) website and forward it to the Graduate College for approval. A Leave of Absence does not take effect until after approval has been received from both the graduate program coordinator or chair and the Dean of the Graduate College.

Any student who does not enroll following termination of a Leave of Absence will be deactivated from the Graduate College.

## REQUIREMENTS FOR VISITING GRADUATE STUDENTS

1. Visitors will be enrolled (or active) in accredited graduate degree programs elsewhere (U.S. or abroad).
2. Visitors will participate at UVM in formal fellowship programs or graduate-level research projects under the direction of UVM faculty.
3. Funding for the fellowship or research activity generally will be from external sources.
4. Visitors will normally perform the equivalent of at least five credits of course work or research credit per semester during the term of the appointment.
5. Visitors will enroll for a Visiting Graduate Student Research section of GRAD 902 or GRAD 903, depending on the level of expected effort, each term (to include Fall, Spring and Summer) they are at UVM. Permission to enroll in the section is required from the Graduate College. Fees<sup>1</sup> and level of access to UVM facilities are established by the enrollment level with a minimum provision of a UVM student ID card and access to the library, fitness center and bus privileges and can be found on the Continuous Graduate Registration topic found under Academic and Enrollment Policies in this catalogue.
6. With the equivalent of half-time student status (GRAD 902), visiting graduate students will be eligible to enroll in the UVM student health insurance plan. Normally, visitors will be required to show proof of existing medical insurance coverage comparable to or greater than the UVM student health insurance plan, or else be required to enroll in the UVM plan.
7. Visitors will be appointed for a period of up to one year as determined by the Dean of the Graduate College and consistent with the educational objectives of the Visitor. Visitors may be reappointed by the dean; in most cases, the maximum total period of Visitor status will not exceed two years.
8. Visitors enrolled for Visiting Graduate Student Research are not enrolled in UVM degree programs and thus will not be eligible

for financial aid, i.e., federal loans or work study, through the University of Vermont.

9. International students should contact the Office of International Education for information on visas and transition to UVM. For information regarding tax status, refer to Tax Information, Foreign Nationals/Nonresident Aliens on the Division of Finance (<https://www.uvm.edu/finance/>) website.
10. Visitor appointments will be made by the department or program subject to the approval of the college or school and the Dean of the Graduate College. Appointing departments will request visiting graduate student status from the Graduate College dean's office by providing a description of the research or other academic activity, an official transcript or a letter from the student's home institution indicating that the student is currently enrolled or active in a graduate program at that institution, and a completed cover sheet with basic background information. The Graduate College dean's office will maintain a file on all individuals appointed as Visitors. The Visiting Graduate Student Form to request Visitor Status can be found on the Graduate College (<https://www.uvm.edu/graduate/>) website Resources page.

<sup>1</sup> 2022-2023 fees are \$200 per semester for GRAD 902 and \$300 per semester for GRAD 903. For students who also want eligibility to utilize the Center for Health and Well Being and/or to purchase UVM health insurance, an additional fee of \$371.50 is required. The estimated annual health insurance premium for the 2022-2023 school year is not yet available; the 2021-2022 premium was \$2,746 per year.

## RIGHTS AND RESPONSIBILITIES

Students have the responsibility to familiarize themselves with the policies and procedures of the university, the Graduate College, and their department or program. Students are primarily responsible for knowing the degree requirements and following the policies that govern their academic program. If students have questions or concerns about individual policies and procedures, they may contact their advisor, their program or department chair, or the Graduate College office, which is the ultimate arbiter of policies and procedures.

University policies and those of the Graduate College are contained on the UVM Institutional Policies (<http://www.uvm.edu/policies/>) website.

## ADVISING

Unless a department or program employs an alternative approved procedure, each graduate student will have a faculty advisor to advise on matters of course selection, research direction, and overall guidance from admission to the Graduate College to completion of degree requirements. The initial advisor is assigned by the department chair or the graduate program coordinator prior to or shortly after enrolling in the Graduate College. If an initial advisor is not assigned by either of the above parties within 2 weeks after the initiation of course work in a given graduate program, the student is encouraged to contact the Graduate College. Many times, 1 faculty member serves as an initial advisor for several students, and the

advisor may change as the student's program and research interests develop.

Another common model, especially in doctoral programs, is a graduate studies committee composed of faculty who share a student's scholarly and professional interests. The committee meets regularly to discuss the student's progress and consult with the student regarding academic development.

While there are a variety of advising models, in each case students have the right to consult regularly with their academic advisor or graduate studies committee.

## PROFESSIONAL ETHICS AND ACADEMIC HONESTY

Graduate students are required to adhere to the highest standards of professionalism as students, researchers, and teachers. The university, in order to encourage a positive atmosphere in all phases of academic learning, teaching and research, has created specific guidelines and policies regarding academic honesty. Information may be found on the Center for Student Conduct (<http://www.uvm.edu/sconduct/>) website.

## SEXUAL HARASSMENT

No member of the university community may sexually harass another. Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when:

1. submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or education;
2. submission to or rejection of such conduct by an individual is used as the basis for academic or employment decisions affecting that individual; or
3. such conduct has the purpose or effect of substantially interfering with an individual's academic or professional performance or creating an intimidating, hostile, or offensive employment, educational, or living environment.

Any University of Vermont student having a complaint of sexual harassment should notify the Office of Affirmative Action and Equal Opportunity; students may also contact the Dean of Student's office. If a student has personal concerns regarding sexual harassment, confidential counseling can be arranged through the Center for Health and Wellbeing. Policies and procedures governing complaints of sexual harassment are available in the office of each dean, department head, and chair as well as in the Howe Library.

## RELIGIOUS HOLIDAYS

Students have the right to practice the religion of their choice. Each semester students should submit in writing to their instructors by the end of the second full week of classes their documented religious holiday schedule for the semester. Faculty must permit students who miss class for the purpose of religious observance to make up the course work.

## DISCRIMINATION

The university community will not tolerate discrimination. Information and resources may be found at The Office of Affirmative Action and Equal Opportunity (<https://www.uvm.edu/aaeo/>) website.

## APPEALS

The Graduate College is ultimately responsible for grievances regarding policies and procedures related to graduate education. A grievance properly begins within the student's department by an appeal to a program director or chair. If this does not resolve the grievance, the student can present the grievance in writing to the dean of the unit in which the program resides, and thereafter to the Dean of the Graduate College. Grievances must state clearly and precisely the basis for appeal and provide supporting evidence that a student's rights have been jeopardized. The Graduate College dean may recommend that the grievance be reviewed by the Graduate College Executive Committee. The Graduate College dean is the final arbiter of Graduate College regulations. Specifically excluded from the Graduate College appeals process are grievances that contest grades on grounds other than due process. The procedure for grade appeals may be found on UVM's Institutional Policies website, listed above.

## TIME LIMITS FOR GRADUATE DEGREE COMPLETION

Doctor of Philosophy- 9 years from matriculation

Doctoral degree (professional)- 7 years from matriculation

Master's degree- 5 years from matriculation

Certificate of Graduate Study- 5 years from matriculation

micro-Certificate of Graduate Study- 3 years from matriculation

All courses applied towards the degree must be taken within 9 years for the Doctor of Philosophy degree; 7 years for professional doctorates and Master's degrees; 5 years for Certificates of Graduate Study; and 3 years for micro-Certificates of Graduate Study. Individual departments may set deadlines within these time limits.

## TRANSFER CREDIT AND CREDIT BY EXAMINATION

A limited number of graduate course credits acquired at other regionally accredited institutions, at UVM prior to admission to a graduate program, or by credit by examination may be included as part of a student's program of study, with approval of the program faculty and the Dean of the Graduate College. Credit by examination is earned by arranging through a program faculty member to take an examination that tests the student's skills and knowledge in a particular UVM course appropriate for inclusion in the student's degree program.

If credit is transferred, only the credit is transferred, not the grade.

Graduate Credit earned at UVM after completion of the bachelor's degree but prior to admission to a graduate program is transfer credit; only the credit and not the grade is transferred, and is subject to the requirements and limits that follow.

## APPROVAL OF CREDIT

Approval of credit is recommended by the graduate program and approved by the Graduate College based on the specific program requirements described in the Graduate College catalogue, as well as:

1. the number of credits requested,
2. the appropriateness of credit for inclusion in the degree program, and
3. the currency of the credit.

These criteria are described below. Any exceptions must be approved by the program faculty and the Dean of the Graduate College.

## NUMBER OF CREDITS

In general, Master's degree students are allowed 9 hours of transfer credit, and/or credit by examination, and an additional 6 credits acquired from appropriate courses taken at UVM prior to admission to a degree program may also be transferred; Doctor of Philosophy students are allowed 24 credits, and an additional 6 credits acquired from appropriate courses taken at UVM. This means that all master's students take at least 21 credits at the University of Vermont (at least 15 after admission) and Doctor of Philosophy students at least 51 credits (at least 45 after admission). For master's programs that require more than 30 credits, program faculty may, in individual cases, recommend more transfer credits. Credits allowed by professional doctoral degrees may vary; refer to individual programs for limit. In all cases, students must take at least one half of their degree credits at the University of Vermont after admission to the graduate program and adhere to all requirements stipulated by the graduate program. Graduate programs, at their discretion, may accept fewer transfer credits than those listed above; see individual programs for limit.

Graduate credits taken at other institutions may not transfer into a UVM Certificate of Graduate Study program. Up to 6 credits (not the grades) from 300 level courses taken as a continuing education student at UVM prior to matriculation in the certificate may transfer into the Certificate of Graduate Study.

Graduate credits taken at other institutions may not transfer into a UVM micro-Certificate of Graduate Study program. For a 12-14 credit micro-Certificate of Graduate Study, 3-5 credits (not the grades) from 300 level courses taken as a continuing education student at UVM prior to matriculation in the micro-CGS may transfer into the micro-Certificate of Graduate Study.

Credits used for a Certificate of Graduate Study may be applied toward an appropriate master's or doctoral degree at UVM, and credits applied toward a graduate degree at UVM may be applied toward an appropriate Certificate of Graduate Study. Credits may overlap between one certificate and one degree. Credits taken for

one Certificate of Graduate Study may not be used to fulfill the requirements for another Certificate of Graduate Study.

Credits used for a micro-Certificate of Graduate Study may be applied toward an appropriate Certificate of Graduate Study, master's degree, or doctoral degree at UVM, and credits applied toward a graduate degree at UVM may be applied toward an appropriate micro-Certificate of Graduate Study. Credits may overlap between one micro-Certificate of Graduate Study, one Certificate of Graduate Study, and one degree. Credits taken for one micro-Certificate of Graduate Study may not be used to fulfill the requirements for another micro-Certificate of Graduate Study.

## APPROPRIATENESS OF CREDIT

Transfer credit and credit by examination must be approved by the program faculty as appropriate for inclusion as part of the student's degree requirements. Credit cannot be awarded for:

1. courses taken prior to completion of an undergraduate degree program,
2. courses that were not graduate credit where taken or would not receive graduate credit if taken at the University of Vermont,
3. courses with a grade lower than B (3.00),
4. independent study or independent research,
5. thesis or dissertation research credits,
6. credit by examination given by another institution,
7. credits taken at a non-regionally accredited institution.

## CURRENCY OF CREDIT

Transfer credit and credit by examination must be taken within 3 years of completion for a micro-Certificate of Graduate Study; within 5 years of completion for a Certificate of Graduate Study; within 7 years of completion for a master's or doctoral (professional) degree; and within 9 years of completion for the Doctor of Philosophy degree. Students wishing to apply for readmission to a program after deactivation must demonstrate currency of knowledge in the field of study to which they are applying. Currency of knowledge must be formally evaluated by the program faculty and approved by the Dean of the Graduate College. In addition, the returning student must complete a program of study including at least two courses in the current program.

## CONCURRENT MASTER'S AND DOCTOR OF PHILOSOPHY CREDIT

Up to 24 credits of course work for which graduate credit is earned at UVM in a master's degree program, whether a master's degree is received or not, may be applied toward a Ph.D. at UVM, provided that the credit is appropriate for the Ph.D. program. If the UVM master's program has a course-based (non-thesis or project) option, then 30 credits of course work for which graduate credit is earned at UVM in a master's degree program may be applied toward a Ph.D. at UVM, provided that the credit is appropriate for the Ph.D. program. Students must still complete a minimum of 15 graded credits that do not count towards the Master's degree as part of the Ph.D. curriculum.

Up to 15 credits of course work for which graduate credit is earned at UVM in a doctoral degree program, whether a doctoral degree is received or not, may be applied toward a master's degree at UVM, provided that the credit is appropriate for the master's program.

No provision is made for a person to employ the same credit to satisfy 2 master's degrees at the University of Vermont.

## WITHDRAWAL FROM A GRADUATE DEGREE PROGRAM

Students must notify the Graduate College dean's office, in writing, of their intent to withdraw from a degree program. If a student does not register at the University of Vermont for course work, thesis or dissertation research, or continuous registration for a period of more than one calendar year, and does not notify the department or the Graduate College dean's office in writing, the student will be considered to have withdrawn from the degree program and will be deactivated from the college. It will be necessary to apply for reactivation and pay a reactivation fee if the student wishes to resume the graduate program. Approval of both the Graduate Program Director (or equivalent) and the Dean of the Graduate College is required for reactivation. At their discretion, programs may require an application from students requesting reactivation after 1 or more years away.

## ADMISSION AND FINANCIAL INFORMATION

- Admissions (p. 253)
- Tuition and Fees (p. 253)
- Financial Aid (p. 254)
- Financial Aid Programs (p. 255)
- Fellowships, Assistantships, Traineeships, Stipends, and Grants (p. 256)
- Payments (p. 257)
- Sponsored and Institutional Research (p. 257)

## ADMISSIONS

Admissions criteria, procedures and deadlines for graduate programs vary by individual program. Current information about graduate admissions can be found on the Graduate Admissions page of the Graduate College website.

In order to allow sufficient time to process applications and immigration documents for international applicants, the Graduate College recommends that applicants submit their application and supporting materials as early as possible. Although deadlines posted by the program may be different, international applicants must submit their documents by the deadlines indicated on the International Graduate Admissions page found on the Graduate College website.

## ADMISSION TESTS

Information about admission tests is available from the GRE website or from the Educational Testing Service, P.O. Box 6103, Princeton,

NJ 08541-6103 for the Graduate Record Examinations Test, or from the official GMAT website for the Graduate Management Admission Test. Those considering application to a graduate program that requires an admissions test must plan for the four to six weeks it can take for the Graduate College to receive the results of test scores.

Applicants must consult the listing of the program to which they are applying to determine exactly which test scores are required, if any. Scores must be from tests taken within five years of the date of application.

If a prospective student's native or first language is not English, scores must be submitted from the Test of English as a Foreign Language (TOEFL); the International English Language Testing System (IELTS), academic version; or the Duolingo English Test.

Minimum acceptable TOEFL, IELTS, or Duolingo scores for admission to the Graduate College at the University of Vermont:

TOEFL iBT (Internet Based Test)	90
IELTS	6.5
Duolingo	110

Minimum acceptable scores for a student to qualify for receiving funding as a Graduate Teaching Assistant at the University of Vermont:

TOEFL	100
IELTS	7.0
Duolingo	120

Institution Code for test scores for UVM is 3920.

## TUITION AND FEES

The student expenses outlined in the following paragraphs are charges for the 2022-2023 academic year for graduate students enrolled in most on-campus degree programs. View graduate college tuition and fees ([https://www.uvm.edu/studentfinancialservices/graduate\\_tuition\\_and\\_fees/](https://www.uvm.edu/studentfinancialservices/graduate_tuition_and_fees/)) to find charges approved by the UVM Board of Trustees after the February 2022 board meeting.

## APPLICATION FEE

The application fee is \$65.

## TUITION

Tuition rates for the 2022-23 academic year are as follows:

For Vermont residents, \$678 per credit hour. For out-of-state residents, \$1,720 per credit hour. Some graduate programs have alternate out-of-state tuition rates, and the information on the graduate college tuition and fees ([https://www.uvm.edu/studentfinancialservices/graduate\\_tuition\\_and\\_fees/](https://www.uvm.edu/studentfinancialservices/graduate_tuition_and_fees/)) page should be referred to for details.

The lower rates for Vermont residents are made possible by a subsidy to the university from the state of Vermont.

Note: Tuition and fee charges are the same whether a course is taken as audit or for credit.

### CONTINUOUS REGISTRATION TUITION FEE: GRAD 901/902/903

Continuous Registration status is for graduate students who have completed all credits required of their program, but are still working on their thesis. Students pay a continuous registration fee ranging from \$100-\$300 each semester until all degree requirements are completed, including removing incomplete grades, passing the comprehensive examination, or completing a thesis or dissertation. For students enrolled in Continuous Registration, the estimated UVM Health Fee of \$371.50 will be billed as a separate charge if the UVM Student Health Insurance Plan (SHIP) is purchased.

### COMPREHENSIVE FEE

Estimated 2022-23 per semester comprehensive fee schedule:

Credits Enrolled/Semester	Fee
1	\$10
2	\$20
3	\$30
4	\$40
5	\$442
6	\$493
7	\$555
8	\$617
9 and above	\$1,018

### GRADUATE STUDENT SENATE FEE

Graduate students enrolled below 5 credits, are charged \$7 for the Graduate Student Senate Fee each semester, and students enrolled in 5 or more credits are charged \$10. The Graduate Student Senate allocates this fee toward the support of student organizations and student activities. Students enrolled in Continuous Registration must also pay this fee.

### STUDENT HEALTH FEE

A health fee (<https://www.uvm.edu/health/fees/>) is included in the comprehensive fee for students enrolled in 9 or more credits. The health fee is a required fee for any student enrolled in fewer than 9 credits who purchases the UVM Student Health Insurance Plan (UVM SHIP). The health fee for 2022-23 is estimated at \$371.50 per semester, and is subject to change. Visit graduate college tuition and fees (mandatory student fees) ([https://www.uvm.edu/studentfinancialservices/graduate\\_tuition\\_and\\_fees/](https://www.uvm.edu/studentfinancialservices/graduate_tuition_and_fees/)) for updated cost information.

### UVM STUDENT HEALTH INSURANCE PLAN (UVM SHIP)

Through an arrangement with a commercial insurance company, students are able to procure health insurance that is designed to provide coverage for services beyond those provided by the Center for Health and Wellbeing (CHWB). There is an additional charge for

this extended coverage beyond the student health fee. The 2021-22 cost for one year's coverage for single students is \$2,746 and is subject to change for 2022-23. Married students may obtain coverage for their spouse and children. Health insurance information (<https://www.uvm.edu/health/health-insurance-information/>) is available from the Center for Health and Wellbeing. To participate in this insurance, the student health fee must be paid each semester as well as the additional insurance premium.

### CREDIT BY EXAMINATION

Under certain circumstances, a student may receive credit for a course by taking and passing an examination. A fee of \$50 per credit is charged for each examination. Any credit earned by examination applies to the total number of credits allowed for validation and transfer. Students initiate the process by completing the Credit by Examination Form (PDF) (<https://www.uvm.edu/sites/default/files/media/CreditByExam.pdf>) available through the Registrar.

### REACTIVATION FEE

Reactivation following withdrawal without an approved leave of absence for longer than two consecutive semesters requires the Reactivation Form (PDF) ([https://www.uvm.edu/sites/default/files/reactivation\\_1.pdf](https://www.uvm.edu/sites/default/files/reactivation_1.pdf)) to be completed along with payment of a \$40 reactivation fee.

### BILL ADJUSTMENT

Tuition refunds for students who drop or withdraw from courses will be handled according to the university's published tuition refund schedule ([https://www.uvm.edu/studentfinancialservices/tuition\\_refunds/](https://www.uvm.edu/studentfinancialservices/tuition_refunds/)).

### WITHDRAWALS

A student may voluntarily withdraw from the university by notifying the Dean of the Graduate College and the registrar. The student will receive a refund in accordance with the Bill Adjustment Policy (PDF) (<https://www.uvm.edu/sites/default/files/UVM-Policies/policies/billadjust.pdf>). Date and time of withdrawal normally will be the date the withdrawal notice is received by the registrar.

### DISMISSAL

In the case of suspension or dismissal from the university for disciplinary reasons, the student will receive a refund in accordance with the Bill Adjustment Policy (PDF) (<https://www.uvm.edu/sites/default/files/UVM-Policies/policies/billadjust.pdf>).

### DEATH

In case of the death of a student, tuition, room and fees that have been paid for the semester during which the death occurs will be refunded fully.

### FINANCIAL AID

Federal education loans are the primary source of financial assistance for graduate students. For detailed information about financial aid, view information on types of aid for graduate students (<https://www.uvm.edu/studentfinancialservices/>)

types\_aid\_and\_how\_apply/#graduate\_financial\_aid). Funding opportunities such as assistantships or fellowships, may be available through the UVM Graduate College or academic departments. Since the cost of attendance is mostly met through loans, graduate students should carefully assess their costs and resources before making a final decision about attendance.

Eligibility for federal financial aid is based on the Free Application for Federal Student Aid (FAFSA) (<https://fafsa.gov>), UVM's cost of attendance, and any other sources of aid being received, such as funding from assistantships, fellowships, traineeships, or tuition grants. Students must meet core eligibility requirements for federal student aid, including U.S. citizenship (or permanent resident status), and at least half-time enrollment (5 credits per semester).

For students seeking a Graduate Certificate, financial aid will generally not be available. View information on costs, types of aid and financing options for UVM Certificate Programs (<https://www.uvm.edu/studentfinancialservices/certificate-graduate-study-tuition-and-fees/>).

## APPLICATION FOR FINANCIAL AID

A U.S. citizen or eligible non-citizen student can file the Free Application for Federal Student Aid (FAFSA) (<https://fafsa.gov>) as soon as October 1 when the FAFSA opens, using UVM's Title IV School code, 003696. The FAFSA is the only financial aid application required. While there is no specific deadline, we recommend completing the FAFSA for the upcoming academic year as early as possible in order to receive an on-time aid offer. Students will be notified via email if additional information is required in order to determine financial aid eligibility. For students who are starting their graduate programs in the summer, the FAFSA will need to be submitted for the prior and upcoming academic years. In addition to completing the FAFSA, graduate students applying for financial aid will be required to inform us of their enrollment plans and funding they may have been awarded through their program through the Graduate Student Data form each year. Incoming students for the fall semester will be notified by email of the financial aid offer beginning in early to mid-March. Official aid offers will be issued once all requested documentation has been received and reviewed.

Students must reapply for financial aid through the FAFSA (<https://fafsa.gov>) each year as soon as October 1 when the FAFSA opens.

## FOR ADDITIONAL INFORMATION

More detailed information about the financial aid availability and procedures may be obtained from the UVM Office of Student Financial Services located in 223 Waterman Building:

Phone: (802) 656-5700

Please use the Student Financial Services website (<http://www.uvm.edu/studentfinancialservices/>) as a resource to find answers to questions, or email a member of the Student Financial Services team at [sfs@uvm.edu](mailto:sfs@uvm.edu).

## CHANGES IN ENROLLMENT

A student who adds courses during an enrollment period will be billed additional tuition and fees applicable to the adjusted credit hours. Students who drop or withdraw from courses during the enrollment period will receive a tuition credit based upon the university's published Refund and Bill Adjustment Policy (PDF) (<https://www.uvm.edu/sites/default/files/UVM-Policies/policies/billadjust.pdf>) which is subject to change. Financial aid will be reviewed and adjusted for any changes in enrollment. It is recommended that financial aid recipients speak with Student Financial Services before withdrawing from or dropping courses.

## SATISFACTORY ACADEMIC PROGRESS (SAP) STANDARDS FOR FINANCIAL AID RECIPIENTS

Federal financial aid regulations require that financial aid recipients maintain satisfactory academic progress in order to remain eligible for financial aid. The UVM Satisfactory Academic Progress (SAP) policy ([https://www.uvm.edu/studentfinancialservices/types\\_aid\\_and\\_how\\_apply/handbook\\_and\\_consumer\\_information\\_current/#SAP\\_GRAD](https://www.uvm.edu/studentfinancialservices/types_aid_and_how_apply/handbook_and_consumer_information_current/#SAP_GRAD)) for financial aid recipients is found in the Student Financial Services handbook and can also be obtained by contacting UVM Student Financial Services. All students should review the complete SAP policy to understand the requirements to remain eligible for aid.

## FINANCIAL AID PROGRAMS

### FEDERAL DIRECT LOAN PROGRAMS

The Federal Direct Unsubsidized Loan and Federal Direct Graduate PLUS Loan programs are the primary source of financial assistance for graduate students. Students who submit the Free Application for Federal Student Aid (FAFSA) (<https://fafsa.gov>) will be reviewed for loan and work-study eligibility. The financial aid offer provided by Student Financial Services will indicate eligibility and provide information on next steps, including loan application procedures. Read more about the types of federal financial aid for graduate students ([https://www.uvm.edu/studentfinancialservices/types\\_aid\\_and\\_how\\_apply/#graduate\\_financial\\_aid](https://www.uvm.edu/studentfinancialservices/types_aid_and_how_apply/#graduate_financial_aid)).

### VETERANS BENEFITS

The university provides support and information to any veteran or dependent eligible for benefits under Federal Law, Chapters 30, 31, 32, 33, 34, 35, or 106. Students eligible for these benefits should contact the Registrar's Office at least one month prior to registration each semester. Students wishing to register for benefits should be prepared to present their certificates of eligibility. Read the information for Veterans ([https://www.uvm.edu/studentfinancialservices/veteran\\_information/](https://www.uvm.edu/studentfinancialservices/veteran_information/)) regarding application for and use of GI Bill® benefits, including the Yellow Ribbon Program. GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government Web site at <https://www.benefits.va.gov/gibill>.



Students involved in the Veterans Program should contact the university in the event of any change in credit load, dependency status, address, or major. The phone number is (802) 656-0581.

## NEW ENGLAND REGIONAL STUDENT PROGRAM

The New England Regional Student Program is an opportunity for qualified legal residents of New England states to enroll at reduced tuition rates for some programs that are not offered by the home state university but are offered in another New England state. You can learn more about the tuition break policy (<https://www.uvm.edu/registrar/tuition-break-policy/>) for UVM graduate students through the New England Board of Higher Education (NEBHE).

Applicants must indicate to the Office of Graduate Admissions that they are seeking admission under the terms of the New England Regional Student Program. Applicants are then sent an application to apply under the New England Regional Student Program where they are requested to provide residency information and supporting documentation. In cases where the program of study is clearly unique or distinctive to the out-of-state institution, the Office of Graduate Admissions will certify directly the applicant's eligibility.

## FELLOWSHIPS, ASSISTANTSHIPS, TRAINEESHIPS, STIPENDS, AND GRANTS

Students who wish to be considered for fellowships must follow the guidelines for the specific fellowship as well as application deadlines for their program. Graduate Teaching and Research Assistantships are awarded by departments/programs.

Application for fellowships and assistantships is normally made by completing the appropriate section on the application form. No separate form is required except where indicated in the descriptions below.

Tuition scholarships accompanying Graduate Teaching, College, Research, and Student Affairs Assistantships do not cover audits or physical education activity courses, nor do they cover courses numbered below 200 or 200-level courses not approved for graduate credit, except upon prior approval of the Dean of the Graduate College.

Students are responsible for paying all mandatory fees- currently \$1,028 per semester.

## GRADUATE TEACHING AND/OR RESEARCH ASSISTANTSHIPS

Graduate Teaching and/or Research assistantships are awarded through many of the departments and programs offering graduate work; Graduate Research Assistantships are also available when a faculty member receives a grant from a source external to the university. For AY 2022-23, 9-month appointments have minimum stipends of \$17,852 for master's and \$22,244 for doctoral students; 12-month appointments have minimum stipends of \$23,802 for

master's and \$29,658 for doctoral students. Some programs have stipends higher than the minimum.

Graduate Teaching, Research or Research/Teaching assistants must maintain full time enrollment of a minimum of nine credits (or GRAD 903) per semester. In addition to the stipend, the assistantship award includes payment for the Single Student Health Insurance Premium and a tuition scholarship for up nine credits per semester (and up to 5 credits in summer if on a 12-month assistantship) during the period of the assistantship. University comprehensive fees and a Graduate Student Senate fee are the responsibility of the student.

Approximately 20 hours of research and/or teaching effort per week is required of Graduate Teaching, Research or Research/Teaching assistants, and assistants must expect that more than one academic year will be necessary to complete the requirements for the master's degree. If a Teaching or Research/Teaching assistant is a candidate for the doctoral degree, at least four calendar years must be anticipated for completion of the academic program. Generally, assistants are appointed in the departments in which they are doing graduate work.

## THE UNIVERSITY AND THE DIVISION OF STUDENT AFFAIRS ADMINISTRATIVE GRADUATE ASSISTANTSHIPS

Graduate Administrative Assistantships are awarded through the Higher Education and Student Affairs Administration (HESA) MED program and other graduate programs across campus. Graduate students who hold these assistantships gain valuable administrative, advising or program development experience in an area related to their program of study. Each HESA Graduate Administrative Assistantship is designed to provide graduate students with a professional opportunity to support and develop UVM's goals and activities through its work with students. Prioritizing holistic learning across curricular, co-curricular, and professional engagements, these Graduate Administrative Assistantship positions are located across various university departments to support student success initiatives and foreground equity within these professional roles.

Stipend, benefits, enrollment requirements and effort expectation are the same as those for Graduate Research or Teaching Assistants.

## GRADUATE FELLOWSHIPS/TRAINEESHIPS

Graduate Fellowships/Traineeships are available in some departments through grants from various state and federal agencies. Fellowships/Traineeships may include a stipend, tuition scholarship and payment of the Single Student Health Insurance premium.

## TRAVEL MINI-GRANTS

The Graduate College provides mini-travel grants to help students underwrite the cost of attending conferences where they will present papers or posters based upon their research. The Mini-Grants Program is administered by the Graduate Student Senate. Funds are awarded three times per year. The student's home department must provide a match. Further information on the Mini-Grants Program is available at the GSS website.

## SMALL GRANTS FOR RESEARCH SUPPORT

The Graduate College has funds for small awards (up to \$750) to graduate students to support their thesis or dissertation research. These awards are limited to students in programs where extramural support is typically not available and resources from their program or academic college/school are not available.

## OTHER FELLOWSHIPS

Fellowships established by private donors or through departmental resources are available periodically in some departments. Please check the website for the program in which you are interested for this information. In addition, the Graduate College has several awards for students in specific disciplines. Please see the Student Awards page on the Graduate College Website for further information.

## PAYMENTS

By registering for courses, students are entering into a financial arrangement with UVM and accept responsibility for charges billed to their UVM account. This legal responsibility of the student is regardless of whether a third party is assisting with payment of their UVM expenses. The online registration system will generate charges based on enrolled credits. Students who enroll in advance for courses will receive notification at their university email address when itemized billing statements of applicable charges are ready to view online. The billing statement will include instructions to settle in full by a specific date. Advance payments are accepted; checks should be made payable to the University of Vermont. Any checks or payments received by the university may be applied to outstanding balances.

Students who cannot meet their financial obligations because of unusual circumstances should contact the Office of Student Financial Services as soon as possible before the payment due date.

Students who have not satisfactorily completed financial arrangements by the announced due date will be assessed a late payment fee and a financial hold preventing access to add courses, view grades, or get transcripts. They are also subject to potential cancellation of their enrollment. Dis-enrollment will automatically place a registration hold on a student's account that will prevent re-enrolling until the student has contacted Student Financial Services to discuss the account.

The university reserves the right to withhold registration material, the diploma, degree, and all information regarding the record, including transcript, of any student who is in arrears in the payment of tuition, fees, or other charges, including, but not limited to, student loans, meal and housing charges, and parking fines.

Seriously delinquent accounts may be placed with an outside collection agency and/or reported to the national credit bureau system. Students are responsible for all late payment fees, collection charges, attorney fees, interest and any other costs and charges necessary for the collection of amounts not paid when due.

International student accounts may be placed with a collection agency if the University can identify a collection agency willing to pursue collections in the student's home country. Since international

student visas require students to supply proof of ability to pay, if it is determined that they no longer have the ability to meet their financial obligations they may have their immigration records terminated and the student will be required to leave the United States.

Accounts with problematic history of payment may be required to pre-pay for the semester or year depending upon case by case assessment by the Director of Student Financial Services.

## BUDGETED PAYMENT

The university offers a Monthly Payment Plan ([https://www.uvm.edu/studentfinancialservices/payment\\_billing\\_repayment/#monthly\\_payment\\_plan](https://www.uvm.edu/studentfinancialservices/payment_billing_repayment/#monthly_payment_plan)) that allows payment of tuition and fees, as well as university billed housing and meals, over a 5-month period (July 1 to November 1 and December 1 to April 1).

## LATE PAYMENT FEE

Students who have not satisfactorily completed financial arrangements by the announced due date will be assessed a late payment fee of \$250 and a financial hold. Learn more about reviewing and responding to the bill ([https://www.uvm.edu/studentfinancialservices/billing\\_and\\_payment\\_due\\_dates/#review\\_bill](https://www.uvm.edu/studentfinancialservices/billing_and_payment_due_dates/#review_bill)) to avoid a late payment fee.

## SPONSORED AND INSTITUTIONAL RESEARCH

During fiscal year 2021, the university received 711 research awards representing \$204,000,000 in funding from a diverse range of sponsors (over 300) from proposals submitted by more than 300 Principal Investigators. UVM ranks nationally as one of the 100 leading public research universities in terms of federal grant support. In addition, there are a substantial number of faculty research projects supported, in part, by institutional funds. Graduate students frequently serve as integral parts of faculty research projects in a wide range of disciplines.

## ACADEMIC AND STUDENT LIFE RESOURCES

### GRADUATE TEACHING PROGRAM

UVM's Center for Teaching & Learning (CTL), Writing in the Disciplines Program (WID), and the Graduate College invite graduate students to participate in the Graduate Teaching Program. Graduate students completing the program can earn formal recognition from the Graduate College.

This program, designed for graduate students who are interested in pursuing teaching in higher education, provides encouragement and feedback in developing teaching philosophies, practices and strategies to prepare you to teach to a wide variety of students, support for preparing a teaching portfolio, a supportive community encouraging professional development.

## GRADUATE WRITING CENTER

The Graduate Writing Center offers free one-to-one and small group consultations for graduate student writers at work on a wide range of projects for academic and public audiences. Staffed by experienced tutors who hail from graduate programs across the campus, the Graduate Writing Center also supports graduate students in their writing through Sunday Graduate Writing Retreats, Friday Forums, and multi-day “camps” for thesis and dissertation writers.

## STUDENT ACCESSIBILITY SERVICES

Student Accessibility Services (SAS) offers: exam accommodations, meetings with Accessibility Specialists to receive advisement and advocacy around disability-related matters, ebooks, Deaf and Hard of Hearing services, notetaking and adaptive technology, as well as other programs and services. For a student with a diagnosis/condition that may be considered disabling, using accommodations and services at SAS could be a resource that helps break down barriers and insures equal access. In order to be eligible for academic services through SAS, students should provide documentation about their disability and meet with a staff person to discuss their disability and their accommodations.

## UVM STUDENT RESEARCH CONFERENCE

All UVM students performing research or creative projects under the mentorship of a UVM faculty member are encouraged to participate in the UVM Student Research Conference, which is a full day devoted to presentations by graduate and undergraduate students from all disciplines. This event is sponsored by the Vice President for Research, the Graduate College and the Honors College.

## STATISTICAL SOFTWARE SUPPORT AND CONSULTING SERVICES

Located on the first floor of Howe Library in room 115, Statistical Software Support and Consulting Services provides help with statistical methodologies, data analysis, experimental design, and the use of statistical software. Please visit the Howe Library website for additional information.

## GRADUATE STUDENT SENATE

The Graduate Student Senate (<https://www.uvm.edu/gss/>) (GSS), composed of graduate student representatives from various graduate programs, provides a forum for discussion of graduate student issues and assists the dean and the Executive Committee in matters affecting graduate students. Issues considered by GSS include academic matters, professional development and student life. GSS sponsors occasional social events and conducts a mini-grants program to support, in part, expenses associated with student travel for professional purposes.

## GRADUATE STUDENT OMBUDSPERSON

The Graduate Student Ombudsperson is responsible for providing independent, confidential, informal and impartial assistance to graduate students on matters affecting their graduate education. The Graduate College ombudsperson is a designated neutral party and approaches each case impartially and without prejudice. The

Ombudsperson is committed to fairness, equity and the humane treatment of all parties.

## GRADNET

GRADNET is an electronic forum where graduate students, faculty, and staff discuss issues, research topics, graduate student life, and announcements that pertain to the graduate community. Subscription is voluntary. Please refer to the Graduate College website for further information and instructions to subscribe.

## INTERFAITH CENTER

The Interfaith Center is open to all UVM students, staff, faculty, and affiliates for reflection, spiritual practice, conversation, education, and community building. The Center offers a peaceful space to study, pray, meditate, explore resources and talk with others who share a desire to explore faith across cultures. The Center hosts a number of programs throughout the year to bring people together and encourage conversation.

## PRISM CENTER

The Prism Center serves the diverse queer and trans communities at UVM. The Center supports and empowers lesbian, gay, bisexual, transgender and queer students, as well as students whose identities fall in between or expand beyond those categories, and works to create a campus community where people of all sexual and gender identities can thrive. The Center offers opportunities for all members of UVM's LGBTQA+ and allied communities to be together, build community and learn from one another. The Prism Center holds a variety of events, social and educational programs, and training & advocacy opportunities throughout the year for students, staff, and faculty members.

## THE MOSAIC CENTER FOR STUDENTS OF COLOR

The vision for the Mosaic Center for Students of Color (MCSC) is to create a diverse and rich community of empowered, engaged, and enthusiastic students of color at UVM. The MCSC is designed to connect students with resources to assist them in their journey and with one another. The Center fully supports the holistic development of self-identified students of color so that they can reach their goals for academic achievement, personal growth, identity formation, and cultural development. The MCSC administers a variety of programs throughout the year.

## WOMEN AND GENDER EQUITY CENTER

The Women and Gender Equity Center (WAGE) envisions a diverse and equitable learning environment for all members of the UVM community. The WAGE Center strives to provide programming, education, and events that connect our community through the exploration of the intersections of their gender and other identities.

## DEGREE REQUIREMENTS

The Graduate College of the University of Vermont is responsible for all advanced degree programs except the program leading to the degree of Doctor of Medicine. Degree requirements for graduate

students vary by academic program and degree type. Please see below for degree specific requirements of the Graduate College and program pages for additional program specific requirements.

## MINIMUM GRADE-POINT AVERAGE REQUIREMENT

To meet the graduation requirements of the Graduate College, a student must have attained a minimum cumulative grade-point average of 3.00. Individual graduate programs may require a higher grade-point average for graduation. Transfer of credit grades cannot be included in this average. Additionally, at least 15 graded credit hours must have been taken after matriculation into a graduate degree program or 9 credits must have been taken after matriculation into a micro-Certificate of Graduate Study or Certificate of Graduate Study.

- Requirements for Accelerated Master's Programs (p. 259)
- Requirements for Certificates of Graduate Study (p. 259)
- Requirements for the Master's Degree (p. 260)
- Requirements for the Master of Education Degree (p. 261)
- Requirements for the Master of Professional Studies Degree (p. 263)
- Requirements for the Doctor of Education Degree (p. 263)
- Requirements for the Doctor of Nursing Practice Degree (p. 264)
- Requirements for the Doctor of Occupational Therapy Degree (p. 265)
- Requirements for the Doctor of Philosophy Degree (p. 265)
- Requirements for the Doctor of Physical Therapy Degree (p. 267)

## REQUIREMENTS FOR ACCELERATED MASTER'S DEGREE ENTRY PROGRAMS

Accelerated Master's Degree (AMP) entry programs are designed to allow current UVM undergraduate students to earn both bachelor's and master's degrees within a total of 5 years for standard 30-36 credit master's programs. Master's programs with more credit requirements will take longer to complete. Students are expected to be full-time until completion of the master's degree. Not all UVM master's degree programs include an AMP option. Those programs that do are listed in the undergraduate catalog under Unique Learning Opportunities/Accelerated Degree Programs. The curriculum for an AMP is identical to that of the affiliated master's degree. The AMP is an entry point into an existing master's degree, not a separate degree.

AMP students may use up to 9 credits of graduate-level courses taken at UVM toward both the bachelor's and master's degrees. Some programs specify the courses that must be taken; in others it is determined individually. Some programs allow only 6 credits to count towards both the bachelor's and master's degrees, but may then allow another 3 taken as an undergraduate student to count towards the master's degree only.

Graduate-level courses taken for the AMP prior to earning the bachelor's must be graded A-F and cannot be independent study or research; thesis research credits; internships; or practica.

Under no circumstance will more than 9 credits of graduate-level coursework taken prior to earning the bachelor's be applied towards the graduate degree.

Students must apply for and be accepted to the AMP through the standard Graduate College application process. Typically, the application and admission process are finalized in the semester prior to the beginning of the senior year. In all cases, students must be admitted by the Graduate College before taking any courses that will apply to the master's degree, i.e., all courses used for the master's degree must be taken after formal admission to the AMP.

Standardized admissions tests are typically not required for AMP admission. AMP students may not receive fellowship or assistantship funding prior to completion of the bachelor's degree and, normally, AMP students are not funded following completion of the bachelor's as the intent is for them to be fully engaged in their studies and complete the master's one year beyond the bachelor's degree.

AMP students are dually enrolled as an undergraduate and a graduate student until they have completed the requirements for an undergraduate degree, and have received their diploma. Once the bachelor's degree is conferred, students are enrolled as graduate students only. Students are subject to the Graduate College dismissal policy while taking graduate coursework in undergraduate status.

AMP students are expected to enroll in the term following completion of their bachelor's degree unless approved for a leave of absence. If the AMP student does not enroll in courses, or take a leave of absence, they will be required to reapply for consideration as a direct entry Master's student should they wish to enroll. The credits taken as an AMP undergraduate student will not count toward their Master's degree. If the credit is for a required course, the program may use their discretion in waiving the requirement but not the credit.

## REQUIREMENTS FOR THE CERTIFICATES OF GRADUATE STUDY

Certificates of Graduate Study provide opportunities for currently enrolled UVM graduate degree students to acquire an additional concentration of study and for post-baccalaureate certificate only students to prepare for further graduate study and/or develop their professional skills.

The general requirements for a Certificate of Graduate study at UVM are:

1. A minimum of 15 graded credits of graduate-level course work is required. Some certificates require more than 15 credits. The courses must be in a defined subject area and approved for the specific certificate. At least 9 of the credits must be identified as core courses in the certificate curriculum, and the remaining courses must be chosen from a published and approved list of options for that certificate.

- All credits must be completed at UVM within a 5 year period. Graduate credits taken at other institutions may not transfer into a UVM Certificate of Graduate Study program. Up to 6 credits (but not grades) from 300-level courses taken at UVM as a non-degree student may transfer into the certificate.
- Students who elect to pursue a Certificate of Graduate Study in conjunction with a master's or doctoral program must apply to the Certificate before registering for the final 9 credits needed for the Certificate. Students pursuing a master's or doctoral degree must choose a Certificate of Graduate Study in a different discipline from the graduate degree.
- A minimum grade point average of 3.00 must be achieved in the certificate program. At least 9 credits of graded coursework taken after admission to the certificate program are required to calculate the Certificate of Graduate Study GPA.
- Credits used for a Certificate of Graduate Study may be applied toward an appropriate master's or doctoral degree at UVM, and credits applied toward a graduate degree at UVM may be applied toward an appropriate Certificate of Graduate Study, subject to the above (i.e., credits may overlap between one certificate and one degree). Credits taken for one Certificate of Graduate Study may not be used to fulfill the requirements for another Certificate of Graduate Study.

## REQUIREMENTS FOR THE MICRO-CERTIFICATES OF GRADUATE STUDY

The micro-Certificate of Graduate Study (mCGS) is similar in intent to the Certificate of Graduate Study but comprises fewer courses (9-14 credits). The goal of the mCGS is to provide students with the opportunity to take a smaller, more specific core set of courses that can either stand alone as an independent credential or be used towards the completion of a Certificate of Graduate Study.

The general requirements for a micro-Certificate of Graduate study at UVM are:

- A minimum of 9 graded credits of graduate-level course work is required; however, a mCGS may require up to 14 credits. The courses must be in a defined subject area and approved for the specific certificate. At least 6 of the credits must be identified as core courses in the certificate curriculum, and the remaining courses must be chosen from a published and approved list of options for that certificate.
- All credits must be completed at UVM within a 3 year period. Graduate credits taken at other institutions may not transfer into a UVM micro-Certificate of Graduate Study program. 3 to 5 credits (but not grades) from 300-level courses taken at UVM as a non-degree student may transfer into a micro-Certificate that requires 12-14 credits total.
- Students who elect to pursue a micro-Certificate of Graduate Study must apply to the mCGS before registering for the final 9 credits needed for the mCGS. Students pursuing a master's or doctoral degree must choose a micro-Certificate of Graduate Study in a different discipline from the graduate degree.
- A minimum grade point average of 3.00 must be achieved in the mCGS.
- Credits used for a mCGS may be applied toward an appropriate Certificate of Graduate Study, master's or doctoral degree at UVM, and conversely, credits applied toward a graduate degree at UVM may be applied toward an appropriate mCGS (i.e., credits may overlap between one mCGS and one degree or CGS). Credits taken for one mCGS may not be used to fulfill requirements for another mCGS.

## REQUIREMENTS FOR THE MASTER'S DEGREE

In addition to the requirements described below, individual programs may have their own specific requirements. Students must read and familiarize themselves with their program's requirements. Some of them are detailed in this catalogue under individual program listings and other requirements are available from the director or chair of each program.

### CREDITS

Master's degrees require a minimum of 30 credits; some programs require more. A minimum grade point average of 3.00 must be achieved. A minimum of fifteen graded credits used in compilation of the graduate GPA must be taken in residence at UVM following matriculation into the master's program. Consult individual program descriptions for specific credit requirements. In programs that require a thesis, the number of credits earned in thesis research may vary by program between 6 (minimum) and 15 (maximum). Thesis credit is included as part of the 30-hour minimum. With the prior approval of their program and the Graduate College, students may apply one 100-level or 200-level (and not listed in the Graduate Catalogue as approved for graduate credit) course toward their graduate program. The student's advisor must petition the Graduate College for approval before the student enrolls in the course. Consult individual programs for further limitations. Under no circumstances will a course numbered below 100 be applicable to a master's program.

### MINIMUM RESIDENCE REQUIREMENTS

Candidates for the master's degree must satisfactorily complete 21 credits in residence. The residency requirement is completed by courses that

- are taken for graduate credit through the University of Vermont, and
- are taken after the student has been admitted to the Graduate College.

Some programs may require more than the above minimum hours in residence. Consult with the individual program.

### COMPREHENSIVE EXAMINATION

All master's degree students are required to pass a written and/or oral comprehensive examination in their field of specialization. If both formats are used, satisfactory completion of the written examination is prerequisite to standing for the oral examination. One re-examination only is permitted for any failed comprehensive

examination. The comprehensive examination is not the same as the oral thesis defense, and must be passed satisfactorily before defending the thesis. Consult individual program descriptions for specific information.

There is no fee for the master's comprehensive examination. The student's program director or advisor must notify the Graduate College of the outcome of the examination. The result and date of the examination is recorded as a notation on the academic transcript.

## RESEARCH AND THESIS

If a thesis is required, the candidate for the master's degree undertakes a problem of original research under the supervision of a faculty member in the department of specialization. At the conclusion of the research, the student must present and defend successfully a thesis which embodies the results of the work and demonstrates the capability for independent research.

## THESIS DEFENSE FORMS

Defense Committee Membership and Defense Notice forms must be submitted to the Graduate College by the designated deadlines. A Public Notice of the defense is required in order to defend. The Intent to Graduate form must be submitted to the candidate's department/program and the Graduate College by the published deadline for the graduation cycle.

## THESIS FORMAT

Students are required by the Graduate College to use a computer software program appropriate to the discipline to create the Table of Contents and the Lists of Tables and Figures from the thesis text headings.

The thesis must be prepared and submitted in compliance with the "Guidelines for Writing a Thesis or Dissertation" available from the Graduate College website. A formatted copy of the thesis must be submitted to the Graduate College for a Format/Record Check at least 3 weeks prior to the scheduled defense. Students must also provide defendable copies of the thesis to members of their thesis defense examination committee at least 2 weeks before the scheduled examination. Individual departments may require earlier deadlines.

Students must notify the Graduate College of the thesis defense at least 3 weeks prior to defending their thesis.

The oral defense of a thesis may be scheduled only after successful completion of the comprehensive examination and the submission of an original copy of the thesis to the Graduate College for a Format/Record Check.

## THESIS DEFENSE EXAMINATION COMMITTEE

The thesis defense examination committee consists of at least 3 University of Vermont faculty members, at least 2 of whom must be regular members of the graduate faculty. If a student has co-advisors, they count as 1 committee member. Ordinarily, 2 committee members will be from the candidate's program, including the thesis advisor. The third member, who acts as chair of the committee, must be a member of the graduate faculty, must be from a different

program and department (including any secondary or adjunct appointments) than the candidate and advisor, and must be approved by the Graduate College upon nomination by the thesis advisor. For University-wide interdisciplinary programs, and/or programs that incorporate faculty from multiple departments, the chair must be outside the department of the candidate's advisor. The thesis defense examination committee and the graduate studies committee do not have to be the same.

The chair of the thesis defense examination committee has the responsibility for ensuring proper conduct of the examination, appropriate documentation of the results, and that the signatures of endorsement are added to the Defense Examination Record following a successful defense.

The acceptability of the thesis is determined by the thesis defense examination committee. The result and date of the examination is recorded as a notation on the academic transcript. If a student's defense examination performance is not satisfactory, then only one re-examination is permitted.

After a successful thesis defense, candidates must electronically upload the corrected thesis to <http://www.etdadmin.com/uvvm> (<http://www.etdadmin.com/uvvm/>) for approval by the Graduate College within the time period specified by the thesis defense examination committee and/or the Graduate College.

## ADDITIONAL REQUIREMENTS FOR THE MASTER OF ARTS IN TEACHING

The M.A.T. degree in Curriculum and Instruction is designed for students seeking initial licensure for middle school or high school teaching. For those seeking licensure in secondary education, the program requires at least 30 credits of education course work and at least 30 credits in the field of specialization for each subject that you are seeking licensure. For those seeking licensure in middle level education, the program requires at least 30 credits in education coursework and 18 credits in one content field for middle level endorsement. The middle level or secondary program coordinator must approve the individual program of study for each M.A.T. student.

## ADDITIONAL REQUIREMENT FOR THE MASTER OF SCIENCE FOR TEACHERS

Applicants for the Master of Science for Teachers must be licensed teachers. Students in a Master of Science for Teachers program may apply more than one 3-credit, 100-level course toward their degree. Consult specific department listings for additional requirements and policies related to this degree program.

## REQUIREMENTS FOR THE MASTER OF EDUCATION DEGREE

The graduate program of each student admitted to candidacy for the degree of Master of Education is planned and supervised by an advisor in the respective program area. Program planning is

based upon the student's undergraduate curriculum, professional experience, and aims and purposes in pursuing the master's degree.

Each program must include a minimum of 30 approved credits (some programs require more; check individual program pages for requirements). A minimum grade point average of 3.00 must be achieved. If a student's preparation is inadequate to begin study at the graduate level, additional undergraduate courses will be required. Normally, each Master of Education degree program must include a minimum of 3 to 6 semester hours of graduate work in the foundations of education unless this requirement or its equivalent has been met previously.

## COMPREHENSIVE EXAMINATION

A comprehensive examination is required. It may be written, oral, or both. The choice of the examination format will be made by faculty members in the area of specialization after consultation with the advisor and the candidate.

1. The written comprehensive examination will cover the field of education with emphasis on the area of specialization.
2. The oral comprehensive examination will emphasize the area of specialization.

It is the responsibility of the candidate to schedule the required examination with the College of Education and Social Services. Since each program has different options for meeting the oral and written comprehensive requirements, candidates must contact the respective program coordinator or advisor regarding program policy.

## THESIS OPTION

If the thesis option is elected (Interdisciplinary and Educational Leadership and Policy Studies only), the oral or written comprehensive examination must be successfully completed prior to the thesis defense.

## RESEARCH AND THESIS

If a thesis is elected (Interdisciplinary and Educational Leadership and Policy Studies only), the candidate for the master's degree undertakes a problem of original research under the supervision of a faculty member in the department of specialization, and registers for a minimum of 6 credits of thesis research. At the conclusion of the research, the student must present and successfully defend a thesis which embodies the results of the work and demonstrates the capability for independent research.

## THESIS DEFENSE FORMS

Defense Committee Membership and Defense Notice forms must be submitted to the Graduate College by the designated deadlines. A Public Notice of the defense is required in order to defend. The Intent to Graduate form must be submitted to the candidate's department and the Graduate College by the published deadline for the cycle in which the student plans to graduate.

## THESIS FORMAT

Students are required by the Graduate College to use a computer software program appropriate to the discipline to create the Table of Contents and the Lists of Tables and Figures from the thesis text headings.

The thesis must be prepared and submitted in compliance with the "Guidelines for Writing a Thesis or Dissertation" available from the Graduate College website. A formatted copy of the thesis must be reviewed by the Graduate College at the Format/Record Check at least three weeks prior to the scheduled defense. Students must also provide defensible copies of the thesis to members of their thesis defense examination committee at least two weeks before the scheduled examination. Individual departments may require earlier deadlines.

Students must notify the Graduate College of the thesis defense at least three weeks prior to defending their thesis.

## THESIS DEFENSE EXAMINATION COMMITTEE

The thesis defense examination committee consists of at least three University of Vermont faculty members, at least two of whom must be members of the graduate faculty. Ordinarily, two committee members will be from the candidate's program, including the thesis advisor. The third member, who acts as chair of the committee, must be a member of the graduate faculty, must be from a different program and department (including any secondary or adjunct appointments) than the candidate and advisor, and must be approved by the Graduate College dean upon nomination by the thesis advisor. The thesis defense examination committee and the graduate studies committee do not have to be the same.

The chair of the thesis defense examination committee has the responsibility for ensuring proper conduct of the examination, appropriate documentation of the results, and that the signatures of endorsement are added to the Defense Examination Record following a successful defense.

The acceptability of the thesis is determined by the thesis defense examination committee. The result and date of the examination is recorded as a notation on the academic transcript. If a student's defense examination performance is not satisfactory, then only one re-examination is permitted.

After a successful thesis defense, candidates must electronically upload the corrected thesis to <http://www.etsadmin.com/uvvm> (<http://www.etsadmin.com/uvvm/>) for approval by the Graduate College within the time period specified by the thesis defense examination committee, and/or the Graduate College.

## REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF EDUCATION

15 credits of Education and related areas or appropriate professional experience as detailed in application. The Education courses prerequisites may not apply to the Higher Education and Student Affairs Administration, Educational Leadership and Policy Studies,

or Interdisciplinary Studies programs, i.e., persons seeking positions which do not require public school certification.

## MINIMUM DEGREE REQUIREMENTS

18 graduate credits in courses in Education and 12 additional credits in approved graduate courses or 6 additional credits and thesis research; a year of successful experience in teaching or in a related educational activity.

## REQUIREMENTS FOR THE MASTER OF PROFESSIONAL STUDIES DEGREE

In addition to the requirements described below, individual programs may have their own specific requirements. Students must read and familiarize themselves with their program's requirements. Some of them are detailed in this catalogue under individual program listings and other requirements are available from the director or chair of each program.

## CREDITS

Master of Professional Studies (M.P.S.) degrees require a minimum of thirty credits; some programs require more. A minimum grade point average of 3.00 must be achieved. A minimum of fifteen graded credits used in compilation of the graduate GPA must be taken in residence at UVM following matriculation into the master's program. Consult individual program descriptions for specific credit requirements. With the prior approval of their program and the Graduate College, students may apply one 100-level, or 200-level (and not listed in the Graduate Catalogue as approved for graduate credit) course toward their graduate program. The student's advisor must petition the Graduate College for approval before the student enrolls in the course. Consult individual programs for further limitations. Under no circumstances will a course numbered below 100 be applicable to a master's program.

## MINIMUM RESIDENCE REQUIREMENTS

Candidates for the M.P.S. degree must satisfactorily complete twenty-one credits in residence. The residency requirement is completed by courses that:

1. are taken for graduate credit through the University of Vermont, and
2. are taken after the student has been admitted to the Graduate College.

Some programs may require more than the above minimum hours in residence. Consult with the individual program.

## COMPREHENSIVE EXAMINATION

All M.P.S. degree students are required to pass a written and/or oral comprehensive examination in their field of specialization. If both formats are used, satisfactory completion of the written examination is prerequisite to standing for the oral examination. All comprehensive examinations are taken on the University of Vermont campus in Burlington. One re-examination only is permitted for

any failed comprehensive examination. Consult individual program descriptions for specific information.

There is no fee for the Master's Comprehensive Examination. The student's program director or advisor must notify the Graduate College of the outcome of the examination. The result and date of the examination is recorded as a notation on the academic transcript.

## INTERNSHIP/RESEARCH

All M.P.S. degree students must complete a minimum of 3 and a maximum of 6 credits of project research or internship to apply their newly acquired knowledge as they develop practical skills.

## CAPSTONE PROJECT

All M.P.S. degree students must complete a capstone project that is the culmination of their studies and integrates their research or internship experience into a professional framework informed by their curriculum. The capstone project must be presented to and assessed by program faculty.

## REQUIREMENTS FOR THE DOCTOR OF EDUCATION DEGREE

### CREDITS

A minimum of 59 credits earned in courses and in dissertation research, at least 53 of which were completed at UVM following formal admission to the program. With the prior approval of their graduate program advisor and the Graduate College, doctoral students may apply up to 6 credits of 100-level, or 200-level courses (not listed in the Graduate Catalogue as approved for graduate credit), towards their graduate program. A student's advisor must submit this request to the Graduate College for approval before the student enrolls in the course. Under no circumstances will a course numbered below 100 be applicable to a doctoral program. Doctoral students must achieve a 3.00 grade point average.

A maximum of 6 credit hours may be accepted in transfer from an accredited graduate program. Credits to transfer may be completed prior to admission to the Doctor of Education program provided that the credit is approved by the student's graduate program advisor and that the credit conforms to all other Graduate College requirements.

## COMPREHENSIVE EXAMINATION

Consistent with Graduate College requirements, the Ed.D. program requires students to complete a comprehensive examination of core knowledge prior to the completion of the degree program. This examination occurs in the semester following the completion of the core course curriculum, with the exception of EDLP 449, Dissertation Writing Seminar. Currently the comprehensive examination is administered in October of Year 3. The examination tests knowledge in areas of study germane to all Ed.D. students.

## RESEARCH AND DISSERTATION

Each candidate, while in residence at the University of Vermont, must complete an acceptable original research project which contributes new knowledge or techniques in an academic field. Each candidate



must enroll in a minimum of 17 credits of dissertation research. Only a member of the graduate faculty may supervise dissertation research for the Ed.D.

## DISSERTATION DEFENSE FORMS

Defense Committee Membership and Defense Notice forms must be submitted to the Graduate College by the designated deadlines. A Public Notice of the defense is required at least three weeks prior to the scheduled defense date in order for the student to defend. The Intent to Graduate form must be submitted to the candidate's department and the Graduate College by the published deadline for the cycle in which the student plans to complete all degree requirements.

## DISSERTATION FORMAT

Students are required by the Graduate College to use a computer software program appropriate to the discipline to create the Table of Contents and the Lists of Tables and Figures from the dissertation text headings.

A dissertation must be prepared and submitted in compliance with the "Guidelines for Writing a Thesis or Dissertation" available from the Graduate College website. A formatted copy of the dissertation must be reviewed by the Graduate College for a Format/Record Check at least three weeks prior to the scheduled oral defense. Each student must also provide copies of the dissertation to members of the dissertation defense examination committee at least two weeks before the scheduled examination. A student's committee may require earlier deadlines.

The dissertation may be defended only after successful completion of the comprehensive examination and the submission of an original copy of the dissertation to the Graduate College for a Format/Record Check.

## DISSERTATION DEFENSE EXAMINATION COMMITTEE

The dissertation defense examination committee consists of a minimum of four University of Vermont faculty members, all regular members of the graduate faculty. The advisor and two graduate faculty members must be from inside the Department of Education or the Department of Leadership and Developmental Sciences, though one may be from outside these departments with program approval. The chair must be both a member of the graduate faculty and from outside the candidate's and advisor's department and program. The definition of outside faculty means the faculty member has no appointment of any kind in the department or program. The dissertation defense examination committee must be approved by the Graduate College prior to the defense.

The chair of the dissertation defense examination committee has the responsibility for ensuring proper conduct of the examination, appropriate documentation of the results, and that the signatures of endorsement are added to the Defense Examination Record following a successful defense.

The acceptability of the dissertation is determined by the dissertation defense examination committee. The chair of the dissertation defense examination committee notifies the Graduate College of the outcome. The result of the defense and the date defended will be recorded as a notation on the academic transcript. If a student's defense examination performance is not satisfactory, then one reexamination, and one only, is permitted.

After a successful dissertation defense, candidates must electronically upload the corrected dissertation to <http://www.etdadmin.com/uvvm> (<http://www.etdadmin.com/uvvm/>) for approval by the Graduate College within the time period specified by the dissertation defense examination committee, and/or the Graduate College.

## REQUIREMENTS FOR THE DOCTOR OF NURSING PRACTICE DEGREE

The Department of Nursing offers a graduate program leading to a Doctor of Nursing Practice (D.N.P.) degree. The program prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, and to acquire the foundation for doctoral study and continued professional development. The ability to work collaboratively on an interdisciplinary team, provide patient-centered care, employ evidence-based practice, access information technology, and apply quality improvement strategies are basic competencies expected of all graduates of this program. The D.N.P. program prepares graduates to provide primary care as advanced practice registered nurses (APRNs) in one of two tracks: Adult-Gerontology Nurse Practitioner (AGNP), or Family Nurse Practitioner (FNP). Additionally, the program offers nurses with an earned Master's Degree in nursing the opportunity to complete a post-MS D.N.P. degree, either in primary care or as an executive nurse leader.

## MINIMUM DEGREE REQUIREMENTS

The D.N.P. graduate curriculum includes 9 core courses essential for all students that address the theoretical foundation of nursing care, professional issues and role development of APRNs, evidence based research utilization and practice, health policy and finance, ethics, health care informatics, quality of health care delivery, leadership of health care systems, genetics/ genomics, population-based health, biostatistics and epidemiology. Students apply core content to their D.N.P. Program. Upon successful completion of program requirements APRN students are eligible to complete a national certification exam as either FNP or AGNP.

Students on the Adult-Gerontology Nurse Practitioner (AGNP) track are required to earn 69.5 credits; students on the Family Nurse Practitioner (FNP) track are required to earn 76 credits. A course list for both tracks can be found on the College of Nursing and Health Sciences website. A minimum grade point average of 3.00 must be achieved.

As a CNHS graduate nursing student, students are required to complete the CNHS mandates prior to matriculating into the program. Students must keep these requirements current throughout their program: Immunizations, CPR, HIPPA/OSHA training, annual PPD, and RN License. Some clinical sites require a criminal

background check as well. It is essential to be compliant with this process to participate in clinical courses/experiences. Complete details on CNHS Mandatories are available on the college website.

## COMPREHENSIVE EXAMINATION

The Comprehensive Examination is conducted by the Graduate Program in the Department of Nursing. The examination is designed to allow the student to demonstrate analysis and synthesis of knowledge gained through the program. Students may take the examination any time after the majority of the core courses have been successfully completed, and must be completed prior to the final track courses and practicums. Students will be expected to orally present their D.N.P. Project proposal, clearly articulating, synthesizing, and applying the D.N.P. Essentials and the NP competencies and core content addressed throughout the program of study as they relate to their D.N.P. Project.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. In the event that the student does not achieve a satisfactory on the oral comprehensive exam, one opportunity to provide written evidence of satisfactory achievement of the goal of the comprehensive exam will be allowed and is to be submitted by two weeks following the oral attempt.

## D.N.P. PROJECT

The project option is a scholarly academic experience of the graduate program where students develop and conduct an innovative project/production relevant to advanced nursing practice with faculty supervision. It is anticipated that the D.N.P. project will result in innovative practices that will improve health care delivery and patient outcomes. Students are required to present and defend the project orally upon its completion.

## REQUIREMENTS FOR THE DOCTOR OF OCCUPATIONAL THERAPY DEGREE

The Department of Rehabilitation and Movement Science offers an entry-level Doctor of Occupational Therapy (OTD) degree. The entry-level Occupational Therapy Doctorate Degree is designed to prepare students to become Occupational Therapy practitioners.

Graduates will learn how to help people attain their desired level of participation in life regardless of age, race, ethnicity, culture, or socioeconomic background. They will learn Occupational Therapy practice across the lifespan and across practice settings. They will become scholarly and innovative thinkers, and will articulate clearly through written and verbal communication the value of the profession. Following successful completion of all didactic coursework, fieldwork, and the capstone project and experience, students will be eligible to sit for the National Board for Certification in Occupational Therapy (NBCOT). A felony conviction may affect a graduate's ability to sit for the NBCOT certification examination or attain state licensure.

## DEGREE REQUIREMENTS

Students enter the entry-level Doctor of Occupational Therapy program with a bachelor's degree. The program is an 8-semester, 98-credit program that consists of traditional, didactic teaching,

experiential learning, fieldwork, and a scholarship capstone project and experience. Students must satisfactorily complete every aspect of the program. Students must also complete and maintain College of Nursing and Health Sciences mandatories including but not limited to: Immunizations, CPR, HIPPA/OSHA training, criminal background checks, etc.

## FIELDWORK

Fieldwork in the OTD program is where students are given the opportunity to practice learned skills in real-world settings. In the OTD program, students participate in 2 Level II fieldwork experiences, 12-weeks each for a total of 24 weeks. During these Level II fieldwork experiences, students work under the supervision of a licensed occupational therapist. Students must successfully pass the 2 12-week Level II fieldwork experiences as part of the entry-level OTD program.

## CAPSTONE EXPERIENCE AND PROJECT

Students are expected to complete a capstone project. The capstone project is an individual, scholarly project that enhances the student's knowledge in an interest area. As part of the capstone project, the student designs and executes a 14-week capstone experience and identifies a capstone mentor to work with during this process. Students must successfully complete and disseminate the entire capstone experience and project as part of the entry-level OTD program.

## REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

In addition to the requirements described below, individual programs may have their own specific requirements. Students must consult and familiarize themselves with their program requirements.

## CREDITS

The degree of Doctor of Philosophy requires a minimum of 75 credits earned in courses and in dissertation research, including a minimum of 30 credits of course work, at least 15 of which must be graded and may not count towards a master's degree, and a minimum of 20 credits of dissertation research. A minimum grade point average of 3.00 must be achieved. A minimum of 15 credits in courses used in compilation of the grade point average must be taken in residence at the University of Vermont following matriculation for the Ph.D. Consult individual programs for additional information on credit hour requirements. Generally, the first year of each doctoral program consists of required courses. With the prior approval of their department and the Graduate College, doctoral students may apply up to 6 credits of 100-level, or 200-level courses not listed in the Graduate Catalogue as approved for graduate credit, towards their graduate program. A student's advisor must petition the Graduate College for approval before the student enrolls in the course. Consult individual programs for further limitations. Under no circumstances will a course numbered below 100 be applicable to a doctoral program.

## MINIMUM RESIDENCE REQUIREMENTS

Candidates for the doctoral degree must satisfactorily complete a minimum of 51 hours in residence. The residency requirement is completed by courses that:

1. are taken for graduate credit through the University of Vermont, and
2. are taken after the student has been admitted to the Graduate College.

Some programs may require more than the above minimum hours in residence.

## TEACHING REQUIREMENT

All doctoral candidates must acquire appropriate teaching experience in their chosen fields prior to the award of the degree. The nature and amount of teaching, for which no academic credit is allowed, will be determined by each candidate's program.

## LANGUAGE REQUIREMENT

Demonstration of competency in foreign languages may be required in some programs. The requirement may be fulfilled by an examination administered by the program or in conjunction with the appropriate language department. The outcome of the language examination is reported to the Graduate College and will appear as a notation on the transcript. There is no fee for taking the exam.

## GRADUATE STUDIES COMMITTEE

It is the responsibility of the graduate studies committee to supervise the graduate student's program and to review progress at regular intervals. A graduate studies committee consisting of at least four regular members of the graduate faculty is appointed by the department chair or designated departmental representative and approved by the Dean of the Graduate College soon after first enrollment in the Graduate College, unless the student's department employs an alternative approved procedure. The chair of the graduate studies committee serves as the student's academic advisor and also as the dissertation advisor or supervisor. Only a regular member of the graduate faculty can serve as an advisor of a doctoral dissertation. On occasion, it may be appropriate for a professional other than a regular member of the graduate faculty to serve as a member of a graduate studies committee. In such cases, written approval must be obtained from the Dean of the Graduate College prior to the student's beginning dissertation research.

## COMPREHENSIVE EXAMINATION

A written comprehensive examination in the field of study must be passed by the candidate at least 6 months before the dissertation is submitted. The examination must be prepared by the program concerned, in consultation with the candidate's graduate studies committee. Should the candidate fail the examination, only one reexamination is permitted. Some programs also require an oral comprehensive examination; success in the written comprehensive examination is prerequisite to standing for the Dissertation Oral Defense Examination.

There is no fee for the Doctoral Comprehensive Examination. The student's program director or advisor must notify the Graduate College of the outcome of the examination. The result of the examination and the date taken will be recorded as a notation on the academic transcript.

## RESEARCH AND DISSERTATION

Each candidate, while in residence at the University of Vermont, must complete an acceptable original research project which contributes new knowledge or techniques in an academic field. Each candidate must enroll in a minimum of 20 credits of dissertation research. Only a member of the graduate faculty may supervise dissertation research for the Ph.D.

## DISSERTATION DEFENSE FORMS

Defense Committee Membership and Defense Notice forms must be submitted to the Graduate College by the designated deadlines. A Public Notice of the defense is required at least 3 weeks prior to the scheduled defense date in order for the student to defend. The Intent to Graduate form must be submitted to the candidate's department and the Graduate College by the published date for the cycle in which the student plans to graduate.

## DISSERTATION FORMAT

Students are required by the Graduate College to use a computer software program appropriate to the discipline to create the Table of Contents and the Lists of Tables and Figures from the dissertation text headings.

A dissertation must be prepared and submitted in compliance with the "Guidelines for Writing a Thesis or Dissertation" available on the Graduate College website and the program. A formatted copy of the dissertation must be reviewed by the Graduate College at the Format/Record Check at least 3 weeks prior to the scheduled oral defense. Each student must also provide defendable copies of the dissertation to members of the dissertation defense examination committee at least 2 weeks before the scheduled examination. Individual departments may require earlier deadlines.

Students must notify the Graduate College prior to defending their dissertations.

## DISSERTATION DEFENSE EXAMINATION COMMITTEE

The dissertation defense examination committee consists of a minimum of 4 University of Vermont faculty members, all regular members of the graduate faculty. If a student has co-advisors, they count as 1 defense committee member. At least 2 graduate faculty members must be from inside the department or program. The chair must be both a member of the graduate faculty and from outside the candidate's and advisor's department and program. The definition of outside faculty means the faculty member has no appointment of any kind in the department or program. For University-wide interdisciplinary programs, and/or programs that incorporate faculty from multiple departments, the chair must be outside the department of the candidate's advisor. Individual programs may require more

than 4 committee members or have other specific membership requirements. The dissertation defense examination committee must be approved by the Graduate College prior to the defense. The dissertation defense examination committee and the graduate studies committee do not have to be the same.

The chair of the dissertation defense examination committee has the responsibility for ensuring proper conduct of the examination, appropriate documentation of the results, and that the signatures of endorsement are added to the Defense Examination Record following a successful defense.

The acceptability of the dissertation is determined by the dissertation defense examination committee. The chair of the dissertation defense examination committee notifies the Graduate College of the outcome. The result of the defense and the date defended will be recorded as a notation on the academic transcript. If a student's defense examination performance is not satisfactory, then 1 reexamination, and 1 only, is permitted.

After a successful dissertation defense, candidates must electronically upload the corrected dissertation to <http://www.etdadmin.com/uvvm> (<http://www.etdadmin.com/uvvm/>) for approval by the Graduate College within the time period specified by the dissertation defense examination committee, and/or the Graduate College.

## REQUIREMENTS FOR THE DOCTOR OF PHYSICAL THERAPY DEGREE

The Doctor of Physical Therapy (D.P.T.) program at the University of Vermont (UVM) consists of 102 graduate credits offered in a 2.5-year full-time program format, over 8 semesters inclusive of summers, that leads to a Doctor of Physical Therapy (D.P.T.) degree. The program is well recognized for preparing D.P.T. graduates as primary care movement system experts who translate evidence into contemporary best practice. Graduates advocate to improve health outcomes and well-being at the individual and community level.

The movement system is the foundation of the curriculum design. Organized in a systems-based model, the curriculum integrates the basic and clinical sciences across the musculoskeletal, nervous, cardiovascular/pulmonary, integumentary and endocrine systems to facilitate student ability to develop as movement system experts. Additionally, the study of evidenced based practice, leadership and professional formation, health policy, business management, and social responsibility shape the students' professional role and identity as a Doctor of Physical Therapy.

Students engage in an array of active learning experiences with multiple opportunities for interprofessional education and community engagement. Integrated clinical experiences and 32 weeks of full time clinical internships broaden student professional preparation. Internships are offered throughout the U.S. in a variety of specialty areas and settings and assignments are based on students' educational needs and clinical site availability. Students are responsible for all costs associated with clinical internships.

Exceptional faculty role model clinical and research expertise across each of the specialty areas of physical therapist practice to facilitate student development as movement system experts.

## COMPREHENSIVE EXAMINATION

The examination takes the form of an individual written student portfolio. Should students not pass the comprehensive examination, they will have one additional opportunity to remediate and provide evidence of achievement of the learning outcomes of the comprehensive examination prior to being able to graduate from the program.

## MINIMUM DEGREE REQUIREMENTS

The UVM D.P.T. program requires successful completion of 102 graduate credits; the passing of all clinical internships and clinical education coursework expectations during their clinical experience and receiving no more than one U grade in a clinical education course (that was successfully retaken for a S grade); and illustrating evidence of professional behaviors commensurate with professional doctoral practice in physical therapy. A minimum cumulative GPA of 3.00 is required for graduation.

## GRADUATE FACULTY

### A

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