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## GRADUATE CATALOGUE

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, degree requirements, charges, regulations, and procedures contained herein as educational and financial considerations require, subject to and consistent with established procedures and authorizations for making such changes.

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<http://www.uvm.edu/academics/catalogue2013-14/?>

Page=archives.html



## ACCOUNTING

### OVERVIEW

The Master of Accountancy (M.Acc.) degree is designed to prepare students to become successful professionals in the field of accounting. The M.Acc. degree also provides individuals interested in becoming a Certified Management Accountant (CMA) with the educational background to successfully pass the exam and begin careers in corporate, governmental and not-for-profit accounting.

### DEGREES

- Accountancy (M.Acc.) AMP (p. 7)
- Accountancy M.Acc. (p. 8)

### FACULTY

**Arel, Barbara M.;** Associate Professor, School of Business Administration; PHD, Arizona State University  
**Beaudoin, Cathy A.;** Assistant Professor, School of Business Administration; PHD, Drexel University  
**Bonifield, Carolyn Marie;** Associate Professor, School of Business Administration; PHD, University of Iowa  
**Cats-Baril, William Lawrence;** Associate Professor, School of Business Administration; PHD, University of Wisconsin Madison  
**Chiang, Kevin C.;** Professor, School of Business Administration; PHD, Louisiana State University  
**Dempsey, Stephen Jeffrey;** Associate Professor, School of Business Administration; PHD, Virginia Polytechnic Institute and State University  
**DeWitt, Rocki-Lee;** Professor, School of Business Administration; PHD, Columbia University  
**Do, Hung Tuan;** Assistant Professor, School of Business Administration; PHD, Purdue University  
**Hughes, Susan Boedecker;** Associate Professor, School of Business Administration; PHD, University of Cincinnati  
**Jones, David A.;** Associate Professor, School of Business Administration; PHD, University of Calgary  
**Kingsley, Allison F.;** Assistant Professor, School of Business Administration; PHD, Columbia University  
**Lucas, Marilyn T.;** Associate Professor, School of Business Administration; PHD, University of Illinois Urbana-Champaign  
**Marble, Hugh;** Assistant Professor, School of Business Administration; PHD, University of Florida  
**McIntosh, Barbara Ruth;** Professor, School of Business Administration; PHD, Purdue University  
**Noordewier, Thomas Gerald;** Professor, School of Business Administration; PHD, University of Wisconsin Madison  
**Novak, David C.;** Associate Professor, School of Business Administration; PHD, Virginia Polytechnic Institute and State University  
**Parke, Edward Lauck;** Associate Professor, School of Business Administration; PHD, University of Massachusetts Amherst  
**Sharma, Pramodita;** Professor, School of Business Administration; PHD, University of Calgary  
**Sharma, Sanjay;** Professor, School of Business Administration; PHD, University of Calgary

**Sinkula, James Michael;** Professor, School of Business Administration; PHD, University of Arkansas  
**Tomas III, Michael John;** Associate Professor, School of Business Administration; PHD, Syracuse University  
**Tomas, Amy M.;** Senior Lecturer, School of Business Administration; PHD, University of Memphis  
**Vanden Bergh, Richard G.;** Associate Professor, School of Business Administration; PHD, University of California Berkeley  
**Walberg, Glenn C.;** Assistant Professor, School of Business Administration; JD, College of William and Mary  
**Zhang, Chun;** Associate Professor, School of Business Administration; PHD, Michigan State University  
**Zhang, Jie;** Assistant Professor, School of Business Administration; DBA, Boston University

## ACCOUNTANCY (M.ACC.) AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

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 be working on their master's degree requirements while still an undergraduate.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Accountancy

Students should apply for admission to the accelerated M.Acc. program preferably in April of their junior year, but not later than the start of the first semester of their senior year. Admission to the accelerated program requires the following:

- A declared accounting 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 accounting or finance course;
- Completion of a letter addressed to the Associate Dean for Graduate Programs expressing intent to join the accelerated M.Acc. program that also provides the student's GPA and expected undergraduate graduation date.

Consistent with the M.Acc. application guidelines, GMAT scores are not required of students enrolled in the School of Business Administration's accounting concentration with overall GPAs of 3.20 or higher.

#### Minimum Degree Requirements

Students may take up to nine (9) credits of graduate course work prior to the conferral of the B.S.BA. degree. Of these, a maximum of six (6) graduate credits taken after Graduate College acceptance into the AMP program may be counted for both the B.S.BA. and M.Acc. degrees. The other three (3) credits will only count toward



the M.Acc. degree. All courses to be counted toward the M.Acc. degree must be completed after Graduate College acceptance of the students in the accelerated program, be 200- or 300-level business courses, and may not include any courses that are required for the undergraduate program (the prohibition includes the four 100- and 200-level courses required for the accounting concentration), and be relevant to the M.Acc. study objective, as determined by the program director.

### **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 pre-requisite 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. 156)

### **OVERVIEW**

The Master of Accountancy provides a means of entry into the public accounting profession.

### **SPECIFIC REQUIREMENTS**

#### **Requirements for Admission to Graduate Studies for the Degree of Master of Accountancy**

To be considered by 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
- 500 score on the GMAT (or the GRE equivalent)

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.

Prerequisite Courses include:

- Mathematics
- Macro Economics
- Micro Economics
- Business Statistics
- Principles of Financial Accounting
- Principles of Managerial Accounting
- Intermediate Accounting 1
- 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; and
- 9 credit hours of graduate-level business electives.

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 future career objectives and 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. International students will likely require two years to complete the program. The capstone course 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 core courses.



## ANIMAL SCIENCE

### OVERVIEW

The research program focuses on lactation physiology and mammary gland biology involving a combination of courses and graduate research. Areas of research interests include lactation physiology, breast cancer, mastitis, developmental biology, nutrition, immunology, cell signaling and metabolism, biotechnology, and transgenics.

### DEGREES

- Animal Science AMP (p. 9)
- Animal Science M.S. (p. 9)

### FACULTY

**Barlow, John W.;** Assistant Professor, Department of Animal Science; DVM, University of Illinois Urbana-Champaign

**Dann, Heather;** Adjunct Assistant Professor, Department of Animal Science; PHD, University of Illinois

**Fobare Erickson, Patricia Ann;** Senior Lecturer; DVM, Cornell University

**Grant, Richard;** Adjunct Professor, Department of Animal Science; PHD, Purdue University

**Greene, Elizabeth Ann;** Extension Professor, Department of Animal Science; PHD, Kansas State University

**Greenwood, Sabrina Louise;** Assistant Professor, Department of Animal Science; PHD, University of Guelph

**Kerr, David E;** Associate Professor, Department of Animal Science; PHD, University of Saskatchewan

**Kraft, Jana;** Assistant Professor, Department of Animal Science; PHD, University of Jena

**McKay, Stephanie Dawn;** Assistant Professor, Department of Animal Science; PHD, University of Alberta

**Smith, Julia M.;** Extension Associate Professor, Department of Animal Science; PHD, Cornell University

**Wright, Andre-Denis G.;** Professor, Department of Animal Science; PHD, University of Guelph

**Zhao, Feng-Qi;** Associate Professor, Department of Animal Science; PHD, University of Alberta

## ANIMAL SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

An option for the outstanding student with an interest in a graduate degree is the Accelerated Master's Program in which students commence study for their master's degree in their senior year and have the potential to obtain a B.S./M.S. in a five-year period.

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 Science, 102 Terrill Hall, (802) 656-0155.

## 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. Satisfactory scores on the general (aptitude) Graduate Record Examination must be presented.

### Minimum Degree Requirements

Option A (Thesis)	
Thirty credits of study with a minimum of fifteen credits in courses in animal science or related fields and a minimum of nine credits of thesis research. Students are required to attend and participate in ASCI 301 and ASCI 302 every semester the courses are offered. 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 one publication ready to submit or already submitted to an appropriate journal at the time of their defense. Students are also required to participate in at least one semester of teaching.	
Option B (Non-thesis)	
Thirty credits of study with twenty-four credits in courses in animal science or related fields, and a minimum of six credits of literature research. Students are required to attend and participate in ASCI 301 and ASCI 302 every semester the courses are offered.	30

### Comprehensive Examination

Animal Science AMP students are required to pass both a written and a subsequent oral comprehensive examination in their field of specialization. Satisfactory completion of the written examination is a prerequisite to standing for the oral examination. The student's studies committee decides the format of this exam (time and page limits, open or closed book, etc.). All comprehensive examinations are taken on the University of Vermont campus in Burlington. 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. Usually the comprehensive exam process is completed at least 2 months prior to the thesis defense.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

The applicant must satisfy the requirements of the Graduate College and complete one semester with satisfactory performance in graduate courses or courses prescribed by the graduate studies committee.

## ANIMAL SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The research program focuses on lactation physiology and mammary gland biology involving a combination of courses and graduate research. Areas of research interests include lactation

physiology, breast cancer, mastitis, developmental biology, nutrition, immunology, cell signaling and metabolism, biotechnology, and transgenics.

## 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. Satisfactory scores on the general (aptitude) Graduate Record Examination must be presented.

### Minimum Degree Requirements

<b>Option A (Thesis)</b>	
Thirty credits of study with a minimum of fifteen credits in courses in animal science or related fields and a minimum of nine credits of thesis research. Students are required to attend and participate in ASCI 301, and ASCI 302, every semester the courses are offered. 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 one publication ready to submit or already submitted to an appropriate journal at the time of their defense. Students are also required to participate in at least one semester of teaching.	
<b>Option B (Non-Thesis)</b>	
Thirty credits of study with twenty-four credits in courses in animal science or related fields, and a minimum of six credits of literature research. Students are required to attend and participate in ASCI 301, and ASCI 302, every semester the courses are offered.	30

### Comprehensive Examination

Animal Science M.S. students are required to pass both a written and a subsequent oral comprehensive examination in their field of specialization. Satisfactory completion of the written examination is a prerequisite to standing for the oral examination. The student's studies committee decides the format of this exam (time and page limits, open or closed book, etc.). All comprehensive examinations are taken on the University of Vermont campus in Burlington. 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. Usually the comprehensive exam process is completed at least 2 months prior to the thesis defense.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

The applicant must satisfy the requirements of the Graduate College and complete one semester with satisfactory performance in graduate courses or courses prescribed by the graduate studies committee.

## ANIMAL, NUTRITION AND FOOD SCIENCES

### OVERVIEW

An interdisciplinary program leading to the Ph.D. degree in Animal, Nutrition and Food Sciences is offered under the direction of a committee composed of faculty members drawn from the departments of Animal Science and Nutrition and Food Sciences. 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, and food microbiology and technology. While all Ph.D. students will complete a common core of courses, they will choose from one of three tracks for specialized study: nutrition, food sciences, or animal science. The program provides flexibility necessary for students to gain competence in the area of their choice. The extensive research facilities of the participating departments are available to all graduate students enrolled in the program.

### DEGREES

- Animal, Nutrition and Food Sciences Ph.D. (p. 11)

### FACULTY

**Barlow, John W.;** Assistant Professor, Department of Animal Science; DVM, University of Illinois Urbana-Champaign  
**Berlin, Linda;** Extension Assistant Professor, Department of Nutrition and Food Science; PHD, Tufts University  
**Fobare Erickson, Patricia Ann;** Senior Lecturer, Department of Animal Science; DVM, Cornell University  
**Greene, Elizabeth Ann;** Extension Professor, Department of Animal Science; PHD, Kansas State University  
**Greenwood, Sabrina Louise;** Assistant Professor, Department of Animal Science; PHD, University of Guelph  
**Harvey, Jean Ruth;** Professor, Department of Nutrition and Food Science; PHD, University of Pittsburgh  
**Johnson, Rachel K.;** Professor, Department of Nutrition and Food Science; PHD, Pennsylvania State University  
**Kerr, David E.;** Associate Professor, Department of Animal Science; PHD, University of Saskatchewan  
**Kindstedt, Paul Stephen;** Professor, Department of Nutrition and Food Science; PHD, Cornell University  
**Kraft, Jana;** Assistant Professor, Department of Animal Science; PHD, University of Jena  
**McKay, Stephanie Dawn;** Assistant Professor, Department of Animal Science; PHD, University of Alberta  
**Pintauro, Stephen Joseph;** Associate Professor, Department of Nutrition and Food Science; PHD, University of Rhode Island  
**Smith, Julia M.;** Extension Associate Professor, Department of Animal Science; PHD, Cornell University  
**Trubek, Amy B.;** Associate Professor, Department of Nutrition and Food Science; PHD, University of Pennsylvania  
**Wright, Andre-Denis G.;** Professor, Department of Animal Science; PHD, University of Guelph  
**Zhao, Feng-Qi;** Associate Professor, Department of Animal Science; PHD, University of Alberta

## ANIMAL, NUTRITION AND FOOD SCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

An interdisciplinary program leading to the Ph.D. degree in Animal, Nutrition and Food Sciences is offered under the direction of a committee composed of faculty members drawn from the departments of Animal Science and Nutrition and Food Sciences. 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, and food microbiology and technology. While all Ph.D. students will complete a common core of courses, they will choose from one of three tracks for specialized study: nutrition, food sciences, or animal science. The program provides flexibility necessary for students to gain competence in the area of their choice. The extensive research facilities of the participating departments are available to all graduate students enrolled in the program.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Satisfactory scores on the general (aptitude) Graduate Record Examination must be presented.

#### Minimum Degree Requirements

- The candidate must meet all the requirements as prescribed by the Graduate College for the degree of Doctor of Philosophy.
- Candidates in the Animal Science track are required to attend and participate in ASCI 301 and ASCI 302 every semester that the courses are offered. These candidates must also participate in one semester of ASCI 303.
- Candidates in the Nutrition and Food Sciences tracks are required to attend and participate in NFS 350 (minimum of 3 credits) and NFS 295 (Journal club, minimum of 2 credits). These candidates must also participate in one semester of NFS 360.
- 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 two semesters and then at least annually until the doctoral research is completed and an acceptable dissertation written and defended.
- It is also expected that a Ph.D. student will have at least two 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 program.

- Proficiency in a modern foreign language or computer language and programming is optional at the discretion of the graduate studies committee.

### **Comprehensive Examination**

For candidates in all tracks, 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 should typically be passed by the end of the third year of candidacy, but absolutely no later than six months before the dissertation is submitted. Should the candidate fail the examination, only one 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**

The applicant must satisfy the prerequisites of the Graduate College and complete one semester with satisfactory performance in graduate courses or courses prescribed by the graduate studies committee.

## BIOENGINEERING

### OVERVIEW

The Bioengineering Ph.D. is an interdisciplinary graduate degree that leverages the close proximity on campus of the School of Engineering and the Medical School. The program is administered by the School of Engineering with strong involvement of the College of Medicine, and has a particular focus on complex systems. Students take courses in both the STEM disciplines and the biomedical sciences, including a core of required courses and a selection of electives as suits their research interests. Co-mentoring between faculty in engineering and the biomedical sciences is encouraged.

### DEGREES

- Bioengineering Ph.D. (p. 13)

### FACULTY

**Bates, Jason H. T.;** Professor, Department of Medicine-Pulmonary; DSC, Canterbury University

**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford

**Berger, Christopher Lewis;** Associate 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

**Dubief, Yves C.;** Associate Professor, School of Engineering; PHD, Institut National Polytechnique de Grenoble

**Dunlop, Mary J.;** Assistant Professor, School of Engineering; PHD, California Institute of Technology

**Eppstein, Margaret Jean;** Associate Professor, Department of Computer Science; PHD, University of Vermont

**Henry, Sharon Margaret;** Professor, Department of Rehabilitation and Movement Science; PHD, University of Vermont

**Hitt, Darren Lee;** Professor, School of Engineering; PHD, Johns Hopkins University

**Huston, Dryver R.;** Professor, School of Engineering; PHD, Princeton University

**Krag, Martin Hans;** Professor, Department of Orthopaedics and Rehabilitation; MD, Yale University

**Marshall, Jeffrey Scott;** Professor, School of Engineering; PHD, University of California Berkeley

**Oldinski, Rachael Ann;** Assistant Professor, School of Engineering; PHD, Colorado State University

**Rizzo, Donna Marie;** Professor, School of Engineering; PHD, University of Vermont

**Spector, Peter Salem;** Professor, Department of Medicine-Cardiology; MD, Albert Einstein College of Medicine

**Warshaw, David Michael;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Wu, Ge;** Professor, Department of Rehabilitation and Movement Science; PHD, Boston University

**Wu, Jun-Ru;** Professor, Department of Physics; PHD, University of California Los Angeles

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## BIOENGINEERING PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

The program in Bioengineering is interdisciplinary and offers the Doctor of Philosophy degree. Graduate students obtain the Ph.D. degree through a program administered by the School of Engineering. The program is overseen by its director and administered by a curriculum committee comprising members from the School of Engineering and the College of Medicine.

Participating faculty with strong commitments to bioengineering research and education are from the School of Engineering, 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, implant design, rehabilitation engineering, simulation and modeling, biomaterials, synthetic biology, tissue engineering, and biomathematics.

Students in the program are generally supported by sponsored research projects, participating departments and training grants. Inquiries about current research and funding opportunities should be directed to:

University of Vermont  
School of Engineering  
Votey Hall  
Burlington, VT 05405  
(802) 656-8157

### 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: Two semesters each, or four introductory courses in the following subjects - anatomy, biology, biophysics, chemistry, physiology
- Engineering: Two introductory courses in one or more of the following subjects - biomechanics, mechanics, thermodynamics, electrical engineering, control theory, or fluid mechanics
- Mathematics: One course past differential equations



- Physics: Two semesters of physics

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 thirteen graduate credits of required courses (advanced bioengineering systems, complex systems, human physiology and pharmacology or equivalent, and an advanced mathematics or statistics course) plus at least seventeen credits of approved technical electives. In addition, the candidate must complete a teaching requirement, pass a comprehensive examination, complete up to forty-five credits of dissertation research, and pass a final oral examination.

### **Comprehensive Examination**

The comprehensive exam for the Bioengineering 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 two 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**

Completion of any deficient admission requirements.

## BIOLOGY

### OVERVIEW

While faculty research interests fall into two broad groupings, we encourage students to consider research projects that cross disciplines.

The broad groupings are:

1. cell and molecular biology, neuroscience, physiology and behavior
2. ecology and evolution

Current research projects under the first group include: molecular biology of cilia; chemical sensing by micro-organisms; signal transduction in neurodevelopment and chemical sensing; visual system development in zebrafish; smell and taste receptor cell function using molecular biology, calcium imaging and electrophysiology; olfactory and taste driven behavior; muscle function, development, and aging; structure and biomechanics of myofilaments; proteomics, biochemistry and cell biology applied to molecular mechanisms of signal transduction governing neuronal positioning; thermal stress and cellular physiology; and chemotherapeutic drug effects on taste cells.

Current research projects under the second group include: evolutionary genomics and systems physiology in sea urchins and horned beetles; microbial ecology and genomics; evolutionary genomics of RNA viruses; physiology, development and evolution of marine invertebrates and fruit flies; community ecology and evolutionary ecology of carnivorous plants; phylogenetics to study evolution and biogeography of spiders and other groups; ecology, zoogeography and conservation of small mammals; modeling and analysis of complex biological and environmental systems; multi-species interactions among plants, their mutualist pollinators and antagonists that include herbivores, seed predators, and competitors; developmental plasticity interactions with extreme sexual size dimorphism in spiders; evolution, ecology, and behavior of social insects; and ecology and evolution of disease.

Current research that crosses between disciplines includes proteomic analysis of Chagas disease vectors; evolution and adaptation of flight muscle proteins; evolution of muscle and courtship behavior in flies; and ecological proteomics.

### DEGREES

- Biology AMP (p. 15)
- Biology M.S. (p. 16)
- Biology M.S.T. (p. 17)
- Biology Ph.D. (p. 17)

### FACULTY

**Agnarsson, Ingi;** Assistant Professor, Department of Biology; PHD, George Washington University

**Ballif, Bryan A.;** Associate 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

**Delay, Eugene Raymond;** Associate Professor, Department of Biology; PHD, University of Georgia

**Delay, Rona J.;** Associate Professor, Department of Biology; PHD, Colorado State University

**Goodnight, Charles James;** Professor, Department of Biology; PHD, University of Chicago

**Gotelli, Nicholas James;** Professor, Department of Biology; PHD, Florida State University

**Kilpatrick, Charles William;** Professor, Department of Biology; PHD, University of North Texas

**Lam, Ying Wai;** Research Assistant Professor, Department of Biology; PHD, Chinese University of Hong Kong

**Mitchell, John Joseph;** Senior Lecturer, Department of Biology; PHD, University of Connecticut

**Schall, Joseph Julian;** Professor, Department of Biology; PHD, University of Texas Austin

**Stevens, Lori;** Professor, Department of Biology; PHD, University of Illinois Chicago

**Van Houten, Judith Lee;** Professor, Department of Biology; PHD, University of California Berkeley

**Vigoreaux, Jim Osvaldo;** Professor, Department of Biology; PHD, University of Oklahoma

## BIOLOGY AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

An accelerated master's degree in biology can be earned in a shortened time by careful planning in the junior and senior years of undergraduate work. Biology 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. can typically be earned in one additional year.

Following formal admission to the Accelerated Master's Program, up to six credits of undergraduate 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 202	Quantitative Biology	3
BIOL 203	Population Ecology	3
BIOL 204	Adv Genetics Laboratory	4
BIOL 205	Adv Genetics Laboratory	4
BIOL 208	Morphology&Evolution Insects	0 or 4
BIOL 209	Field Zoology	0 or 4
BIOL 212	Comparative Histology	0 or 4
BIOL 217	Mammalogy	0 or 4



BIOL 219	Compar/Func Vertebrate Anatomy	4
BIOL 223	Developmental Biology	3
BIOL 225	Physiological Ecology	3
BIOL 238	Winter Ecology	3
BIOL 246	Ecological Parasitology	1 or 3
BIOL 254	Population Genetics	0-4
BIOL 255	Comparative Physiology	0 or 4
BIOL 261	Neurobiology	3
BIOL 262	Neurobiology Techniques	4
BIOL 263	Genetics Cell Cycle Regulation	3
BIOL 264	Community Ecology	3
BIOL 265	Developmental Molecular Genetics	3
BIOL 266	Neurodevelopment	3
BIOL 267	Molecular Endocrinology	4
BIOL 270	Speciation and Phylogeny	3
BIOL 271	Evolution	3
BIOL 275	Human Genetics	3
BIOL 277	Sociobiology	3
BIOL 280	Molecular Ecology	0 or 4
BIOL 286	Forensic DNA Analysis	3

## 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 Program, a student must be a declared biological science, zoology, neuroscience or environmental science B.S. major, and have identified a 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. After graduation with the B.S. degree, students are eligible to become candidates for the M.S. degree.

### Minimum Degree Requirements

Nine or more additional course credits in biology and related fields; thesis research (up to fifteen credits); and successful defense of thesis.

### Comprehensive Examination

The comprehensive examination must be taken by the end of the second semester as a matriculated graduate student for students admitted under 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 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

Satisfactory completion of a qualifying examination.

## BIOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

## OVERVIEW

While faculty research interests fall into two broad groupings, we encourage students to consider research projects that cross disciplines.

The broad groupings are:

1. cell and molecular biology, neuroscience, physiology and behavior
2. ecology and evolution

Current research projects under the first group include: molecular biology of cilia; chemical sensing by micro-organisms; signal transduction in neurodevelopment and chemical sensing; visual system development in zebrafish; smell and taste receptor cell function using molecular biology, calcium imaging and electrophysiology; olfactory and taste driven behavior; muscle function, development, and aging; structure and biomechanics of myofilaments; proteomics, biochemistry and cell biology applied to molecular mechanisms of signal transduction governing neuronal positioning; thermal stress and cellular physiology; and chemotherapeutic drug effects on taste cells.

Current research projects under the second group include: evolutionary genomics and systems physiology in sea urchins and horned beetles; microbial ecology and genomics; evolutionary genomics of RNA viruses; physiology, development and evolution of marine invertebrates and fruit flies; community ecology and evolutionary ecology of carnivorous plants; phylogenetics to study evolution and biogeography of spiders and other groups; ecology, zoogeography and conservation of small mammals; modeling and analysis of complex biological and environmental systems; multi-species interactions among plants, their mutualist pollinators and antagonists that include herbivores, seed predators, and competitors; developmental plasticity interactions with extreme sexual size dimorphism in spiders; evolution, ecology, and behavior of social insects; and ecology and evolution of disease.

Current research that crosses between disciplines includes proteomic analysis of Chagas disease vectors; evolution and adaptation of flight muscle proteins; evolution of muscle and courtship behavior in flies; and ecological proteomics.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

An undergraduate major in biology or its equivalent. Satisfactory scores on the Graduate Record Examination, general (aptitude) section. Acceptability to the faculty member with whom the candidate wishes to do thesis research.

### Minimum Degree Requirements

Biology Graduate Colloquia, four credits; eleven to eighteen additional credits in biology and related fields; thesis research (eight to fifteen credits) and successful defense of thesis. Each candidate must participate in the teaching of at least one 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

Satisfactory completion of a qualifying examination.

## BIOLOGY M.S.T.

All students must meet the Requirements for the Master's Degree (p. 156)

## OVERVIEW

While faculty research interests fall into two broad groupings, we encourage students to consider research projects that cross disciplines.

The broad groupings are:

1. cell and molecular biology, neuroscience, physiology and behavior
2. ecology and evolution

Current research projects under the first group include: molecular biology of cilia; chemical sensing by micro-organisms; signal transduction in neurodevelopment and chemical sensing; visual system development in zebrafish; smell and taste receptor cell function using molecular biology, calcium imaging and electrophysiology; olfactory and taste driven behavior; muscle function, development, and aging; structure and biomechanics of myofilaments; proteomics, biochemistry and cell biology applied to molecular mechanisms of signal transduction governing neuronal positioning; thermal stress and cellular physiology; and chemotherapeutic drug effects on taste cells.

Current research projects under the second group include: evolutionary genomics and systems physiology in sea urchins and horned beetles; microbial ecology and genomics; evolutionary

genomics of RNA viruses; physiology, development and evolution of marine invertebrates and fruit flies; community ecology and evolutionary ecology of carnivorous plants; phylogenetics to study evolution and biogeography of spiders and other groups; ecology, zoogeography and conservation of small mammals; modeling and analysis of complex biological and environmental systems; multi-species interactions among plants, their mutualist pollinators and antagonists that include herbivores, seed predators, and competitors; developmental plasticity interactions with extreme sexual size dimorphism in spiders; evolution, ecology, and behavior of social insects; and ecology and evolution of disease.

Current research that crosses between disciplines includes proteomic analysis of Chagas disease vectors; evolution and adaptation of flight muscle proteins; evolution of muscle and courtship behavior in flies; and ecological proteomics.

## 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. Satisfactory scores on the Graduate Record Examination, general (aptitude) section.

### Minimum Degree Requirements

Thirty credits of 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 four of the five following areas: anatomy; neurobiology; morphology and systematics; evolution; genetics; developmental biology; and environmental biology. Up to twelve 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 thirty credits. No thesis is required; however, each degree recipient must complete a 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

Satisfactory completion of a qualifying examination.

## BIOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

## OVERVIEW

While faculty research interests fall into two broad groupings, we encourage students to consider research projects that cross disciplines.

The broad groupings are:

1. cell and molecular biology, neuroscience, physiology and behavior
2. ecology and evolution

Current research projects under the first group include: molecular biology of cilia; chemical sensing by micro-organisms; signal transduction in neurodevelopment and chemical sensing; visual system development in zebrafish; smell and taste receptor cell function using molecular biology, calcium imaging and electrophysiology; olfactory and taste driven behavior; muscle function, development, and aging; structure and biomechanics of myofilaments; proteomics, biochemistry and cell biology applied to molecular mechanisms of signal transduction governing neuronal positioning; thermal stress and cellular physiology; and chemotherapeutic drug effects on taste cells.

Current research projects under the second group include: evolutionary genomics and systems physiology in sea urchins and horned beetles; microbial ecology and genomics; evolutionary genomics of RNA viruses; physiology, development and evolution of marine invertebrates and fruit flies; community ecology and evolutionary ecology of carnivorous plants; phylogenetics to study evolution and biogeography of spiders and other groups; ecology, zoogeography and conservation of small mammals; modeling and analysis of complex biological and environmental systems; multi-species interactions among plants, their mutualist pollinators and antagonists that include herbivores, seed predators, and competitors; developmental plasticity interactions with extreme sexual size dimorphism in spiders; evolution, ecology, and behavior of social insects; and ecology and evolution of disease.

Current research that crosses between disciplines includes proteomic analysis of Chagas disease vectors; evolution and adaptation of flight muscle proteins; evolution of muscle and courtship behavior in flies; and ecological proteomics.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Satisfactory completion of: college-level courses appropriate for science majors including a year of mathematics, a year of physics, organic chemistry, at least one year of biology; scores from the Graduate Record Examination, general (aptitude) section; and acceptability to the faculty member with whom the candidate wishes to do dissertation research or rotations. Deficiencies in prerequisites may be made up after entering the program.

### Minimum Degree Requirements

There are seventy-five required credits, of which at least thirty credits must be earned in graduate courses including six credits of

Graduate Colloquia. The selection of courses will be designated for each student by the advisor and graduate studies committee. At least twenty, but not more than forty-five, credits must be earned in dissertation research. Each candidate must participate in the teaching of at least one 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

The diagnostic examination prior to registration for the first semester; the comprehensive exam; minimum requirement course work of thirty credits and additional courses as required by the advisor and graduate studies committee; at least one academic year of graduate study at the University of Vermont.

## BIOSTATISTICS

### 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 computerized 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.

Three faculty members are in 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 will arise through involvement in the Statistical Consulting Clinic (STAT 385). (See also Statistics Program and Statistical Consulting Clinic descriptions.)

### DEGREES

- Biostatistics AMP (p. 19)
- Biostatistics M.S. (p. 20)

### FACULTY

**Archdeacon, Dan Steven;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Ashikaga, Takamaru;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford

**Bunn, Janice Yanushka;** Research Associate Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Burgmeier, James William;** Professor, Department of Mathematics and Statistics; PHD, University of New Mexico

**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Danforth, Christopher M.;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park

**Dinitz, Jeffrey Howard;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Dodds, Peter S.;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology

**Dummit, David Steven;** Professor, Department of Mathematics and Statistics; PHD, Princeton University

**Foote, Richard Martin;** Professor, Department of Mathematics and Statistics; PHD, University of Cambridge

**Golden, Kenneth Ivan;** Professor, Department of Mathematics and Statistics; PHD, University De Paris

**Gross, Kenneth Irwin;** Professor, Department of Mathematics and Statistics; PHD, Washington University in St Louis

**Jefferys, William;** Lecturer I, Department of Mathematics and Statistics; PHD, Yale University

**Lakoba, Taras Igorevich;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Mickey, Ruth Mary;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Sands, Jonathan Winslow;** Professor, Department of Mathematics and Statistics; PHD, University of California San Diego

**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

**Son, Mun Shig;** Professor, Department of Mathematics and Statistics; PHD, Oklahoma State University

**Warrington, Gregory S.;** Assistant 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

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## BIOSTATISTICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### 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 one additional year, because six credits of undergraduate courses can also be counted concurrently toward the M.S. degree requirements.



## 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 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 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 one or two 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 thirty credit program requiring twenty-four credits of course work. The program must include:		24
BIOS 200	Med Biostatistics&Epidemiology	
BIOS 221	Statistical Methods II	
BIOS 223	Applied Multivariate Analysis	
BIOS 231	Experimental Design	
BIOS 251	Probability Theory	
BIOS 261	Statistical Theory	
STAT 360	Linear Models	
Three additional course credits are required. BIOS 229 or BIOS 235 are recommended. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281, BIOS 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
Plus six semester hours of approved thesis research (BIOS 391)		

Option B (Non-Thesis)		
A thirty credit program requiring twenty-seven credits of course work. The program must include:		21
BIOS 200	Med Biostatistics&Epidemiology	
BIOS 221	Statistical Methods II	
BIOS 223	Applied Multivariate Analysis	
BIOS 231	Experimental Design	
BIOS 251	Probability Theory	
BIOS 261	Statistical Theory	
STAT 360	Linear Models	

Six additional course credits are required. BIOS 229 or BIOS 235 are recommended. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281, BIOS 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		6
The research project requirement is met by taking three credits of:		3
STAT 381	Statistical Research	
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 exam is typically held two weeks after the final exam in the spring semester. The student can take the exam a maximum of two 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. 156)

## 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 computerized 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.

Three faculty members are in 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 will 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 experience is desirable. The Graduate Record Examination is strongly advised and is required of any applicant who wishes to be considered for assistantship support. 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 thirty credit program requiring twenty-four credits of course work. The program must include:		24
BIOS 200	Med Biostatistics&Epidemiology	
BIOS 221	Statistical Methods II	
BIOS 223	Applied Multivariate Analysis	
BIOS 231	Experimental Design	
BIOS 251	Probability Theory	
BIOS 261	Statistical Theory	
STAT 360	Linear Models	

Three additional course credits are required. BIOS 229 or BIOS 235 are recommended. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281, BIOS 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
Plus six credits of approved thesis research		6

Option B (Non-Thesis)		
A thirty credit program requiring twenty-seven credits of course work. The program must include:		24
BIOS 200	Med Biostatistics&Epidemiology	
BIOS 221	Statistical Methods II	
BIOS 223	Applied Multivariate Analysis	
BIOS 229	Survival Analysis	
or BIOS 235	Categorical Data Analysis	
BIOS 231	Experimental Design	
BIOS 251	Probability Theory	
BIOS 261	Statistical Theory	
STAT 360	Linear Models	
Six additional course credits are required. BIOS 229 or BIOS 235 are recommended. Another 200/300 level statistics course (except BIOS 211, BIOS 241, STAT 281, BIOS 308) 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 three credits of:		3
STAT 381	Statistical Research	
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 exam is typically held two weeks after the final exam in the spring semester. The student can take the exam a maximum of two 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

### OVERVIEW

The University of Vermont's Sustainable Entrepreneurship MBA (SEMBA) program prepares students to create profitable and sustainable business opportunities in a world undergoing transformational change. SEMBA students will learn from the originators of business sustainability, ideas and tools for creating profitable and sustainable business opportunities, positioning them among the new breed of visionary leaders ready to use business to create a more prosperous and sustainable world.

The program is built on the notion of sustainability and entrepreneurship from the ground-up; sustainability is not just a set of "bolt-on" electives, it is at the core of the program and addressed in every single course; courses share educational material and cases across disciplines and deal with issues of sustainable development; entrepreneurs that have built successful, sustainable businesses will share the classroom with our excellent faculty; faculty will include professors from the Business School, the Department of Community Development and Applied Economics, the nationally top-ranked Rubenstein School of the Environment and Natural Resources, and the Vermont Law School.

The MBA program is accredited by The Association to Advance Collegiate Schools of Business.

### DEGREES

- Business Administration MBA (p. 23)

### FACULTY

**Arel, Barbara M.;** Associate Professor, School of Business Administration; PHD, Arizona State University  
**Beaudoin, Cathy A.;** Assistant Professor, School of Business Administration; PHD, Drexel University  
**Bonifield, Carolyn Marie;** Associate Professor, School of Business Administration; PHD, University of Iowa  
**Cats-Baril, William Lawrence;** Associate Professor, School of Business Administration; PHD, University of Wisconsin Madison  
**Chiang, Kevin C.;** Professor, School of Business Administration; PHD, Louisiana State University  
**Dempsey, Stephen Jeffrey;** Associate Professor, School of Business Administration; PHD, Virginia Polytechnic Institute and State University  
**DeWitt, Rocki-Lee;** Professor, School of Business Administration; PHD, Columbia University  
**Do, Hung Tuan;** Assistant Professor, School of Business Administration; PHD, Purdue University  
**Hughes, Susan Boedeker;** Associate Professor, School of Business Administration; PHD, University of Cincinnati  
**Jones, David A.;** Associate Professor, School of Business Administration; PHD, University of Calgary  
**Kingsley, Allison F.;** Assistant Professor, School of Business Administration; PHD, Columbia University  
**Lucas, Marilyn T.;** Associate Professor, School of Business Administration; PHD, University of Illinois Urbana-Champaign

**Marble, Hugh;** Assistant Professor, School of Business Administration; PHD, University of Florida  
**McIntosh, Barbara Ruth;** Professor, School of Business Administration; PHD, Purdue University  
**Noordewier, Thomas Gerald;** Professor, School of Business Administration; PHD, University of Wisconsin Madison  
**Novak, David C.;** Associate Professor, School of Business Administration; PHD, Virginia Polytechnic Institute and State University  
**Parke, Edward Lauck;** Associate Professor, School of Business Administration; PHD, University of Massachusetts Amherst  
**Sharma, Pramodita;** Professor, School of Business Administration; PHD, University of Calgary  
**Sharma, Sanjay;** Professor, School of Business Administration; PHD, University of Calgary  
**Sinkula, James Michael;** Professor, School of Business Administration; PHD, University of Arkansas  
**Tomas III, Michael John;** Associate Professor, School of Business Administration; PHD, Syracuse University  
**Tomas, Amy M.;** Senior Lecturer, School of Business Administration; PHD, University of Memphis  
**Vanden Bergh, Richard G.;** Associate Professor, School of Business Administration; PHD, University of California Berkeley  
**Walberg, Glenn C.;** Assistant Professor, School of Business Administration; JD, College of William and Mary  
**Zhang, Chun;** Associate Professor, School of Business Administration; PHD, Michigan State University  
**Zhang, Jie;** Assistant Professor, School of Business Administration; DBA, Boston University

## BUSINESS ADMINISTRATION MBA

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The University of Vermont's Sustainable Entrepreneurship MBA (SEMBA) is an accelerated, full-time, 12-month program (August-to-August) including a three month practicum consisting of starting or expanding a new sustainable business. The program requires a total of 45 credit hours (after all prerequisites are met). The program is structured in 5 modules and each module covers a range of topics. All participants take the same courses at the same time. The intensity and frequency of class meetings changes depending on the best pedagogical approach for the specific topic.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies the Degree of Master of Business Administration

To be considered by the Graduate Studies Committee, applicants to the Master of Business Administration must meet the following minimum requirements:

- 4-year Bachelor's degree
- 3-5 years of work experience

- GMAT of 550 or higher, or equivalent GRE

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.

### Minimum Degree Requirements

Every course addresses issues of sustainability. Business cases are shared across courses and these business cases focus on how certain corporations are building a more inclusive, resilient, and sustainable economy. The curriculum will discuss in depth how the global challenges associated with sustainability, when viewed through a business lens, can help identify managerial strategies and practices to achieve sustainable economic growth while simultaneously driving shareholder value.

Required courses:

MBA 300	Business Fundamentals	1
<b>Module 1</b>		
MBA 301	Foundations of Management	9
Business Strategy for a Sustainable World		
Finance for Innovators		
Sustainable Marketing		
Managing and Leading for Sustainable Innovation		
World Challenges: The Physical Environment		
World Challenges: The Social Environment		
<b>Module 2</b>		
MBA 302	Bldg a Sustainable Enterprise	8
Business Sustainability and Public Policy		
Crafting the Business Plan		
Marketing Decision Making Under Uncertainty		
Corporate Social Responsibility and Performance		
Ethics for Entrepreneurs		
Measuring Triple Bottom Line and Impact		
Mindfulness		
<b>Winter Session: Initial Framing of the Practicum Project</b>		
<b>Module 3</b>		
MBA 303	Growth of Sust Enterprise	9
Entrepreneurial Leadership and Mindset		
Business, Communities and Sustainability		
Systems Tools for Sustainability		
Business Law for Entrepreneurs 1		

Negotiations		
Financing an Innovative Entrepreneurial Venture		
Sustainable Operations and Green Supply Chains		
<b>Module 4</b>		
MBA 395	Advanced Special Topics	1-18
Technology Entrepreneurship and Commercialization		
Regulatory Issues for the Entrepreneur		
Integrative Thinking and Competitive Imagination		
Mindfulness		
Five additional courses selected from available electives, such as:		
Business in a Finite World		
Service Operations and Sustainability		
Building Human Capital and Capability		
Social Enterprise and Nonprofit Law		
Sustainable Development Policy		
<b>Module 5</b>		
Practicum, Pitch and Debriefing		
MBA 395	Advanced Special Topics	1-18

### Comprehensive Examination

Successful completion of Module 5 (which takes place during the summer) 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 any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## CELLULAR, MOLECULAR, AND BIOMEDICAL SCIENCES

### OVERVIEW

The Cellular, Molecular and Biomedical Sciences (CMB) program provides personalized training in a graduate-student focused, state-of-the-art research environment. Our graduates are highly qualified scientists ready to take on the rigors of scientific careers.

Our 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 underlie human disease.

### DEGREES

- Cellular, Molecular and Biomedical Sciences M.S. (p. 26)
- Cellular, Molecular and Biomedical Sciences Ph.D. (p. 26)

### FACULTY

**Amiel, Eyal;** Assistant Professor, Department of Medical Lab and Radiation Science; PHD, Dartmouth Medical School

**Anathy, Vikas;** Assistant Professor, Department of Pathology; PHD, Madurai Kamraj University

**Ballif, Bryan A.;** Associate Professor, Department of Biology; PHD, Harvard University

**Barlow, John W.;** Assistant Professor, Department of Animal Science; DVM, University of Illinois Urbana-Champaign

**Berger, Christopher Lewis;** Associate Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Bond, Jeffrey P.;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Rochester

**Bonney, Elizabeth Ann;** Professor, Department of Obstetrics and Gynecology; MD, Stanford University

**Botten, Jason W.;** Assistant Professor, Department of Medicine-Immunobiology; PHD, University of New Mexico

**Bouchard, Beth Ann;** Assistant Professor, Department of Biochemistry; PHD, University of Vermont

**Boyson, Jonathan E.;** Associate Professor, Department of Surgery; PHD, University of Wisconsin Madison

**Brayden, Joseph Elliott;** Professor, Department of Pharmacology; PHD, University of Vermont

**Budd, Ralph Charles;** Professor, Department of Medicine-Immunobiology; MD, Weill Cornell Medical College

**Burke, John MacKenzie;** Professor, Department of Microbiology and Molecular Genetics; PHD, Massachusetts Institute of Technology

**Carr, Frances Eileen;** Professor, Department of Pharmacology; PHD, University of Illinois Chicago

**Cipolla, Marilyn Jo;** Professor, Department of Neurological Sciences; PHD, University of Vermont

**Delaney, Terrence Patrick;** Associate Professor, Department of Plant Biology; PHD, University of Washington Seattle

**Diehl, Sean A.;** Assistant Professor, Department of Medicine-Infectious Disease; PHD, University of Vermont

**Dostmann, Wolfgang R. G.;** Professor, Department of Pharmacology; MD, University of Munich

**Double, Sylvie;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of North Carolina Chapel Hill

**Dunlop, Mary J.;** Assistant Professor, School of Engineering; PHD, California Institute of Technology

**Everse, Stephen Jay;** Associate Professor, Department of Biochemistry; PHD, University of California San Diego

**Finette, Barry Alan;** Professor, Department of Pediatrics; MD, University of Texas

**Francklyn, Christopher Steward;** Professor, Department of Biochemistry; PHD, University of California Santa Barbara

**Freeman, Kalev;** Assistant Professor, Department of Surgery; MD, University of Colorado Boulder

**Gilmartin, Gregory Michael;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, University of Virginia

**Harris, Jeanne M.;** Associate Professor, Department of Plant Biology; PHD, University of California Berkeley

**Heintz, Nicholas H.;** Professor, Department of Pathology; PHD, University of Vermont

**Hondal, Robert J.;** Associate Professor, Department of Biochemistry; PHD, Ohio State University

**Howe, Alan K.;** Associate Professor, Department of Pharmacology; PHD, Northwestern University

**Huber, Sally Ann;** Professor, Department of Pathology; PHD, Duke University

**Huston, Christopher D.;** Associate 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; PHD, University of Lumburg

**Jetton, Thomas Lawrence;** Associate Professor, Department of Medicine-Endocrinology; PHD, Vanderbilt University

**Johnson, Douglas Ian;** Professor, Department of Microbiology and Molecular Genetics; PHD, Purdue University

**Kelm, Robert John;** Associate Professor, Department of Medicine-Vascular Biology; PHD, University of Vermont

**Kerr, David E.;** Associate Professor, Department of Animal Science; PHD, University of Saskatchewan

**Krag, David Nielsen;** Professor, Department of Surgery-Oncology; MD, Loyola University Chicago

**Landry, Christopher C.;** Professor, Department of Chemistry; PHD, Harvard University

**Li, Dawei;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Shanghai Jiao Tong University

**Lidofsky, Steven D.;** Professor, Department of Medicine-Gastroenterology; MD, Columbia University

**Lord, Matthew J.;** Associate Professor, Department of Molecular Physiology and Biophysics; PHD, University of Oxford

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**Matthews, Dwight E.;** Professor, Department of Chemistry; PHD, Indiana University Bloomington

**Miller, Mark Stuart;** Research Associate, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Mintz, Keith Peter;** Associate Professor, Department of Microbiology and Molecular Genetics; PHD, University of Vermont

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Berkeley

**Morrill, Scott Walker;** Professor, Department of Biochemistry; PHD, University of Wisconsin Madison

**Nelson, Mark Tuxford;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Pederson, David Scott;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of Rochester

**Poynter, Matthew E.;** Associate Professor, Department of Medicine-Pulmonary; PHD, University of Utah

**Preston, Jill C.;** Assistant Professor, Department of Plant Biology; PHD, University of Missouri

**Radermacher, Michael;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Munich

**Rincon, Mercedes Rincon;** Professor, Department of Medicine-Immunobiology; PHD, Autonomous University of Madrid

**Ruiz, Teresa;** Associate Professor, Department of Molecular Physiology and Biophysics; PHD, Brandeis University

**Sarkar, Indra N.;** Assistant Professor, Department of Microbiology and Molecular Genetics; MLIS, Syracuse University

**Shen, Aimee;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Harvard University

**Shukla, Arti;** Associate Professor, Department of Pathology; PHD, Institute of Medical Science

**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 L.;** Associate Professor, Department of Medicine-Vascular Biology; PHD, University of California Davis

**Stein, Gary;** Professor and Chair, Department of Biochemistry; PHD, University of Vermont

**Stein, Janet;** Professor, Department of Biochemistry; PHD, Princeton University

**Stumpff, Jason K.;** Assistant Professor, Department of Molecular Physiology and Biophysics; PHD, University of Colorado

**Suratt, Benjamin Tate;** Associate Professor, Department of Medicine-Pulmonary; MD, Columbia University

**Taatjes, Douglas Joseph;** Professor, Department of Pathology; PHD, University of Basel

**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 Laurretta;** Associate Professor, Department of Plant Biology; PHD, Michigan State University

**Toth, Michael J.;** Associate Professor, Department of Medicine-Cardiology; PHD, University of Maryland College Park

**Tracy, Paula Babiarz;** Professor, Department of Biochemistry; PHD, Syracuse University

**Tracy, Russell P.;** Professor, Department of Pathology; PHD, Syracuse University

**Trybus, Kathleen M.;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Chicago

**van der Vliet, Albert;** Professor, Department of Pathology; PHD, University of Amsterdam

**Van Houten, Judith Lee;** Professor, Department of Biology; PHD, University of California Berkeley

**Vigoreaux, Jim Osvaldo;** Professor, Department of Biology; PHD, University of Oklahoma

**Wallace, Susan Scholes;** Professor, Department of Microbiology and Molecular Genetics; PHD, Weill Cornell Medical College

**Ward, Gary E.;** Professor, Department of Microbiology and Molecular Genetics; PHD, University of California San Diego

**Wargo, Matthew;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Dartmouth College

**Warshaw, David Michael;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Vermont

**Weiss, Daniel Jay;** Professor, Department of Medicine-Pulmonary; MD, Mount Sinai School of Medicine

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

**Wright, Andre-Denis G.;** Professor, Department of Animal Science; PHD, University of Guelph

## CELLULAR, MOLECULAR AND BIOMEDICAL SCIENCES M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

The Cellular, Molecular and Biomedical Sciences Program only awards M.S. degrees to students who have matriculated into the Ph.D. program, but for various reasons cannot complete the Ph.D. These students must be recommended by their studies committee for the M.S., and 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. 159)

### OVERVIEW

The 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 presentation. 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 two opportunities to serve as teaching assistants in undergraduate, graduate, and medical school courses.

During the first year, CMB students complete three 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 two. In addition to core courses, students are expected to enhance their training through advanced courses in the following areas:

- Biochemistry, Structural Biology and Biophysics
- Genetics, Cellular and Molecular Biology
- Microbiology and Immunology
- Molecular Physiology and Pharmacology

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Competitive applicants typically have evidence of strong course preparation, an undergraduate GPA of 3.00 or better, and 60th percentile or greater on the general Graduate Record Examination (GRE). 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). Experience in laboratory research is recommended.

### 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	0 or 3
BIOC 302	General Biochemistry	3
CLBI 301	Cell Biology	3
BIOC 325	Data Analysis&Presentation I	2
BIOC 326	Data Analysis&Presentation II	2
MMG 233	Genetics and Genomics	3

Students must also complete an ethics course, a grant-writing course, and required courses in their area of concentration before completion of their degree. Students must complete a minimum of twenty research credits (CLBI 491) and thirty course credits, and an additional twenty-five 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 first 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 second year.

## ADVANCED CONCENTRATION COURSES

Biochemistry, Structural Biology, & Biophysics		
BIOC 370	Physical Biochemistry	3
MPBP 323	Biophysical Techniques	4
Genetics, Cell, & Molecular Biology (choose two)		
MMG 232	Methods in Bioinformatics	3
MMG 312	Eukaryotic Molecular Genetics	3
MPBP 310	Molecular Control of the Cell	3
Microbiology & Immunobiology		
MMG 320	Cellular Microbiology	4
SURG 301	Immunity and Host Defense	3
Physiology & Pharmacology		
MPBP 301	Human Physiology & Pharm I	4
MPBP 302	Human Physiology & Pharm II	4

## 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. The goal is to ensure that 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 three formats, two oral and one written. The three phases of the exam occur at distinct times during training and all three must be satisfactorily completed to advance to 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 and core courses. The oral exam is scheduled after the student's first year. Phase II is a written grant proposal based on the student's thesis research project that is completed by the end of the student's second year. Phase III is an oral examination based on the grant proposal that must be completed by the student prior to entering the third year. The Phase II and III exams 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 in designated first and second year courses and successful completion of the comprehensive exam, as outlined in the CMB Program Handbook.

## CHEMISTRY

### OVERVIEW

The Chemistry Department currently offers graduate programs leading to either the M.S. or Ph.D. in analytical, 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 our 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 M.S. (p. 29)
- Chemistry Ph.D. (p. 30)

### FACULTY

**Brewer, Matthias;** Associate Professor, Department of Chemistry; PHD, University of Wisconsin Madison

**Goldberg, Joel Michael;** Associate Professor, Department of Chemistry; PHD, University of Michigan Ann Arbor

**Landry, Christopher C.;** Professor, Department of Chemistry; PHD, Harvard University

**Leenstra, Willem R.;** Associate Professor, Department of Chemistry; PHD, University of Washington

**Liptak, Matthew Denis;** Assistant Professor, Department of Chemistry; PHD, University of Wisconsin

**Madalengoitia, Jose Santos;** Associate Professor, Department of Chemistry; PHD, University of Virginia

**Matthews, Dwight E.;** Professor, Department of Chemistry; PHD, Indiana University Bloomington

**Petrucchi, Giuseppe A.;** Associate Professor, Department of Chemistry; PHD, University of Florida

**Waterman, Rory;** Associate Professor, Department of Chemistry; PHD, University of Chicago

**Waters, Stephen P.;** Assistant Professor, Department of Chemistry; PHD, University of Pennsylvania

**Whalley, Adam C.;** Assistant Professor, Department of Chemistry; PHD, Columbia University

## CHEMISTRY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 classic 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. Satisfactory scores on the Graduate Record Examination general (aptitude) section is required.

#### 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 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 384). 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 two (2) 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 Master of Science

Proficiency in three areas of chemistry evidenced by the biannual qualifying examinations or completion of designated courses at this university		
One semester of residence		
CHEM 318	Current Topics in Chemistry (Must be taken twice)	1
At least 15 credits of formal course work including:		15
Six credits of graduate level courses in the chemical field of specialization		
Three credits of graduate-level chemistry courses not in the area of specialization		
CHEM 381	Grad Seminar	
Maintenance of an overall point-hour ratio of 3.00		

## CHEMISTRY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### 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 classic chemical subdivision follows.

Analytical chemistry involves developing and applying instrumentation and chemical methods to solve problems across a range of chemistries and scientific disciplines. One focus is in electroanalytical chemistry studying redox processes of organometallic compounds, including electrocatalysis relevant to the environmental and biological applications. Another area focuses on the 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. The third area develops mass spectrometry instrumentation and chemistries for addressing current problems in the biomedical sciences. Key foci are development of methods for advancing the rapidly growing field of proteomics and application of stable isotopically labeled tracers to answer questions of metabolism and metabolic diseases in humans.

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. Another area of interest is spectroscopic and biochemical studies of metalloproteins, with the goal of using a detailed understanding of their structures to explain reaction patterns. 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, target-directed total synthesis of medicinally valuable natural products including macrolides, alkaloids, and terpenoids, biomimetic natural product synthesis, 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.

Physical chemistry research areas include three major areas of focus. The first is thermodynamics/kinetics of hydrogen absorption by metals, alloys, and intermetallic compounds with a view toward storage of hydrogen as a fuel. The second is utilization of TGA, IR, solid-state NMR, and powder X-ray diffraction in determining the structural features of layered zirconium phosphonates containing a mix of chromophores as pendant groups in the interlayer region. Subsequently, photophysics of the interlayer chromophores is explored via UV-vis and fluorescence spectroscopy. Third is the development of Co-59 NMR as a probe of metal tetrapyrrole electronic structure and using NMR/MCD spectroscopies to elucidate tetrapyrrole-containing enzyme binding sites.

### 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 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. Satisfactory scores on the Graduate Record Examination general (aptitude) section is required.

### Minimum Degree Requirements

In addition to the above requirements a student must:

- Complete a doctoral research project, write an acceptable dissertation, and defend it
- Present a total of 75 hours of credit in course work and dissertation research
- Make an oral and written presentation of an original research proposal, CHEM 488, typically in the first semester of the third year

### 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 three (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:

At least fifteen credits of research (CHEM 491)		15
CHEM 318	Current Topics in Chemistry (Must be taken three times)	1
CHEM 484	Advanced Topics in Chemistry (present and defend proposed dissertation topic)	2
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		
Three credits of teaching		3

One year of residence		
The following courses are required:		
CHEM 381	Grad Seminar	
Three semester hours of advanced course work in three of the following five areas: analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry, and related science (the remainder of each student's program will be determined by a departmental studies committee on the basis of qualifying examination performance, background, and research interests - typically, a student devotes much of the first year to formal course work)		
Maintenance of an overall grade point average of 3.00		

## CIVIL AND ENVIRONMENTAL ENGINEERING

### OVERVIEW

Graduate programs in Civil and Environmental Engineering that lead to the master of science and doctor of philosophy degrees are offered. The curricular and research programs emphasize engineering related to environmental processes, sustainable transportation systems, geotechnical, geoenvironmental and structural analysis.

Research includes: groundwater contamination; modeling and remediation including optimal remediation design; environmental restoration and ecological engineering; hydrological processes; air pollution and related health effects; modeling of contaminant fate and transport in the environment; materials; geotechnical and geoenvironmental engineering; dynamic behavior of structures and structural health monitoring; geo-energy; and sustainable transportation systems.

Graduate students of CEE can concurrently pursue certificates of graduate education in sustainable transportation systems, complex systems, and ecological economics.

### DEGREES

- Civil and Environmental Engineering AMP (p. 32)
- Civil and Environmental Engineering M.S. (p. 33)
- Civil and Environmental Engineering Ph.D. (p. 33)

### FACULTY

**Aultman-Hall, Lisa M.;** Professor, School of Engineering; PHD, McMaster University

**Bombliès, Arne;** Assistant Professor, School of Engineering; PHD, Massachusetts Institute of Technology

**Dewoolkar, Mandar M.;** Associate Professor, School of Engineering; PHD, University of Colorado Boulder

**Garcia, Luis;** Professor, School of Engineering; PHD, University of Colorado

**Ghazanfari, Ehsan;** Assistant Professor, School of Engineering; PHD, Lehigh University

**Hernandez, Eric M.;** Assistant Professor, School of Engineering; PHD, Northeastern University

**Hession, William;** Adjunct Associate Professor, School of Engineering; PHD, Oklahoma State University

**Holmen, Britt A.;** Associate Professor, School of Engineering; PHD, Massachusetts Institute of Technology

**Lee, Brian H. Y.;** Assistant Professor, School of Engineering; PHD, University of Washington

**Pinder, George Francis;** Professor, School of Engineering; PHD, University of Illinois Urbana-Champaign

**Rizzo, Donna Marie;** Professor, School of Engineering; PHD, University of Vermont

**Rosowsky, David;** Professor, School of Engineering; PHD, Johns Hopkins University

**Tan, Ting;** Assistant Professor, School of Engineering; PHD, Princeton University

## CIVIL AND ENVIRONMENTAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### 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 master's degree in civil and environmental engineering may enroll in the Accelerated Master's Program, 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. Upon entering the program, students may take up to nine graduate credits no later than August before the start of their senior year. Of these, a maximum of six credits can be counted toward both the B.S. and the M.S. degrees. 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 in the program typically begin work toward their master's thesis starting in the summer following their junior year.

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 list the courses proposed for graduate credit. Applicants must also complete the Graduate College application.

Students pursuing an M.S. degree in civil and environmental engineering may choose either a thesis or non-thesis based program.

#### Minimum Degree Requirements

The requirements for advancement to candidacy must be supplemented in either of the two following ways:

Option A (Thesis)	
Completion of advanced courses in civil and environmental engineering, mathematics, and other approved disciplines, and the completion of an acceptable master's thesis. At least thirty credits must be accumulated, six to nine of them in thesis research	30
Option B (Non-Thesis)	
Completion of thirty-six credits of advanced courses in civil and environmental engineering, mathematics, and other approved disciplines	36

Students must declare which option they intend to pursue at the beginning of their program.

#### Comprehensive Examination

A comprehensive examination is required of all M.S. students and must be completed before the thesis defense. For thesis option students this generally takes the form of an informal 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 a written examination consisting of four to six topics related to the student's course of study. The advisor solicits written questions from instructors from the courses the student has taken. This is usually taken in the last semester of their 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. 156)

### OVERVIEW

Graduate programs in Civil and Environmental Engineering that lead to the master of science and doctor of philosophy degrees are offered. The curricular and research programs emphasize engineering related to environmental processes, sustainable transportation systems, geotechnical, geoenvironmental and structural analysis.

Research includes: groundwater contamination; modeling and remediation including optimal remediation design; environmental restoration and ecological engineering; hydrological processes; air pollution and related health effects; modeling of contaminant fate and transport in the environment; materials; geotechnical and geoenvironmental engineering; dynamic behavior of structures and structural health monitoring; geo-energy; and sustainable transportation systems.

Graduate students of CEE can concurrently pursue certificates of graduate education in sustainable transportation systems, complex systems, and ecological economics.

### 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 Bachelor of Science degree in engineering is preferred, but applicants with a B.S. degree in one of the sciences are often accepted. The latter, however, should have a minimum of the following mathematics and science course work prior to admission: three semesters of calculus, one semester of differential equations, one semester of calculus-based physics, and one semester of chemistry. Satisfactory scores on the Graduate Record Examination general (aptitude) section are also required. 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 examination. Completed applications are due February 1.

### Minimum Degree Requirements

The requirements for advancement to candidacy must be supplemented in either of the two following ways:

Option A (Thesis)	
Completion of advanced courses in civil and environmental engineering, mathematics, and other approved disciplines, and the completion of an acceptable master's thesis. At least thirty credits must be accumulated, six to nine of them in thesis research	30
Option B (Non-Thesis)	
Completion of thirty-six credits of advanced courses in civil and environmental engineering, mathematics, and other approved disciplines	36

Students must declare which option they intend to pursue at the beginning of their program.

### Comprehensive Examination

A comprehensive examination is required of all M.S. students and must be completed before the thesis defense. For thesis option students this generally takes the form of an informal 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 a written examination consisting of four to six topics related to the student's course of study. The advisor solicits written questions from instructors from the courses the student has taken. This is usually taken in the last semester of their program.

The examination may be retaken 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. 159)

### OVERVIEW

Graduate programs in Civil and Environmental Engineering that lead to the master of science and doctor of philosophy degrees are offered. The curricular and research programs emphasize engineering related to environmental processes, sustainable transportation systems, geotechnical, geoenvironmental and structural analysis.

Research includes: groundwater contamination; modeling and remediation including optimal remediation design; environmental



restoration and ecological engineering; hydrological processes; air pollution and related health effects; modeling of contaminant fate and transport in the environment; materials; geotechnical and geoenvironmental engineering; dynamic behavior of structures and structural health monitoring; geo-energy; and sustainable transportation systems.

Graduate students of CEE can concurrently pursue certificates of graduate education in sustainable transportation systems, complex systems, and ecological economics.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

An undergraduate degree in an appropriate field of study and demonstrated academic performance as measured by grades and satisfactory scores on the Graduate Record Examination general (aptitude) section. Applicants whose native language is not English or who have not received their education in English must present satisfactory results from the TOEFL examination. Completed applications are due February 1.

### Minimum Requirements for the Degree of Doctor of Philosophy

In addition to advancement to candidacy, the student must:

- Present at least seventy-five credits in approved course work and research (including those required for advancement to candidacy), of which at least thirty-five credits are in research and six credits are in course work in disciplines ancillary to Civil and Environmental Engineering
- Write and successfully defend an acceptable dissertation

### 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 one year of residency at UVM are needed for advancement to candidacy.

The comprehensive examination covers five topics or courses, from three topical areas. The three areas are described below.

Area 1. One topic from the following three;

1. Advanced Mathematical Methods (e.g. CE 304, CE 305)
2. Advanced Statistical Methods (e.g. STAT 231, STAT 225)
3. Probabilistic Methods (e.g.

Area 2. Two topics from the following eight;

1. Water and Wastewater Engineering (e.g. CE 254, CE 255, CE 256)
2. Air Pollution, Hazardous Waste (e.g. CE 253, CE 248)
3. Hydrology (e.g. CE 260, CE 360)
4. Groundwater (e.g. CE 265, CE 365)
5. Advanced Fluids (e.g. CE 261)
6. Advanced Civil Engineering Analysis (e.g. CE 226)
7. Advanced Soils (e.g. CE 283)
8. Transportation Systems (CE 241, CE 245)

Area 3. Two topics from the following four;

1. Numerical Methods (e.g. CE 220)
2. Computational Modeling (e.g. CE 366)
3. Information Technology Applications (e.g. NR 285 (GIS), CS 256, CS 331)
4. Optional Area subject to approval by Studies Committee

Five members of the Comprehensive Examination Committee will test the student in five appropriate topics selected from the previous list. Each faculty member will be responsible for one of the five topics. Students generally select from courses that they have had at UVM, but occasionally a student may select a faculty member that they did not have, but covers a topic that they have taken. The students and their Advisor select the Comprehensive Examination Committee.

The examination takes place in two days and covers a written part (day 1) and an oral part (day 2). Each committee member makes up a written question or questions for the student that will take about an hour. The written examination is 6 hours long. The student usually answers three questions in the three and a half hour morning session and then two questions in the two and a half hour afternoon session. The questions can be closed book or open book. This is determined by each committee member. The student should talk to each committee member prior to the examination to determine the format and scope.

The oral examination is usually then given two days after the written examination. This allows a day for the committee members to review the answer to their question, and the student to relax before the oral examination. The oral examination requires three consecutive hours, a half an hour per examiner and a half an hour for the committee to reassemble and to decide if the student passed or failed the examination.

The student is responsible for coordinating the dates for the written and oral examination with their committee members, at least one month prior to the examination date. For the oral examination, all committee members must be present. Students will coordinate with the office of the Dean of the college or Program secretary to find a room for the oral examination. The student then gives to

the Graduate Program Coordinator the list of members with email addresses and phone numbers, and the dates of the examinations. The Graduate Program Coordinator solicits the questions from the examiners and administers the written examination to the student. The Graduate Program Coordinator then returns the examination to the appropriate committee members to be graded. The Graduate Program Coordinator schedules the examination times for each committee member. They each have a half of an hour. At the end of the two and a half hours, all of the committee members meet.

The Comprehensive Examination must be passed at least 6 months before submitting the dissertation. Success in the Comprehensive Examination is prerequisite for an oral Dissertation Defense 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:

- One year of residency at UVM
- Teaching experience in one course
- At least twelve credits of research
- At least fifteen 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

### 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. Our 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. 36)
- Clinical and Translational Science M.S. (p. 36)
- Clinical and Translational Science Ph.D. (p. 37)

### FACULTY

**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Chen, Elizabeth S.;** Assistant Professor, Department of Medicine-General Internal Medicine Research; PHD, Columbia University

**Freeman, Kalev;** Assistant Professor, Department of Surgery; MD, University of Colorado Boulder

**Galbraith, Richard A.;** Professor, Department of Medicine-Clinical Pharmacology; MD, Kings College University

**Jones, Christopher Arthur-Anthony;** Assistant Professor, Department of Surgery; PHD, University of Oxford

**Kennedy, Amanda G.;** Associate Professor, Department of Medicine-General Internal Medicine Research; PHARM, D, Northeastern University

**Littenberg, Benjamin;** Professor, Department of Medicine-General Internal Medicine Research; 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 Research; MD, SUNY Buffalo

**Rubin, Alan Saul;** Associate Professor, Department of Medicine-General Internal Medicine Research; MD, New York University

**Sarkar, Indra N.;** Assistant Professor, Department of Microbiology and Molecular Genetics; MLIS, Syracuse University

## CLINICAL AND TRANSLATIONAL SCIENCE CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### 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 from the Center for Clinical and Translational Science website.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

- U.S. Baccalaureate degree or an equivalent international degree
- Four semesters of college-level science highly recommended.
- Two semesters of college-level mathematics or statistics highly recommended.
- Two semesters of college level English composition or equivalent

#### Minimum Degree Requirements

Students are expected to complete 19 credits of core course work and participate in the weekly Seminar in CTS.

## CLINICAL AND TRANSLATIONAL SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

#### Concentration in Investigation

This program is designed to effectively and efficiently transform clinicians and other young academics drawn from the large array of disciplines contributing to health into successful independent clinical and translational science investigators.

#### Concentration in Research Management

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 Admissions to Graduate Studies for the Degree of Master's of Science

##### CONCENTRATION IN INVESTIGATION

- Applicants should have a Doctoral Degree, expertise in their specialty and some general research experience.
- Four semesters of college-level science highly recommended.
- Two semesters of college-level mathematics or statistics highly recommended.
- Two semesters of college level English composition or equivalent.
- Interviews with appointed faculty are required.

##### CONCENTRATION IN RESEARCH MANAGEMENT

- U.S. Baccalaureate degree or an equivalent international degree.
- Four semesters of college-level science highly recommended.



- Two semesters of college-level mathematics or statistics highly recommended.
- Two 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 31 credit degree that includes 19 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.

#### CONCENTRATION IN RESEARCH MANAGEMENT

The Master's in CTS (Research Management) is a 31 credit degree that includes 22 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.

### 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 two parts. The first part is writing a 1-2 page NIH-style project summary of a grant protocol. The second part requires an analysis of an existing dataset using the concepts learned in the core courses

The oral exam requires students to meet with 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 the Advancement to Candidacy for the Degree of Master's 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.

## CLINICAL AND TRANSLATIONAL SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

## 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.
- Four semesters of college-level science highly recommended.
- Two semesters of college-level mathematics or statistics highly recommended.
- Two 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 19 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.

### 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 protocol 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 a minimum 3.00 grade point average in didactic coursework, have acceptable evaluations in their research work and successfully complete the oral and written comprehensive exam.

## COMMUNICATION SCIENCES AND DISORDERS

### 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 2012 - 2020 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 faculty does research in speech and language development and disorders. Many opportunities are available for graduate students who wish to become involved in faculty research projects. Our faculty members include:

Adams, Elizabeth; Clinical Associate Professor, Department of Communication Sciences and Disorders; Au.D., CCC-A, A.T. Still University

Baldwin, Tracey; Clinical Assistant Professor, Department of Communication Sciences and Disorders; M.A., CCC-SLP, University of Memphis

Cote, Sharon; Clinical Assistant Professor, Department of Communication Science and Disorders; M.S., CCC-SLP, Boston University

Erwin-Davidson, Lisa; Lecturer, Department of Communication Science and Disorders; M.S., CCC-SLP, Pennsylvania State University

Favro, Mary Alice; Clinical Assistant Professor, Department of Communication Sciences and Disorders; M.A., CCC-SLP, University of Massachusetts, Amherst

Hutchins, Tiffany L.; Assistant Professor, Department of Communication Sciences and Disorders; Ph.D., University of South Florida

Morris, Hope; Clinical Assistant Professor, Department of Communication Sciences and Disorders; M.S., CCC-SLP, Towson University

Potvin, Christine-Marie; Lecturer, Department of Communication Sciences and Disorders; Doctorate, Rehabilitative Sciences, McGill University

Smith, Dinah; Clinical Associate Professor, Department of Communication Sciences and Disorders; M.A., CCC-A, Indiana University

Velleman, Shelley L.; Professor & Chair, Department of Communication Sciences and Disorders; Ph.D., University of Texas Austin

### DEGREES

- Communication Sciences and Disorders M.S. (p. 38)

### FACULTY

**Cannizzaro, Michael S.;** Associate Professor, Department of Communication Sciences and Disorders; Ph.D., University of Connecticut

**Guilar, Barry E.;** Professor, Department of Communication Sciences and Disorders; Ph.D., University of Wisconsin

**Prelock, Patricia A.;** Professor, College of Nursing and Health Sciences; Ph.D., University of Pittsburgh

## COMMUNICATION SCIENCES AND DISORDERS M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 2012 - 2020 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 faculty does research in speech and language development and 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
CSD 094	Dev of Spoken Language	3
CSD 101	Speech & Hearing Science	4
CSD 022	Introduction to Phonetics (OR )	3
or LING 165	Phonetic Theory and Practice	
CSD 281	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, 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	3
CSD 272	Hearing Rehabilitation	3
CSD 313	Augmentative Communication	3
CSD 320	Clinic Preparation&Management	3
CSD 321	Clinic Study 1	1
CSD 322	Clinic Study 2	2
CSD 323	Clinic Study 3	3
CSD 324	Clinic Study 4	2
CSD 325	Clinic Study 5	3

CSD 326	Clinic Study Winter Term 6	1
CSD 330	Assessment of Stuttering	1
CSD 331	Treatment of Stuttering	2
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 352	Voice Disorders	3
CSD 351	Aphasia in Adults	3
CSD 353	Adult Neuropathologies	3
CSD 360	Rsch Methods Comm Disorders I	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		54-57

In total, 49-55 credits of graduate course work are required for the non-thesis track and 55-58 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.

<b>Option A (Thesis)</b>	
The student will complete 49-52 credits of graduate-level courses and six additional credits (CSD 362) for conducting the research leading to an M.S. thesis	
<b>Option B (Non-Thesis)</b>	
Students choosing the non-thesis option will complete 49-55 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

Satisfactory completion of the written comprehensive examination in the form of a portfolio. Students will not be admitted to candidacy if

400 practicum hours (including twenty-five hours of observation) are not reached. Students may submit their comprehensive examination portfolio only in or following that semester in which they will have completed thirty-six graduate credits and 300 hours of supervised clinical practicum, and eleven credits in clinical study.

## COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS

### 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), ecological design and renewable energy, public policy, community entrepreneurship, cross-cultural communication, consumer affairs, food systems, and political process. CDAE's research and outreach is both global 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 M.S. (p. 41)

### FACULTY

**Baker, Daniel H.;** Associate Professor, Department of Community Development and Applied Economics; PHD, University of Vermont  
**Conner, David S.;** Assistant 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;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Ohio University  
**Inwood, Shoshannah Miriam;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Ohio State 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  
**Liang, Chyi-Lyi Kathleen;** Professor, Department of Community Development and Applied Economics; PHD, Purdue University  
**Parsons, Robert L.;** Extension Professor, Department of Community Development and Applied Economics; PHD, Virginia Polytechnic Institute and State University  
**Sun, Tao;** Assistant Professor, Department of Community Development and Applied Economics; PHD, University of Minnesota Twin Cities  
**Wang, Qingbin;** Professor, Department of Community Development and Applied Economics; PHD, Iowa State University  
**Watts, Richard A.;** Research Assistant Professor, Department of Community Development and Applied Economics; PHD, University of Vermont  
**Zia, Asim;** Associate Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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), ecological design and renewable energy, public policy, community entrepreneurship, cross-cultural communication, consumer affairs, food systems, and political process. CDAE's research and outreach is both global 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

- GPA = 3.00 or equivalent from bachelor's degree.
- Completion of an acceptable Calculus course.
- Completion of an acceptable Intermediate Microeconomics course.
- Satisfactory scores from the Graduate Record Examination (GRE); official scores are required.
- Three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing the M.S. in CDAE.
- 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 acceptable scores for admission to the Graduate College at UVM:

Internet Based	80
Computer Based	213
Paper Based	550

- Minimum acceptable scores for a student receiving funding from UVM:

Internet Based	100
Computer Based	250
Paper Based	600

Institution code for test scores for UVM is 3920.



NOTE: The application deadlines for the program are mid-February (for an acceptance decision by March 1) for fall funding consideration. Open enrollment for others.

### Minimum Degree Requirements

The degree requires a total of thirty-six credits, of which thirty are from advanced courses in CDAE and other related fields plus six 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.

Four core courses and graduate research seminars are required for each graduate student:

CDAE 354	Advanced Microeconomics	3
CDAE 351	Research Methods	3
One additional course in quantitative or qualitative analysis to be approved by the graduate studies committee, for example:		3
STAT 225	Applied Regression Analysis	
STAT 223	Applied Multivariate Analysis	
EDFS 347	Qualitative Research Methods	
One course in community development to be approved by the graduate studies committee, for example:		3
CDAE 326	Community Economic Development	
CDAE 392	Graduate Seminars (Each student is required to complete three credits of this course. Students should enroll for one credit in each of three semesters)	1

### 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.

## COMPLEX SYSTEMS

### OVERVIEW

The Vermont Complex Systems Center comprises a transdisciplinary group of faculty and their graduate students and postdocs who collaborate in analyzing, modeling, and understanding complex physical, biological, technological, and/or sociological systems. The Center sponsors an invited seminar series, a biweekly reading group, biweekly meetings of SCRAPs (Student Complexity Research And Pizza Seminar), research symposia, and TEDxUVM events. Most graduate students affiliated with the Center complete the 5-course Certificate of Graduate Study in Complex Systems as a complement to their graduate degrees across campus.

### DEGREES

- Complex Systems CGS (p. 43)

### FACULTY

**Bates, Jason H. T.;** Interim Director, School of Engineering; Professor, Department of Medicine - Pulmonary; Research Professor, Department of Molecular Physiology and Biophysics; PHD, Otago University

**Beckage, Brian;** Associate Professor, Department of Plant Biology; PHD Duke University

**Bongard, Joshua C.;** Associate Professor, Department of Computer Science; PHD, University of Zurich

**Danforth, Christopher M.;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park

**Del Maestro, Adrian G.;** Assistant Professor, Department of Physics; PHD, Harvard University

**Dodds, Peter S.;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology

**Dubief, Yves C.;** Associate Professor, School of Engineering; PHD, Institut National Polytechnique de Grenoble; PHD, Institut National Polytechnique de Grenoble

**Dunlop, Mary J.;** Assistant Professor, Department of Computer Science, Assistant Professor, Department of Engineering; PHD, California Institute of Technology

**Eppstein, Margaret Jean;** Associate Professor, Department of Computer Science; PHD, University of Vermont

**Garavan, Hugh P.;** Associate Professor, Department of Psychiatry, Associate Professor, Department of Psychology; PHD, Bowling Green State University

**Gibson, William Arch;** Professor, Department of Economics; PHD University of California, Berkeley

**Goodnight, Charles James;** Professor, Department of Biology; PHD, University of Chicago

**Hernandez, Eric;** Assistant Professor, Department of Engineering; PHD, Northeastern University

**Hines, Paul D.;** Assistant Professor, School of Engineering; PHD, Carnegie Mellon University

**Koliba, Christopher J.;** Professor, Department of Community Development and Applied Economics; PHD, Syracuse University

**Mirchandani, Gagan S.;** Professor, Department of Computer Science, Professor, Department of Engineering; PHD, Cornell University

**Ricketts, Taylor H.;** Director, Gund Institute, Professor, Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**Rizzo, Donna Marie;** Associate Professor, Department of Engineering; PHD, University of Vermont

**Sansoz, Frederic P.;** Associate Professor, Department of Engineering, Director, Department of Mechanical Engineering; PHD, Ecole des Mines

**Zia, Asim;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Georgia Institute of Technology

## COMPLEX SYSTEMS CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### 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. Please visit the Complex Systems Center website for more information regarding the Certificate.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

Calculus, statistics, and computer programming (in any language, but prior Matlab 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 fifteen graduate credits, including two core courses (CSYS 300 and CSYS 302), one additional approved course on core complex systems methodologies, and two other approved complex systems electives. It may be earned either in conjunction with or independent of a UVM graduate degree program.

Additional information on the Certificate of Graduate Study in Complex Systems, including a list of approved complex systems electives, is available on the Vermont Complex Systems Center website.

## COMPUTER SCIENCE

### OVERVIEW

The Department of Computer Science offers three graduate programs through the Graduate College: an Accelerated Master's Program (AMP) that enables strong computer science 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 contributes courses to and coordinates the Transdisciplinary Certificate of Graduate Study in Complex Systems.

### DEGREES

- Computer Science AMP (p. 44)
- Computer Science M.S. (p. 45)
- Computer Science Ph.D. (p. 46)

### FACULTY

**Bongard, Joshua C.;** Associate Professor, Department of Computer Science; PHD, University of Zurich

**Chen, Elizabeth S.;** Assistant Professor, Department of Medicine-General Internal Medicine; PHD, Columbia University

**Dinitz, Jeffrey Howard;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Dunlop, Mary J.;** Assistant Professor, School of Engineering; PHD, California Institute of Technology

**Eppstein, Margaret Jean;** Associate Professor, Department of Computer Science; PHD, University of Vermont

**Hines, Paul D.;** Assistant Professor, School of 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

**Mirchandani, Gagan S.;** Professor, School of Engineering; PHD, Cornell University

**Oughstun, Kurt Edmund;** Professor, School of Engineering; PHD, University of Rochester

**Pinder, George Francis;** Professor, School of Engineering; PHD, University of Illinois Urbana-Champaign

**Radermacher, Michael ;** Professor, Department of Molecular Physiology and Biophysics; PHD, University of Munich

**Rizzo, Donna Marie;** Professor, School of Engineering; PHD, University of Vermont

**Sarkar, Indra N.;** Assistant Professor, Department of Microbiology and Molecular Genetics; MLIS, Syracuse University

**Skalka, Christian Edward;** Associate Professor, Department of Computer Science; PHD, Johns Hopkins University

**Snapp, Robert Raymond;** Associate Professor, Department of Computer Science; PHD, University of Texas Austin

**Wang, Xiaoyang;** Adjunct Professor, Department of Computer Science; PHD, University of Southern California

**Wu, Xindong;** Professor, Department of Computer Science; PHD, Edinburgh University

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

**Zia, Asim;** Associate 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. 156)

### OVERVIEW

The Accelerated Master's Program (AMP) in computer science allows students with strong ability and motivation to complete a bachelor's and a master's degree in computer science within five years. It is expected that students enrolled in this program will pursue a master's thesis on original research commencing in the summer following their senior year.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Master's Students

The first four years of the AMP consist of a complete undergraduate program in computer science, satisfying the curricular requirements for one of the following:

- the Bachelor of Science in Computer Science,
- the Bachelor of Science, major in Computer Science and Information Systems, or
- the Bachelor of Arts, major in Computer Science.

During the fourth year, a student in the AMP has dual status, being an undergraduate student in computer science, and simultaneously a first-year graduate student in computer science. Up to six credits of graduate courses taken during an AMP student's senior year can be applied simultaneously towards both the undergraduate and graduate degree, provided that the courses are taken after the student has been accepted into the Graduate College. These courses must be approved in advance by the Director of Graduate Studies in Computer Science.

With permission of the Graduate Committee and the Graduate College, AMP students may apply additional graduate level computer science credits taken before they complete their undergraduate degree to their Master's degree, as long as these credits are not applied to their undergraduate degree.

Undergraduates interested in the AMP should discuss this option with the Director of Graduate Studies in Computer Science during their junior year.

## Minimum Degree Requirements

<b>Option A (Thesis)</b>		
Thirty credits, including a minimum of twenty-one credits of approved course work, and six to nine credits of thesis research (CS 391)		30
<b>Option B (Project)</b>		
Thirty credits, including a minimum of twenty-four credits of approved course work, and three to six credits of project research (CS 392)		30
<b>Option C (Non-Thesis)</b>		
Thirty credits of approved course work		30
<b>All Options</b>		
Students in all options must take, or have completed the equivalent of, the core sequence:		
CS 201	Operating Systems	3
CS 224	Algorithm Design & Analysis	3
CS 243	Theory of Computation	3
Pass a comprehensive exam covering material from the core sequence		
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 two grades below B are eligible for dismissal.)		

## Comprehensive Examination

Taking all required M.S. courses at UVM and receiving a grade of A- or better constitutes successfully completing the comprehensive examination.

M.S. students who either took one or more required courses at another institution, or who passed a course at UVM but with a grade between B+ and C- must take an oral exam in this course area. In this event, the Graduate Committee will form an exam committee for this oral exam. Each student who needs to take comprehensive oral exams should arrange a schedule with the examiners and then inform the Graduate Committee of the exam date. It is strongly recommended that the examination is completed during the academic year, unless all examiners agree to give the exam on a date during the break. Passing or failing of the examination is noted on the student's transcript.

## 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. 156)

## 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:

Two courses that treat systematic program development in a high-level language, for example:		7
CS 021	Computer Programming I	
CS 110	Intermediate Programming	
One course in computer system organization, for example:		3
CS 121	Computer Organization	
One course in data structures, for example:		3
CS 124	Data Structures & Algorithms	
One course in computability and complexity, for example:		3
CS 125	Computability and Complexity	
Two courses in differential and integral calculus, for example:		8
MATH 021	Calculus I	
MATH 022	Calculus II	
One course in linear algebra:		3
MATH 124	Linear Algebra	
One course in probability and statistics, for example:		3
STAT 143	Statistics for Engineering	

Applicants who have strong academic records in a different discipline and lack one 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.

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 examination.

## Minimum Degree Requirements

<b>Option A (Thesis)</b>		
Thirty credits, including a minimum of twenty-one credits of approved course work, and a minimum of six credits of thesis research (CS 391)		30
<b>Option B (Project)</b>		



Thirty credits, including a minimum of twenty-four credits of approved course work, and a minimum of three credits of project research (CS 392)		30
<b>Option C (Non-Thesis)</b>		
Thirty credits of approved course work		33
<b>All Options</b>		
Students in all options must take, or have completed the equivalent of, the core sequence:		
CS 201	Operating Systems	3
CS 224	Algorithm Design & Analysis	3
CS 243	Theory of Computation	3
Pass a comprehensive exam covering material from the core sequence		
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 two grades below B are eligible for dismissal.)		

## Comprehensive Examination

Taking all required M.S. courses at UVM and receiving a grade of A- or better constitutes successfully completing the comprehensive examination.

M.S. students who either took one or more required courses at another institution, or who passed a course at UVM but with a grade between B+ and C-, must take an oral exam in this course area. In this event, the Graduate Committee will form an exam committee for this oral exam. Each student who needs to take comprehensive oral exams should arrange a schedule with the examiners and then inform the Graduate Committee of the exam date. It is strongly recommended that the examination is completed during the academic year, unless all examiners agree to give the exam on a date during the break. There is no fee. A grade of "S" or "U" is recorded.

## 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. 159)

## 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.

Applicants who have strong academic records in a discipline other than computer science and lack an acceptable computer science background, including courses in Data Structures (e.g. CS 124), Computer Organization (e.g., CS 121), and Theory of Computation (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 550 (or 213 with computer-based test or 80 with Internet-based test) or above. To be considered for financial assistantship from the University, applicants must have a TOEFL score of 600 (or 250 with computer-based test or 100 with Internet-base test) or above.

### Minimum Requirements for the Degree of Doctor of Philosophy

A minimum of seventy-five credits of graduate study must be approved by the graduate studies committee and successfully completed. All students must take a minimum of thirty credits of research and thirty credits of course work, of which at least fifteen 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

Three hurdles mark the completion of these stages:

- 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 two peer-reviewed publications 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 Committee. 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 Committee after a commenting period of one week from the CS graduate faculty. The specific policy on the oral examination procedure is administered by the Graduate Committee.

On the first try, the examination committee will award students one of the following three outcomes to the exam:

1. Pass at the Ph.D. level
2. Pass at the M.S. level with opportunity for at most one retake (to try for a Ph.D. level pass)
3. Fail with opportunity for at most one retake

If a student retakes the comprehensive exam, the examination committee will award students one of the following three 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. degree (including the M.S. comprehensive exam, defined above), 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 fifteen 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

### OVERVIEW

The Graduate Counseling Program provides professional preparation for individuals who wish to work as counselors in schools, colleges, community mental health, social service agencies or private practice.

To achieve professional competence, students are expected to become knowledgeable and skilled in the following areas: professional identity, social and cultural diversity, human growth and development, career development, helping relationships, group work, assessment, research and program evaluation, and in additional areas in their specialized track of study. A supervised internship in an appropriate field setting is a requirement in the program for each track of study.

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 M.S. (p. 48)

### FACULTY

**Geroski, Anne M.;** Associate Professor; Department of Leadership and Developmental Sciences; EDD, University of Maine

**Okech, Jane E.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, Idaho State University

**Smith, Lance C.;** Assistant Professor; Leadership and Developmental Sciences; PHD, Syracuse University

## COUNSELING M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

There are two tracks of study in the Graduate Counseling Program: the school counseling track (48 credits) and the mental health track (60 credits). Students may elect to enroll in both tracks - the Dual option, which is 68 credits. The Graduate Counseling Program (both tracks) is accredited by the Council for the Accreditation of Counseling and Related Educational Programs (CACREP). The

school counseling track meets the requirements set by the State of Vermont Department of Education for preparing school counselors (K-12) for licensure in Vermont, and the mental health counseling track 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 on-line admissions process. Applications received by February 1 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.
- Three 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.
- Official Graduate Record Examination (GRE): GRE scores must be no more than 5 years old.
- 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): It is a Graduate College policy that applicants whose native or first language is not English must submit TOEFL test scores for admission. Minimum acceptable scores for admission to the Graduate College at the University of Vermont - Internet based = 90 and Paper based = 577. Minimum acceptable scores for a student receiving funding at the University of Vermont - Internet based = 100 and Paper based = 600.

After an initial review of applications, qualified applicants will be invited to participate in a group interview on the UVM campus. One or more faculty members and a graduate student currently enrolled in the program conduct the 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.

In extenuating circumstances, an applicant may be given permission to participate in a Skype interview. Arrangements will be made for these alternatives on an individual basis after full faculty consultation.

**Admissions Prerequisites:** Applicants seeking admissions to the School Track and wishing to be licensed in Vermont as a school counselor should have documentation of at least 30 credit hours in an Arts and Sciences undergraduate major (e.g., English, Mathematics, Psychology). This is a State of Vermont requirement for licensure to practice counseling in public schools in Vermont. For more information about this requirement or how a specific transcript may document this requirement, students should speak directly with the director of CESS Student Services, UVM (802-656-3468) prior to applying to the program.

### **Minimum Degree Requirements**

The Graduate Counseling Program offers two specialty tracks: school counseling and mental health counseling. Students may also select the dual option which includes preparation in both specialty tracks. Forty-eight credits are required for completion of the school counseling track, sixty credits are required for the mental health counseling track and sixty-eight credits are required for the dual option. (Note: school counselor licensure in Vermont requires that the individual have at least a thirty-credit-hour liberal arts concentration at the undergraduate-level.) 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.

### **Comprehensive Examination**

The comprehensive exam for the Graduate Counseling program consists of the oral examination and the School Counseling Portfolio. 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 School Counseling Portfolio 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

### 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 develop expertise in specific educational content areas. These content areas (concentrations) are developed to provide a comprehensive background in fields basic to instruction and curriculum development as well as the application of that knowledge to a specialized field. They include courses aimed at the examination and improvement of instructional practices in PreK through 12 and instructional roles in human services, and understanding of curriculum theory and the application of curriculum development.

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 AMP (p. 50)
- Curriculum and Instruction M.A.T. (p. 51)
- Curriculum and Instruction M.Ed. (p. 52)

### FACULTY

**Colley, Binta M.;** Assistant Professor, Department of Education; PHD, Boston College

**Neumann, Maureen Doyle;** Associate Professor, Department of Education; PHD, University of Washington

**Tinkler, Barri E.;** Assistant Professor, Department of Education; PHD, University of Denver

**Toolin, Regina;** Associate Professor, Department of Education; PHD, University of Wisconsin Madison

## CURRICULUM AND INSTRUCTION AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

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. Following acceptance by the Graduate College, these students, may complete nine credits of graduate-level course work, 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 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 two 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 or Spanish

For both Middle Level and Secondary Education:

- A minimum overall grade point average of 3.00 in undergraduate course work as well as a 3.00 in the State-approved licensing area (major)
- A demonstrated commitment to working with young people

#### Minimum Degree Requirements

AMP students may use up to six (6) 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. 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 Master of Arts in Teaching program has two tracks: Middle level and Secondary level.

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.

EDSC 207	Development:Theory & Applctn	3 or 4
EDSP 201	D2:Foundations of Special Ed	3
EDSC 209	Practicum in Teaching	3 or 4
EDSC 215	Reading in Secondary Schools	3-4
EDSC 216	Curr,Instr&Assmt Sec Schl Tch	3
EDSC 226	Teaching Internship	8-12
EDSC 227	Tchg Science in Sec Schls	3
EDSC 230	Teaching for Results	3
Total Program Credit Requirements		31

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 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 177	Adolescent Lit and Literacy	3
EDML 260	Teaching Young Adolescents	6
EDML 261	Middle Level Teaching Pract	3
EDML 270	Middle School Org & Pedagogy	3
EDSP 201	D2:Foundations of Special Ed	3
EDML 207	Adoles Lrng&Beh&Cog Perspect	3
EDML 287	Literacy & Mathematics	3
EDML 285	Middle Level Student Teaching	9
EDML 286	Internship Support Seminar	3

## Comprehensive Examination

Secondary Education Comprehensive Examination includes satisfactory completion of Vermont Agency of Education ROPA License Portfolio.

Middle Level Education Comprehensive Examination includes an oral examination and satisfactory completion of Vermont Agency of Education ROPA License Portfolio.

## Requirements for Advancement to Candidacy for the Degree of Master of Arts in Teaching

Successful completion of any prerequisite courses, and at least 15 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. 156)

## 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 particularly welcomes students from UVM and northeastern colleges, and universities majoring in arts and sciences, agriculture and natural resources who have completed majors in social sciences, science, mathematics, etc. Students will prepare for licensure to teach in grades five through nine or seven through twelve in one or two summers and one academic year.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Arts in Teaching

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 and Secondary level.

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.

EDSC 207	Development:Theory & Applctn	3 or 4
EDSP 201	D2:Foundations of Special Ed	3
EDSC 209	Practicum in Teaching	3 or 4



EDSC 215	Reading in Secondary Schools	3-4
EDSC 216	Curr,Instr&Assmt Sec Schl Tchr	3
EDSC 226	Teaching Internship	8-12
EDSC 227	Tchng Science in Sec Schls	3
EDSC 230	Teaching for Results	3
Total Program Credit Requirements		31

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 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 177	Adolescent Lit and Literacy	3
EDML 260	Teaching Young Adolescents	6
EDML 261	Middle Level Teaching Pract	3
EDML 270	Middle School Org & Pedagogy	3
EDSP 201	D2:Foundations of Special Ed	3
EDML 207	Adoles Lrng&Beh&Cog Perspect	3
EDML 287	Literacy & Mathematics	3
EDML 285	Middle Level Student Teaching	9
EDML 286	Internship Support Seminar	3

### Comprehensive Examination

Secondary Education Comprehensive Examination includes satisfactory completion of Vermont Agency of Education ROPA License Portfolio.

Middle Level Education Comprehensive Examination includes an oral examination and satisfactory completion of Vermont Agency of Education ROPA License Portfolio.

### Requirements for Advancement to Candidacy for the Degree of Master of Arts in Teaching

Successful completion of any prerequisite courses, and at least 15 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. 158)

## OVERVIEW

The Curriculum and Instruction Master's program is designed to develop leadership in such educational settings as teaching, curriculum theory, curriculum development, and related areas of research for elementary, middle and secondary level school settings, along with other educational areas. Areas of focus within the M.Ed. include Educational Technology, Library Media, Mathematics, Middle Level Multicultural and Cultural Studies, Reading and Language Arts, Physical Education, and General Curriculum Theory. The program is also appropriate for those with instructional roles in human services agencies and other educational venues.

Programs are developed to provide a comprehensive background in fields basic to instruction and curriculum development as well as the application of that knowledge to a specialized field. They include courses aimed at the examination and improvement of instructional practices in atmospheres that support student learning in grades K-12, and the application of curriculum theory and development. Opportunities for independent study and research are encouraged in all specializations.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Education

Program information and application instructions for this degree at the Middle and Secondary Levels can be found on the Curriculum and Instruction Program website. Inquiries regarding these programs can be made at (802) 656-3356.

### Minimum Degree Requirements

Work at the graduate-level draws upon other divisions of the university, thus enabling the college to develop strong programs of professional education which include academic offerings in the various teaching fields in elementary and secondary education. Degree concentrations, in addition to those listed below, can be developed on an interdisciplinary basis responding to student strengths and needs.

Courses in professional education include:

EDCI 200	Contemporary Issues	0-6
EDCI 207	Univ and Third World Devel	3
EDCI 211	Educational Measurements	3
EDCI 215	The Gifted Child	3
EDCI 238	Teach'g w/Global Perspective	3
EDCI 241	Science for the Elem School	3
EDCI 245	Computer Apps in Elem&Sec Curr	3
EDCI 261	Current Direction in C&I	3
EDCI 333	Curr Concepts/Planning/Develop	3
EDCI 363	Analysis of Curr & Instruc Sem	3

EDCI 397	Problems in Education	1-6
EDFS 200	Contemporary Issues	3
EDFS 204	Sem in Educational History	3
EDFS 205	History of American Education	3
EDFS 206	D2:Comparative Education	3
EDFS 207	Traditionalist Education	3
EDFS 209	Intro to Research Methods	3
EDFS 255	School as Social Institution	3
EDFS 302	Philosophy of Education	3
EDFS 303	Ethics Helping Relationships	3
EDFS 304	Religion, Spirituality & Ed	3
EDFS 309	Schol Pers Narr Writing:ED&SS	3
EDFS 314	Modes of Inquiry	3
EDFS 322	D1:Chall Multicult/Ed&Soc Inst	3
EDFS 347	Qualitative Research Methods	3
EDFS 348	Analyze&Write Qualitative Rsch	3
EDFS 352	Aesthetic Ed & Social Justice	3
EDFS 354	Anth Persp on Ed & Soc Serv	3
EDFS 369	Ethics in Ed & Soc Serv Admin	3
EDFS 377	Seminar Educational Psychology	3
EDFS 380	Professional Problems in Educ	3
EDFS 397	Problems in Education	1-6
EDLT 200	Contemporary Issues	1-6
EDLT 222	Cltvate Chil Lit in El/Mid Sch	3
EDLT 223	Read Pgms in Sec Schl & Col	3
EDLT 228	Lit in Jr/Sr High Schl Curr	3
EDLT 234	Lit & Lang for Chil & Youth	3
EDLT 236	Multicultural Children's Lit	3
EDLT 295	Laboratory Experience in Educ	1-6
EDLT 319	Internship for Spec Pers in Ed	1-18
EDLT 375	Lit Assmt: Understand Indiv Dif	3
EDLT 376	Clin/Tut Appr for Lit Intrvntn	3-6
EDLT 378	Adv Stdy/Rsch in Read/Rel LArt	3
EDLT 379	Seminar in Reading Instruction	3
EDLT 380	Professional Problems in Educ	3
EDLT 385	Critical Issues in Lang&Litrcy	3

EDLI 200	Contemporary Issues	1-6
EDLI 272	Manage Schl Library Media Ctrs	3
EDLI 273	Organizing Schl Libr Media Ctr	3
EDLI 274	Design Instr Sch Lbr Media Ctr	3
EDLI 275	Dev Sch Libr Media Ctr Collect	3
EDLI 276	Information Sources & Services	3
EDLI 277	Info Tech Schl Libr Media Ctrs	3
EDLI 295	Lab Experience in Educ	1-6
EDLP 268	Educational Law	2-3
EDLP 336	Curr Mgmt in Ed & Soc Srv Org	3

### 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.

### Requirements for Advancement to Candidacy for the Degree of Master of Education

The requirements for advancement to candidacy for the Curriculum and Instruction M.Ed. focus includes:

1. The completion of ten courses that include one foundations class, one research methods course and one general curriculum course; six courses within a specialization and one elective course; all at the graduate level or with graduate school approval.
2. The satisfactory completion of the e-portfolio (Written Comprehensive Examination)
3. Successful presentation of the e-portfolio (Oral Comprehensive Examination)

## DIETETICS

### 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 which includes didactic course work, an evidence-based practice project, and supervised practice.

The mission of the M.S.D is to prepare and educate graduate students who will successfully function as entry-level dietitians who have a specialized area of knowledge, competence in research methodology, and an advanced degree. Students will take graduate-level courses throughout the University of Vermont as well as advanced nutrition courses offered by the Department of Nutrition and Food Sciences.

The University of Vermont forms a strong alliance with Fletcher Allen Health Care (FAHC) and both institutions share the mission of providing advanced learning, training, and development of students and practitioners of medicine and medical related fields. Students will have access to the vast array of state of the art learning opportunities and resources available through this alliance: the medical library network, national medical data banks, and renowned guest lecturer seminars. Students will be welcome to attend advanced-level lectures hosted at both facilities. In addition, students will be provided with a variety of experiences in community settings.

The Master of Science in Dietetics is accredited by:

Accreditation Council for Education and Dietetics  
Academy of Nutrition and Dietetics  
120 South Riverside Plaza, Suite 2000  
Chicago, IL 60606-6995  
(312) 899-0040 ext. 5400

Or visit them at the AND website. Upon completion of the supervised practice and all requirements for the M.S.D, students will be granted a verification statement of completion of the program and will be eligible to sit for the Registration Exam for Dietitians.

### DEGREES

- Dietetics M.S.D. (p. 54)

### FACULTY

**Harvey, Jean Ruth;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pittsburgh

**Pintauro, Stephen Joseph;** Associate Professor, Department of Nutrition and Food Sciences; PHD, University of Rhode Island

## DIETETICS M.S.D.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

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hour graduate credit degree which includes didactic course work, an evidence-based practice project, and supervised practice.

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Or visit them at the AND website. Upon completion of the supervised practice and all requirements for the M.S.D, students will be granted a verification statement of completion of the program and will be eligible to sit for the 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. Satisfactory scores on the Graduate Record Exam, general (aptitude) portion. Specific prerequisite admission requirements for the two-year and three-year programs are provided on the M.S.D. website. The application deadline is December 15th of each year.

### DIDACTIC CURRICULUM

The M.S.D. program provides three tracks for entrance into the program to accommodate the needs of a variety of students including those interested in remaining in Vermont and those who do not have all the requirements to directly enter a dietetic internship or supervised practice.

- **Track One** is 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).
- **Track Two** is for students in the third year of the dietetics major at the University of Vermont who are interested in completing their dietetics major and then remaining at the University of Vermont to

obtain a master's degree with supervised practice (these students would be assured of a position during their junior year but would need to apply to the Graduate College in their senior year and would successfully complete the dietetics major and receive a verification statement).

- **Track Three** is for students who have a baccalaureate (B.A. or B.S.) degree in areas other than dietetics or nutrition or have a dietetics or nutrition degree that is more than five years old (these students would need to complete a set of prerequisite courses prior to applying to the program).

The M.S.D. committee strongly believes that there is a set of requisite knowledge and skills necessary prior to entering the M.S.D. This requisite knowledge is obtained through the receipt of a verification statement or through prerequisite course work and individual transcript and work experience evaluation. Further description of each track, the entrance requirements, curriculum requirements, sample course work schedules, and application procedures can be found on the M.S.D. website.

### **Minimum Degree Requirements for the Degree of Master of Science in Dietetics**

Satisfactory completion of thirty credits of graduate-level courses including research methods, statistics, evidence-based project, ethics, and dietetics practice in addition to all supervised practice requirements.

### **SUPERVISED PRACTICE EXPERIENCES**

The supervised practice portion of the curriculum is integrated with course work. NFS 311 and NFS 312 will be taught in coordination with the supervised practice rotations. The class time for NFS 311 and NFS 312 is six (6) hours per week. This will provide 32 weeks (2 semesters) of six (6) hours per day (one day per week), totaling 192 hours of class time. Students will spend the other four (4) days each week in supervised practice with rotations individualized to the various students. The supervised practice provides 37 weeks (two semesters) of eight (8) hours per day (four days per week), totaling 1,184 hours of supervised practice.

Between NFS 311 and NFS 312 and the supervised practice the M.S.D. program provides a total of 1,280 hours. The program will also include one week of orientation which will be four (4) days of eight (8) hours each, totaling 32 hours. All students will complete 14 weeks in Clinical rotations, 7 weeks in Foodservice Management rotations, 10 weeks in Community rotations, 3 weeks in a school nutrition program, and 1 week 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). This choice rotation must be a minimum of 2 weeks but it can be longer if a student requests it.

### **COMMUNITY HEALTH AND NUTRITION CONCENTRATION**

The M.S.D. program will prepare entry-level dietetics practitioners with a concentration in Community Health and Nutrition. This unique program fills an ever-growing niche in the country's health care delivery system, particularly in rural areas such as Vermont.

The current trend of shifting medical treatment and care from acute tertiary-care hospitals to outpatient clinics, often based in smaller community hospitals, has created a need for professionals who can provide seamless medical nutritional therapy for patients as they progress from the acute care setting to community-based programs and services.

M.S.D. students must complete all course work, comprehensive exam, supervised practice rotations, and the evidenced-based practice project in order to receive the M.S.D. degree and verification statement of eligibility to write the registration exam for dietitians. The description of the evidence based practice project, program mission, goals and outcomes, student learning outcomes, and estimated program costs can be found on the M.S.D. Program website.

### **Comprehensive Examination**

Candidates will defend an oral comprehensive exam during their 3rd semester of the M.S.D. Program. The exam will test the candidate's ability to systematically develop solutions to 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 DESIGN

### OVERVIEW

Ecological Design is the process of integrating humans with the rest of nature in order to create a sustainable and desirable future. Ecological Design employs transdisciplinary integration, creative synthesis, and true participatory problem-solving to understand and resolve increasingly complex issues. The emphasis of the Certificate of Graduate Study in Ecological Design is on problem-based learning in ecology, engineering, natural resources, and community development. The approach is to develop applied and interdisciplinary solutions which integrate the ecological, social, economic, and built systems.

### DEGREES

- Ecological Design CGS (p. 56)

## ECOLOGICAL DESIGN CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### OVERVIEW

Ecological design is the process of integrating humans with the rest of nature in order to create a sustainable and desirable future. Ecological Design employs transdisciplinary integration, creative synthesis, and true participatory problem-solving to understand and resolve increasingly complex issues. The emphasis of the Ecological Design Certificate of Graduate Study is on problem-based learning in ecology, engineering, natural resources, and community development. The approach is to develop applied and interdisciplinary solutions which integrate the ecological, social, economic, and built systems.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Certificate of Graduate Study in Ecological Design

The Ecological Design Certificate of Graduate Study is currently not accepting new students.

#### Minimum Degree Requirements for Certificate of Graduate Study in Ecological Design

The Ecological Design Certificate of Graduate Study requires fifteen credits including four core courses and one approved elective. Students must demonstrate competency in ecosystem ecology, graphic communications, and ecological economics either through additional course work, transferring credits in, or life experience. Students may earn the certificate either in conjunction with a UVM master's or doctoral degree, or independent of a degree.



## ECOLOGICAL ECONOMICS

### OVERVIEW

Ecological Economics is a transdisciplinary field that examines the relationships between ecological and economic systems while working to solve humanity's current 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. 57)

### 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. 156)

### OVERVIEW

Ecological Economics is a transdisciplinary field that examines the relationships between ecological and economic systems while working to solve humanity's current 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.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Certificate of Graduate Study in Ecological Economics

**FOR CURRENT UVM STUDENTS:** If you are currently enrolled in a UVM master's or doctoral program, complete the Certificate of Graduate Study Short-Form Application and attach a brief statement (200-500 words) explaining why you are interested in the Certificate program. Have your academic advisor sign the form. If you are not in RSENR, have your Graduate Program Coordinator sign the form. Give the original to the RSENR Dean's Office. The Dean's Office will send this on for the last two signatures.

**FOR DUAL GRADUATE DEGREE/CERTIFICATE PROGRAM APPLICANTS:** Students applying at the same time for both a regular

graduate degree program and also for a Certificate of Graduate Study at UVM must complete the online UVM Graduate Application.

**FOR APPLICANTS TO CERTIFICATE PROGRAM:** Applicants seeking to enroll in just 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. If a student already has a graduate degree from an accredited college/university, GRE scores are 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 fifteen credits, including three core courses and two approved electives, one in each of two different competency areas. Students must demonstrate competency in four areas: Natural Science, Social Science, Management, and Quantitative Methods. Two of the competencies (six credits) are taken as electives through certificate course work at UVM. The remaining two competencies are typically demonstrated as prerequisites prior to enrolling in the certificate by appropriate graduate course work at UVM or elsewhere, or by life experience. If prerequisites are not met prior to application, a student may be provisionally admitted with the understanding that the prerequisite(s) be taken at UVM prior to completion of the certificate.

The Certificate of Graduate Study in Ecological Economics requires fifteen graduate credits that must be taken at UVM. They are distributed as follows<sup>1</sup>.

Three core courses (nine credits total):		9
NR 341	Ecological Economic Theory	
NR 385	Special Topics in NR (Ecological Economics Methods)	
or:		
PA 308	Decision Making Models	
NR 385	Special Topics in NR (Ecological Economics Practice (various course titles))	
Elective courses that meet the competencies include but are not limited to:		
Natural Science:		
BIOL 264	Community Ecology	
NR 280	Stream Ecology	
PSS 212	Advanced Agroecology	
WFB 279	Marine Ecology	
Social Science:		
CDAE 354	Advanced Microeconomics	

FS 345	Food Systems, Society & Policy	
NR 377	Land Use Policy & Economics	
PA 311	Policy Analysis&Program Eval	
Management:		
BSAD 307	Organization & Mgmt Studies	
NR 378	Integrating Analyses NR Issues	
PA 317	Systems Anly & Strategic Mgmt	
TRC 312	Sustainability & Transportatn	
Quantitative Methods:		
CDAE 250	Applied Research Methods	
NR 242	Adv Geospatial Techniques	
NR 285	Advanced Special Topics	
STAT 211	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.

## EDUCATIONAL LEADERSHIP

### OVERVIEW

The master's degree program in Educational Leadership is guided by its Conceptual Framework which is grounded in respect for diversity, social justice, and democratic community. The program is committed to the preparation of leaders who are reflective practitioners, instructional leaders, and change agents who can collaborate with other professionals to make a positive difference in schools, human service agencies, communities and in the lives of all learners. The program is directed toward preparing competent and caring professionals who:

- have the knowledge, skills, and professional dispositions to promote the success of all students and/or members of their educational and human service organizations
- understand alternative perspectives on leadership that support the development of more just, humane, and diverse organizations
- construct effective ways to demonstrate caring and collaborative leadership and understand how to partner with families and other community members, responding to diverse community interests, needs and assets
- create networks which support leadership and change, and cultures of learning
- advance educational and human environments that advance social justice, equity, and democracy

The program's Conceptual Framework is guided by several principles which are aligned with the Vermont Standards for Professional Educators and the Interstate School Leaders Licensure Consortium (ISLLC) created by the National Policy Board for Educational Administration and the Educational Leadership Constituents Council (ELCC) Standards for Advanced Programs in Educational Leadership. The program is grounded in:

- Constructivism - Knowledge is socially constructed through dialogue and community-based practice (constructivism).
- Collaboration - Teachers and other school professionals work collaboratively to problem-solve with stakeholders (collaboration, interprofessional practice, reflective practice, excellence).
- Human Development and Empowerment - Education facilitates development of human potential (developmentally appropriate practice, strengths perspective, empowerment).
- Inclusion - All students can learn and have value in their communities (inclusion).
- Multiculturalism/Culturally Responsible Pedagogy - Learning communities demonstrate respect for and honor diversity; pursue knowledge and affirmation of diverse cultures (multiculturalism, culturally responsive pedagogy, equity).
- Equity and Justice - Education should advance social justice and democracy (equity).

### DEGREES

- Educational Leadership M.Ed. (p. 59)

## FACULTY

**Aiken, Judith A.;** Associate Professor; Department of Leadership and Developmental Sciences; EDD, Rutgers University New Brunswick/Piscataway

**Gerstl-Pepin, Cynthia I.;** Professor; Department of Leadership and Developmental Sciences; PHD, University of North Carolina Chapel Hill

**Griffin, Robert Stanley;** Professor; Department of Leadership and Developmental Sciences; PHD, University of Minnesota Twin Cities

**Hurley, Sean M.;** Assistant Professor, Department of Leadership and Developmental Sciences; PHD, Vanderbilt University

**Jewiss, Jennifer Lynn;** Research Assistant Professor; Department of Leadership and Developmental Sciences; EDD, University of Vermont

**Jiron, Haley-Woodside;** Associate Professor; Department of Education; PHD, SUNY Albany

**Killeen, Kieran M.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, Cornell University

**Kolbe, Tammy G.;** Assistant Professor; Department of Leadership and Developmental Sciences; EDD, University of Vermont

**Miller, Fayneese S.;** Professor; Department of Leadership and Developmental Sciences; PHD, Texas Christian University

**Nash, Robert James;** Professor; Department of Leadership and Developmental Sciences; EDD, Boston University

**Shelton, Lawrence G.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, University of Minnesota Twin Cities

**Shiman, David Aaron;** Professor; Department of Leadership and Developmental Sciences; PHD, University of California Los Angeles

**Smith, Lance C.;** Assistant Professor; Department of Leadership and Developmental Sciences; PHD, Syracuse University

**Tarule, Jill Mattuck;** Professor, Department of Leadership and Developmental Sciences; EDD, Harvard University

**Weinstock, Jacqueline S.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, University of Vermont

## EDUCATIONAL LEADERSHIP M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 158)

### OVERVIEW

The master's degree in Educational Leadership is a nationally recognized program by the National Council for Accreditation for Teacher Education (NCATE). The program 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. 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 will 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 M.Ed. program for administrative licensure requires thirty to thirty-six credits of courses including seminars, clinical field work, internships, and research experiences.

For students who already have a master's degree there is a Certificate of Advanced Study (C.A.S.) available. The program requirements are identical to the master's degree program and require thirty credits of course work, leading to Vermont Administrative Endorsement.

The program requirements include:

- Thirty to thirty-six credits distributed among courses, summer seminars, independent study, action research, clinical field experiences, and internships.
- Fifteen 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.
- 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 nine (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.

While the program is designed within the broad concept of leadership, two major strands of concentration are available. The areas of concentration are:

#### STRAND I: School Leader with Administrative Endorsement

- Educational Administration
- Curriculum Leadership
- Teacher Leadership

#### STRAND II: Human Service, Organizational and Community Leadership

- Leadership in Private or Nonprofit Educational Organizations
- Leadership in human service agencies and other community/public agencies

Courses with an administration/planning focus include:

EDLP 268	Educational Law	2-3
EDLP 295	Lab Experience	1-6
EDLP 300	Leading Learning Organizations	3
EDLP 310	Effecting & Managing Change	3
EDLP 320	Collaborative Consultation	3
EDLP 333	Education Finance & Policy	3
EDLP 335	Staff Evaluation & Development	3
EDLP 336	Curr Mgmt in Ed & Soc Srv Org	3
EDLP 338	Sem in Community Education	3
EDLP 371	Schl Business Mgmt	3
EDLP 380	Professional Problems in Educ	3
EDLP 390	Internship	1-6

### Comprehensive Examination

Comprehensive examination is taken in the last semester prior to graduation. The examination consists of an oral defense 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

### OVERVIEW

The Educational Leadership and Policy Studies degrees are 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 educational and social service agencies, and leaders for other educational organizations. The program is designed to prepare leaders to think and act creatively, responsibly, and effectively in leadership roles.

### DEGREES

- Educational Leadership and Policy Studies Ed.D. (p. 61)
- Educational Leadership and Policy Studies Ph.D. (p. 62)

### FACULTY

**Aiken, Judith A.;** Associate Professor; Department of Leadership and Developmental Sciences; EDD, Rutgers University New Brunswick/Piscataway

**Gerstl-Pepin, Cynthia I.;** Professor; Department of Leadership and Developmental Sciences; PHD, University of North Carolina Chapel Hill

**Griffin, Robert Stanley;** Professor; Department of Leadership and Developmental Sciences; PHD, University of Minnesota Twin Cities  
**Hurley, Sean M.;** Assistant Professor, Department of Leadership and Developmental Sciences; PHD, Vanderbilt University

**Jewiss, Jennifer Lynn;** Research Assistant Professor; Department of Leadership and Developmental Sciences; EDD, University of Vermont

**Jiron, Haley-Woodside;** Associate Professor; Department of Education; PHD, SUNY Albany

**Killeen, Kieran M.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, Cornell University

**Kolbe, Tammy G.;** Assistant Professor; Department of Leadership and Developmental Sciences; EDD, University of Vermont

**Miller, Fayneese S.;** Professor; Department of Leadership and Developmental Sciences; PHD, Texas Christian University

**Nash, Robert James;** Professor; Department of Leadership and Developmental Sciences; EDD, Boston University

**Shelton, Lawrence G.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, University of Minnesota Twin Cities

**Shiman, David Aaron;** Professor; Department of Leadership and Developmental Sciences; PHD, University of California Los Angeles  
**Smith, Lance C.;** Assistant Professor; Department of Leadership and Developmental Sciences; PHD, Syracuse University

**Tarule, Jill Mattuck;** Professor, Department of Leadership and Developmental Sciences; EDD, Harvard University

**Weinstock, Jacqueline S.;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, University of Vermont

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES ED.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

A Doctor of Education (Ed.D.) degree is offered in Educational Leadership and Policy Studies. This is an applied research based program for professionals serving in educational management positions in schools and school-related organizations, e.g. state departments of education, professional associations, higher education, and human service agencies.

Program emphases include: the design and implementation of educational research; policy studies; adaptation of theoretical constructs and models related to leadership and change in educational and social service settings; knowledge and skills in interorganizational relationships; budget and strategic planning; and program evaluation.

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; 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 and social and fiscal policy; develop and manage budgets; assess and respond to the psychological needs of educational consumers; and employ effective interpersonal management and decision-making skills.

### 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 and a cumulative grade point average of 3.00 for previous graduate study. Other requirements include three letters of recommendation, a representative scholarly writing sample and a resume. Students applying for graduate fellowships and/or assistantships are required to demonstrate satisfactory scores on the Graduate Record Examination (GRE).

Students admitted to graduate studies must complete successfully a core of study consisting of courses in research, foundational and policy studies, and organizational change and leadership. Upon such completion and submission of a qualifying paper, students will be considered for candidacy for the degree. Students must also pass a written comprehensive examination prior to the award of the degree of Doctor of Education.

The application deadline is February 1.



## Minimum Degree Requirements

All course credits beyond the core are distributed in educational leadership, research, critical perspectives, organizational change and selected specialty content areas. Students must satisfactorily complete:

- all core course requirements (twenty-one credits)
- the comprehensive examination
- the qualifying paper

A maximum of nine (9) semester hours may be accepted in transfer from an accredited graduate program. Transfer credit may be completed prior to admission to the Doctor of Education 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.

## Comprehensive Examination

Consistent with Graduate College requirements, the EDLP doctoral 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. Currently the comprehensive examination is taken in October, following the spring semester and completion of the core courses. The examination will test 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

A minimum of fifty-six credits of doctoral studies completed at UVM following formal admission to the program with the following distribution:

Eighteen credits in the core courses (minimum)	18
Eighteen credits general distribution (minimum)	18
Twenty credits of dissertation research (minimum)	20

For further requirements concerning graduate studies committees, research and dissertation, and the dissertation defense examination committee, refer to General Requirements for the degree of Doctor of Philosophy.

Detailed information on the course of study is available from:

University of Vermont  
College of Education and Social Services  
499B Waterman Bldg.  
Burlington, VT 05405-0160

And on the program Educational Leadership and Policy Studies website.

## EDUCATIONAL LEADERSHIP AND POLICY STUDIES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

## 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 or undergraduate work 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 letters of application and references to social change and justice with 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 CESS faculty.
- Strong inquiry and writing skills.
- In-depth understandings of systems change, leadership, and policy in order to conduct high quality research.

## Minimum Degree Requirements

A minimum of eighty credits of doctoral studies following formal admission to the program.

Satisfactory completion of:

- all core course requirements
- the research course requirements
- the comprehensive examination
- the qualifying paper

All course credits beyond the core are distributed in educational leadership, research, critical perspectives, organizational change, and selected specialty content areas.

A maximum of twenty-four (24) semester hours may be accepted in transfer from an accredited graduate program. Transfer credit may be completed prior to admission to the EDLP Ph.D. 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.

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). Successful completion of the comprehensive examination is a program requirement. The examination consists of a critical, in-depth review/empirical article on a topic to be agreed upon by the student, his/her mentor, and one additional faculty reader, with these individuals approving an abstract of the paper in advance. The review/empirical article must demonstrate comprehensive empirical and theoretical mastery of the agreed-upon topic, including relevant knowledge on which the specific research area is based. If the article is not specifically on an applied topic, it should at least discuss relevant applications associated with the topic. The draft article must be the student's original writing and conceptualization; however, the student's committee members may provide editorial suggestions for improvement. If the article was developed out of a shared research project, it may not be co-authored for the purpose of the comprehensive examination. In these cases, it is understood that the article draft may later be revised and become a co-authored piece before being submitted to a journal. The article submitted for the comprehensive examination should be the student's original writing and conceptualization and should be in the form of an approaching quality necessary to be submitted for publication in an appropriate peer review journal.

Once the student's advisor and one 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 studies committee will serve as the faculty 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 any pre-requisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses and a comprehensive examination.

For further requirements concerning studies committees, research and dissertation, and the dissertation defense examination committee, refer to General Requirements for the degree of Doctor of Philosophy.

## ELECTRICAL ENGINEERING

### OVERVIEW

The Electrical Engineering program at the University of Vermont (UVM) offers programs of study leading to the M.S. and Ph.D. degrees in Electrical Engineering. In addition, the EE program partners with other academic units to offer M.S. and Ph.D. degrees in materials science and the Ph.D. degree in bioengineering. Areas of research expertise in electrical engineering include digital signal processing, control systems, electromagnetics and optics, electric energy systems, solid-state physical electronics, semiconductor materials and devices, wireless communications, VLSI design and testing, and biomedical engineering.

### DEGREES

- Electrical Engineering AMP (p. 64)
- Electrical Engineering M.S. (p. 65)
- Electrical Engineering Ph.D. (p. 65)

### FACULTY

**Frolík, Jeff L.;** Associate Professor, School of Engineering; PHD, University of Michigan Ann Arbor

**Hines, Paul D.;** Assistant Professor, School of Engineering; PHD, Carnegie Mellon University

**Mirchandani, Gagan S.;** Professor, School of Engineering; PHD, Cornell University

**Oughstun, Kurt Edmund;** Professor, School of Engineering; PHD, University of Rochester

**Titcomb, Stephen;** Associate Professor, School of Engineering; PHD, Lehigh University

**Varhue, Walter John;** Professor, School of Engineering; PHD, University of Virginia

**Xia, Tian;** Associate Professor, School of Engineering; PHD, University of Rhode Island

## ELECTRICAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

Qualified undergraduate students who plan to earn a master's degree in electrical engineering may enroll in the Accelerated Master's Program, 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. Following acceptance by the Graduate College, students may take up to nine graduate credits while still an undergraduate. Of these, up to six credits can be counted toward both the B.S. and the M.S. degrees. This is subject to approval of the student's graduate advisor. Students in the program typically begin work toward their master's thesis starting 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.

The Accelerated Master's Program is only available for electrical engineering and mechanical engineering students who are planning a thesis-based degree

### Minimum Degree Requirements

Advanced courses in electrical engineering, physics, computer science, and mathematics (eighteen to twenty-four credits) with at least fifteen credits appropriately distributed in approved areas of study in the electrical and computer engineering departments. Thesis research (six to twelve credits).

Although a thesis is normally required in the program leading to the M.S. in Electrical Engineering, the thesis may be waived with departmental approval, in favor of additional courses which constitute a non-thesis option. In such cases, the student will be expected to have considerable professional experience, or to submit high quality technical reports as evidence of professional maturity.

In either case, successful completion of the M.S. degree will require passing a comprehensive examination. This examination will 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. Non-thesis option students will be asked to make a report, both written and oral on a design or research topic of current interest which relates to course work taken at UVM. The presentation must be understandable to engineers and scientists, not just professionals working directly on the particular topic.

### 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 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.

## 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. 156)

### OVERVIEW

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 as outlined under the "Regulations of the Graduate College" must be met. Areas of research expertise are biomedical engineering, machine vision, mechatronics, computer engineering, solid state physical electronics, electromagnetics, information processing, communication theory, semiconductor materials, devices, and integrated circuits (VLSI).

### 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 (eighteen to twenty-four credits) with at least fifteen credits appropriately distributed in approved areas of study in the electrical and computer engineering departments. Thesis research (six to twelve credits).

Although a thesis is normally required in the program leading to the M.S. in Electrical Engineering, the thesis may be waived with departmental approval, in favor of additional courses which constitute a non-thesis option. In such cases, the student will be expected to have considerable professional experience, or to submit high quality technical reports as evidence of professional maturity.

In either case, successful completion of the M.S. degree will require passing a comprehensive examination. This examination will 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. Non-thesis option students will be asked to make a report, both written and oral on a design or research topic of current interest which relates to course work taken at UVM. The presentation must be understandable to engineers and scientists, not just professionals working directly on the particular topic.

## 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 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.

## 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. 159)

### OVERVIEW

Master of Science and Doctor of Philosophy in Electrical Engineering programs are offered. Typically candidates have obtained the Bachelor 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 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. Areas of research expertise are biomedical engineering, computer engineering, solid state physical electronics, electro-optics, information processing, communication-theory, semiconductor materials, devices, and integrated-circuits (VLSI).

### 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.

#### Minimum Degree Requirements for the Degree of Doctor of Philosophy

At least forty-five credits in courses and seminars and twenty credits in dissertation. Four courses are to be chosen from a major area of concentration and two from a minor. The requirements specified under the Policies of the Graduate College must also be met. A total of seventy-five credits is required.

## Comprehensive Examination

In order to be advanced to candidacy for the Doctor of Philosophy in Electrical Engineering, a Ph.D. Program Student is required to pass a



Comprehensive Examination. Part I of this examination is generally taken after three semesters of Ph.D. study, and after completing the EE core requirement (EE 301 and EE 302 or their equivalent). Part II is generally taken near the end of four semesters of Ph.D. study.

Part I of the Comprehensive Examination is administered by the EE Graduate Program Committee, is both written and oral, and normally takes six to eight hours for completion for the written portion and one and a half hours for the oral portion. Part I of the Comprehensive Examination is based on core material from the EE core courses (EE 301 and EE 302 or their equivalent) as well as prerequisite material from Linear Circuit Analysis (EE 3 & 4), Signals & Systems (EE 171), and mathematics at the level of Math 124 & Math 271, and is generally offered annually in either December or January.

A passing grade for the Part I Comprehensive Examination is required for each of the two parts (EE 301 and EE 302) individually as well as a successful oral presentation. For the written portion, a passing grade consists of an average score of 70% or higher. A score of lower than 65% is a failing grade. An intermediate score is considered passing if approved by a two-thirds majority of the EE graduate program faculty.

Part II of the Comprehensive Examination is focused on the student's research area and assesses whether or not the student is capable of performing independent research at the doctoral level. It consists of an oral presentation (<30 minutes) and time for faculty questions (~30 minutes). The presentation should include a clear statement of the problem that the student is researching (1 to 2 slides), a review of the most important literature related to this problem (~15 min), and a presentation of the student's research methods and results to date (~15 min). This presentation should be scheduled near the end of the student's fourth semester (April-May), and is open to all members of the EE graduate program faculty.

On the first try, the examination committee will award students one of the following three outcomes to the exam:

1. Pass at the Ph.D. level.
2. Pass at the M.S. level with opportunity for at most one retake (to try for a Ph.D. level pass)
3. Fail with opportunity for at most one retake.

If a student retakes the comprehensive exam, the examination committee will award students one of the following three 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 and dismissal from the graduate program

### **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.



## 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 M.A. (p. 67)

### FACULTY

**Alexander, Sarah C.;** Assistant Professor, Department of English; PHD, Rutgers University  
**Barnaby, Andrew Thomas;** Associate 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  
**Bessette, Jean M.;** Assistant Professor, Department of English; PHD, University of Pittsburgh  
**Bottoms, Gregory Todd;** Professor, Department of English; MFA, University of Virginia  
**Fenton, Elizabeth A.;** Associate Professor, Department of English; PHD, Rice University  
**Gutman, Stanley T.;** Professor, Department of English; PHD, Duke University  
**Harrington, Susanmarie;** Professor, Department of English; PHD, University of Michigan Ann Arbor  
**Huh, Jinny;** Assistant Professor, Department of English; PHD, University of Southern California  
**Jackson, Major L.;** Professor, Department of English; MFA, University of Oregon  
**Jenemann, David;** Associate Professor, Department of English; PHD, University of Minnesota Twin Cities  
**Kahn-Fogel, Daniel Mark;** Professor, Department of English; PHD, Cornell University  
**Kete, Mary Louise;** Associate Professor, Department of English; PHD, Harvard University  
**Lindstrom, Eric Reid;** Associate 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;** Associate Professor, Department of English; PHD, Ohio State University  
**Neroni, Hilary L.;** Associate Professor, Department of English; PHD, University of Southern California  
**Nilsen, Sarah Dawn;** Associate Professor, Department of English; PHD, University of Southern California  
**Rohy, Valerie;** Professor, Department of English; PHD, Tufts University  
**Schnell, Lisa Jane;** Associate Professor, Department of English; PHD, Princeton University

**Scott, Helen C.;** Associate Professor, Department of English; PHD, Brown University  
**Simone, R. Thomas;** Professor, Department of English; PHD, Claremont School of Theology  
**Sisk, Jennifer L.;** Assistant Professor, Department of English; PHD, Yale University  
**Welch, Nancy Ellen;** Professor, Department of English; PHD, University of Nebraska Lincoln

## ENGLISH M.A.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 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); satisfactory scores on the Graduate Record Examination (General test only); and demonstration of proficiency in writing (both by a statement of purpose detailing the applicant's reasons for pursuing graduate study in English and by the writing sample).

#### Minimum Degree Requirements for the Degree of Master of Arts

Option A (Thesis)		
Completion of twenty-four credits of course work (normally eight courses), including:		
ENGS 350	Surv of Lit Theory & Criticism	3
Choose ONE course from ENGS 320 (Studies in Literature to 1900)		3
Choose ONE course from ENGS 330 (Studies in 20th and 21st Century Literature)		3
Choose ONE course from any of the other categories:		3
ENGS 340	Studies in Rhetoric & Comp	
ENGS 360	Seminar: Special Topics	
ENGS 370	Principles of Literary Rsch	
And four additional courses		12

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 four-hour written comprehensive exam based on it, complete six additional credits by writing an acceptable thesis (ENGS 391), and defend the thesis successfully in a one-hour oral exam.	
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<b>Option B (Comprehensive Option)</b>	
Completion of thirty credits of course work (normally ten courses), including:	
ENGS 350	Surv of Lit Theory & Criticism
Choose ONE course from ENGS 320 (Studies in Literature to 1900)	
Choose ONE course from ENGS 330 (Studies in 20th and 21st Century Literature)	
Choose TWO courses from the other categories:	
ENGS 340	Studies in Rhetoric & Comp
ENGS 360	Seminar: Special Topics
ENGS 370	Principles of Literary Rsch
And at least five 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 submit three reading lists (covering three different areas of the discipline) and pass a four-hour written comprehensive exam based on them. Please note that all incoming Teaching Assistants are required to take ENGS 345. This three-credit course does count toward the requisite number of credits for course work (for both options), but it does not count for distribution requirements.	

member may write more than one question and offer the student a choice of essays to write.) The composer of each question grades that response. Students who fail one of their three essays may be re-tested in that area. Students who fail two or three 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

A student achieves candidacy in the M.A. program when he or she has submitted the exam prospectus (typically at the end of the spring semester of the first year).

### 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 one or more essays have failed the examination and may ask to be re-tested not less than one 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 three examiners will provide the student with an examination question. (A faculty

## FIELD NATURALIST (PLANT BIOLOGY)

### OVERVIEW

The Field Naturalist Graduate Program provides professional-level, hands-on training in field science, critical and integrative thinking, environmental problem-solving, and effective communication. Field Naturalists learn how to dissect landscapes and human influences into their component parts, make sense of the parts, piece the parts together into an integrative whole, and then “tell the story” in ways that engage any audience.

### DEGREES

- Field Naturalist (Plant Biology) M.S. (p. 123)

### FACULTY

**Barrington, David Stanley;** Professor, Department of Plant Biology; PHD, Harvard University

**Bierman, Paul Robert;** Professor, Department of Geology; PHD, University of Washington

**Erickson, Jon;** Professor, Gund Institute; PHD, Cornell University

**Hughes, Jeffrey Winston;** Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, Cornell 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

**Mendez, Victor E.;** Associate Professor, Department of Plant and Soil Science; PHD, University of California Santa Cruz

**Murdoch, James D.;** Assistant Professor, Rubenstein School of Environment and Natural Resources; PHD, University of Oxford

**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

**Strong, Allan Matthew;** Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, Tulane University

**Wang, Deane;** Associate Professor, Rubenstein School of Environment and Natural Resources; PHD, Yale University

**Wemple, Beverley Coghill;** Associate Professor; Department of Geography; PHD, Oregon State University

## FOOD SYSTEMS

### 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.

Students examine the breadth and complexity of key issues in our contemporary food system:

- Collaborate with community partners to work on food systems problems and solutions
- Engage in hands-on, skill-based education from farm (field work) to plate (kitchen work and food behavior) in field and laboratory settings
- Develop mixed-method, transdisciplinary research projects

### DEGREES

- Food Systems AMP (p. 70)
- Food Systems M.S. (p. 71)

### FACULTY

**Barlow, John W.;** Assistant Professor, Department of Animal Science; DVM, University of Illinois Urbana-Champaign

**Belliveau, Cynthia L.;** Research Assistant Professor, Department of Nutrition and Food Sciences; EDD, University of Vermont

**Berlin, Linda;** Extension Assistant Professor, Department of Nutrition and Food Sciences; PHD, Tufts University

**Bose, Pablo Shiladitya;** Assistant Professor, Department of Geography; PHD, York College

**Colley, Binta M.;** Assistant Professor, Department of Education; PHD, Boston College

**Conner, David S.;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Cornell University

**DeWitt, Rocki-Lee;** Professor, School of Business Administration; PHD, Columbia University

**Fanslow, Yolanda H. Chen;** Assistant Professor, Department of Plant and Soil Science; PHD, University of California Berkeley

**Greenwood, Sabrina Louise;** Assistant Professor, Department of Animal Science; PHD, University of Guelph

**Harvey, Jean Ruth;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pittsburgh

**Inwood, Shoshannah Miriam;** Assistant Professor, Department of Community Development and Applied Economics; PHD, Ohio State University

**Johnson, Rachel K.;** Professor, Department of Nutrition and Food Sciences; PHD, Pennsylvania State University

**Kaza, Stephanie;** Professor, Rubenstein School of Environment and Natural Resources; MDiv, Starr King School for Ministry

**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

**Kornbluh, Felicia A.;** Associate Professor, Department of History; PHD, Princeton University

**Kraft, Jana;** Assistant Professor, Department of Animal Science; PHD, University of Jena

**Mares, Teresa Marie;** Assistant Professor, Department of Anthropology; PHD, University of Washington

**Mendez, Victor E.;** Associate Professor, Department of Plant and Soil Science; PHD, University of California Santa Cruz

**Morse, Cheryl E.;** Assistant Professor, Department of Geography; PHD, University of British Columbia

**Neher Weicht, Deborah;** Professor, Department of Plant and Soil Science; PHD, University of California Davis

**Parsons, Robert L.;** Extension Professor, Department of Community Development and Applied Economics; PHD, Virginia Polytechnic Institute and State University

**Perkins, Timothy David;** Research Professor, Department of Plant Biology; PHD, University of Vermont

**Trubek, Amy B.;** Associate Professor, Department of Nutrition and Food Sciences; PHD, University of Pennsylvania

**van den Berg, Abby Katrien;** Research Assistant Professor, Department of Plant Biology; PHD, University of Vermont

**Wang, Qingbin;** Professor, Department of Community Development and Applied Economics; PHD, Iowa State University

## FOOD SYSTEMS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

Qualified undergraduate students who plan to earn a Professional Master's degree in Food Systems may enroll in the Accelerated Master's 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. Upon admission to the program by the Graduate College, students may take up to six approved graduate credits from the Food Systems Minor, while still an undergraduate. These credits can be counted toward both the B.S. and the M.S. degrees, subject to approval by the student's graduate advisor.

### SPECIFIC REQUIREMENTS

Must be a UVM student with a declared Minor in Food Systems. All students that are accepted into the Food Systems AMP will be enrolled into the Professional track (there is also a research track, but AMP students are not eligible for this track). 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 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
- A letter of support from a Food Systems Faculty member who agrees to serve as primary advisor during enrollment in the M.S. Program.

### Minimum Degree Requirements

Professional Track – 31 hours, including a 3-4 credit final project		
Required Courses:		19
FS 335	Qualitative Research Methods (spring)	
FS 345	Food Systems, Society & Policy (fall)	
FS 340	Food Systems, Science & Policy (spring)	
FS 395	Special Topics (fall)	
FS 350	Food Systems Immersion (spring)	
FS Graduate Seminar (one semester)		
Travel Immersion Course (summer or semester breaks)		

### Comprehensive Examination

The comprehensive examination must be taken by the end of the student's first year spring semester. The examination will cover food systems knowledge. For Professional track students, the details and format of the examination are decided upon by the Project 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. 156)

Students in the Professional Track complete a final project in lieu of a thesis.

### 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.

There are two phases to the Food Systems Graduate Program: Immersion and either Research or Application (Professional Track).

All students will take the same first-year immersion program, then continue on either of two tracks:

- **Research Track** (two-year): Students design and complete a year-long project with a faculty mentor, continuing to take courses through the traditional academic year.
- **Professional Track** (accelerated): Students choose summer intensive courses and spend one semester designing and researching a final project.

For more information please visit the Food Systems Graduate Program website.

### 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
- Completion of the GRE with satisfactory results in the general (aptitude) portion. Read Graduate Admissions Tests for more information. If you have received a Master's Degree from an accredited institution, you may request to have the GRE waived. Contact the Program Coordinator for more information.
- 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

Research Track – 32 hours, including six hours of supervised thesis research		
Professional Track – 31 hours, including a three-credit final project		
Required Courses:		19-20
FS 335	Qualitative Research Methods	
FS 345	Food Systems, Society & Policy (fall)	
FS 340	Food Systems, Science & Policy (spring)	
FS 395	Special Topics (fall)	
FS 350	Food Systems Immersion (spring)	
FS Graduate Seminar (one semester- Professional Track/two semesters- Research Track)		
Travel Immersion Course (summer or semester breaks)		

### Comprehensive Examination

The comprehensive examination must be taken by the end of the student's first year spring semester. The examination will cover food systems knowledge. For Research track students the examination is



structured to provide assessment in two formats: oral and written. For Professional track students, the details and format of the examination are decided upon by the Project 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.

## 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 orogenic belts. 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 deformed continental margins and interiors; petrofabric and structural analysis of deformed rocks; partial melting processes; and stratigraphy and sedimentary environments of lower Paleozoic sandstones and carbonates.

### DEGREES

- Geology M.S. (p. 73)

### FACULTY

**Bierman, Paul Robert;** Professor, Department of Geology; PHD, University of Washington

**Druschel, Gregory;** Adjunct Associate Professor, Department of Geology; PHD, University of Wisconsin Madison

**Hughes, John M.;** Professor, Department of Geology; PHD, Dartmouth College

**Klepeis, Keith Andrew;** Professor, Department of Geology; PHD, University of Texas Austin

**Lini, Andrea;** Associate Professor, Department of Geology; PHD, ETH-Zurich

**Mehrtens, Charlotte Jean;** Professor, Department of Geology; PHD, University of Chicago

**Webb, Laura E.;** Assistant Professor, Department of Geology; PHD, Stanford University

### GEOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 orogenic belts. 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 deformed continental margins and interiors; petrofabric and structural analysis of deformed rocks; partial melting 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 twelve 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 three-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 thirty semester hours, including at least one 300-level course and six to nine 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 principle advisor's approval. Advanced courses in geology must total at least thirty semester hours, including at least one 300-level course and three to six 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 fifteen 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, three-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 two 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:

- a written and oral research thesis proposal during the second semester of enrollment
- a written and oral progress report during the third semester of enrollment

## GERMAN

### 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. 75)

### FACULTY

**Mahoney, Dennis Francis;** Professor, Department of German and Russian; PHD, University of Massachusetts Amherst

**McKenna, Kevin James;** Professor, Department of German and Russian; PHD, University of Colorado Boulder

**Mieder, Wolfgang;** Professor, Department of German and Russian; PHD, Michigan State University

**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. 156)

### 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

Thirty credits of graduate-level courses including:

GERM 281	Sem in Lit Genre,Period,Theme	3
GERM 282	Sem on Particular Author	3
or GERM 295	Advanced Special Topics	
GERM 296	Advanced Special Topics	1-18
Additional courses in German, which may include two advanced courses in a related field		6
Thesis research		6-12

The department also offers a program leading to the degree of Master of Arts in Teaching.

### 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 five hours. Subject matter for the exam questions will be drawn from three German graduate program courses of the student's choosing. In each subject area, students will answer one of the three 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

### OVERVIEW

Graduate students in the program primarily learn general philological skills in Greek and Latin. That said, current faculty research interests include Mycenaean and Homeric Greece; Greek and Latin lyric and elegiac poetry; Greek drama; the Attic orators; ancient literary criticism; Greek and Roman philosophy and intellectual history; Greek and Roman historiography; Greek and Latin prose; Latin epic; satire; Greek and Roman technological authors; Roman history; Roman imperial families; mythology; archaeology; medieval studies; Near Eastern history; and ancient music. There is also particular faculty interest in the following authors: Cicero; Homer; Virgil; Petronius; Ovid; Plato.

### DEGREES

- Greek and Latin M.A. (p. 76)
- Greek and Latin M.A.T. (p. 77)

### 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.;** Associate Professor, Department of Classics; PHD, University College London

**Rodgers, Robert Howard;** Professor, Department of Classics; PHD, Harvard University

**Saylor Rodgers, Barbara;** Professor, Department of Classics; PHD, University of California Berkeley

**Usher, Mark David;** Associate Professor, Department of Classics; PHD, University of Chicago

## GREEK AND LATIN M.A.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

Graduate students in the program primarily learn general philological skills in Greek and Latin. That said, current faculty research interests include Mycenaean and Homeric Greece; Greek and Latin lyric and elegiac poetry; Greek drama; the Attic orators; ancient literary criticism; Greek and Roman philosophy and intellectual history; Greek and Roman historiography; Greek and Latin prose; Latin epic; satire; Greek and Roman technological authors; Roman history; Roman imperial families; mythology; archaeology; medieval studies; Near Eastern history; and ancient music. There is also particular faculty interest in the following authors: Cicero; Homer; Virgil; Petronius; Ovid; Plato.

## 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 two years of each); a reading knowledge of a modern foreign language, usually French, German, or Italian.

### Minimum Degree Requirements

Option A (Thesis)		
Twenty-four credits of graded course work plus at least six credits of thesis research (GKLT 391), and successful completion and defense of a master's thesis. The twenty-four credits of course work consist of:		
GKLT 300	Proseminar	3
Six credits of GKLT 381 (Seminar)		6
Nine additional credits of advanced courses in Greek and Latin		9
Six additional credits in Greek, Latin, classics, or approved credits in related fields		6

Note: The thesis option is reserved for students who have completed their first probationary year in the program and have passed the Greek and Latin sight translation exams by the beginning of the third semester. This option is, by special application, subject to departmental permission.

Option B (Non-Thesis)		
Thirty credits of graded course work. The thirty credits of course work consist of:		
GKLT 300	Proseminar	3
Six credits of GKLT 381 (Seminar)		6
Fifteen additional credits of advanced courses in Greek, Latin, and Classics		15
Six additional credits of advanced courses in Greek, Latin, Classics, or approved credits in related fields		6

Note: The non-thesis option is the default option for the majority of students who, in lieu of a thesis, present to the faculty a dossier of two polished term papers from their course work.

Both Options		
Comprehensive examinations in Greek, Latin, at least one modern foreign language, ancient history, and literature and philology are required. In addition to course work, students will have a list of ancient authors to be read in the original languages.		

### Comprehensive Examination

The comprehensive exam includes the following components: 1) translation exam in Greek and Latin passages from the reading list (this component must be attempted by Fall of the second year and passed before the remaining components may be attempted); 2) ancient history; 3) literature and philology. Comprehensive exams



are taken in the first two weeks of Fall and Spring semesters. Ideally, students take and pass the first component at the beginning of the Fall semester of their second year and take and pass the remaining components at the beginning of the Spring semester of their second year. For the ancient history component, appropriate courses in ancient history may be substituted, if formally approved by classics faculty in advance. Extraordinarily, faculty may decide that a student's exceptionally high performance on the GKLT 300 final exam counts as the literature and philology component. Substitutions are not normal procedure; written confirmation from the graduate coordinator in Classics is advised. In addition, students must demonstrate reading knowledge of French, German, or Italian (the graduate coordinator in Classics may agree to substitute another appropriate language) via a modern language exam.

### 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.T.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The M.A.T. is designed for two groups of people: those who already have licensure as secondary school teachers 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 two years of each); a reading knowledge of a modern foreign language, usually French, German, or Italian is highly recommended.

#### Minimum Degree Requirements

Those who already have licensure must complete a minimum of thirty credits of work, with at least twenty-one in the field of specialization (Latin and related subjects) and at least six in education (consult with advisor in education). Those who are seeking licensure must complete at least twenty-one credits in the field of specialization and at least thirty 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 field of specialization credits and in education for the education credits. The twenty-one credits in the field of specialization will consist primarily of Latin courses, but also Greek and classics courses.

Course requirements for the twenty-one credits in Latin, Classics, or Greek are as follows:

Students must complete twenty-one credits of Latin at or above the 200-level, including one course from the LAT 211/LAT 212 sequence, with the following possible exceptions: one 200-level or higher course in Roman (or Greek) history, one 200-level or higher course in Roman (or Greek) Art History, and 200-level Greek courses may count, all at the discretion of the Classics faculty.	21
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 general comprehensive exams before the degree may be granted including:

- a written examination in Latin,
- an examination in ancient history (emphasis on Roman, but including Greek and, if appropriate, Near Eastern History),
- an examination in literature and philology, and
- an oral examination on the pedagogy of Latin.

The Latin examination will be taken at the end of the Spring semester of the first year of study, (with a retake, if needed, in the week before the start of the first semester of the second year of study), the pedagogy examination at the conclusion of the practice teaching. For the ancient history examination, appropriate courses in ancient history may be substituted, if formally approved by classics faculty in advance. For the examination in literature and philology, the final examination in GKLT 300 Proseminar may be substituted. Substitutions are at the discretion of the faculty; they are not simply normal procedure. Written confirmation of specific substitutions after consultation with the graduate coordinator and relevant faculty is advised.

The format of the exams is at the discretion of the faculty. For students pursuing licensure, although students are not required to do so, it is by far best to complete these exams before the end of the second semester, because the student will be occupied fully by education requirements in the second year, and 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

### 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 two 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. 78)

### 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.;** Associate Professor, Department of Classics; PHD, University College London

**Rodgers, Robert Howard;** Professor, Department of Classics; PHD, Harvard University

**Saylor Rodgers, Barbara;** Professor, Department of Classics; PHD, University of California Berkeley

**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. 156)

### 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 two 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.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to the Certificate of Graduate Study

Greek and Latin language abilities sufficient to succeed in advanced courses (generally, the bare minimum is at least 3 semesters or the equivalent in each language; students will struggle if they have only the bare minimum).

#### Minimum Degree Requirements for Certificate of Graduate Study in Greek and Latin Languages

Requirements for the Greek and Latin Languages certificate include a minimum of 15 credits chosen from the following:

- 3-6 credits of Latin (GKLT 381A: Latin Seminar)
- 3-6 credits of Greek (GKLT 381B: Greek Seminar)
- 6 credits in Greek Prose Style or Latin Prose Style (GRK 211, GRK 212 or LAT 211, LAT 212)

Details of requirements for the GKLT certificate:

- GKLT 381 Seminar. Intensive study at the graduate level of Greek or Latin authors not read in the candidate's undergraduate program. Credit as arranged (usually 3 per semester).

This course is conventionally labelled 381A for Latin and 381B for Greek iterations. This course meets concurrently with LAT 2XX or GRK 2XX but students enrolled at the 381 level are held to higher standards and do more work.

Two sections of GKLT 381, one in each language, are offered every semester.

- GRK 211 and GRK 212 Greek Prose Style. Readings in literary prose analyzed stylistically and imitated in composition. 3 credits each.
- LAT 211 and LAT 212 Latin Prose Style. Readings in literary prose analyzed stylistically and imitated in composition. 3 credits each.

The courses are taught in the following sequence, one per semester: LAT 211 Fall, GRK 212 Spring, GRK 211 Fall, LAT 212 Spring, then begin the cycle again. Thus Certificate students will get at least one semester of each sequence, with those who do the 3-semester option getting three semesters. Occasionally, the order in a given academic year is reversed (e.g. LAT 212 Fall, then GRK 211 Spring), but that does not affect students' ability to fulfill the certificate program's requirements, as the courses need not be taken in sequence.

- Certificate students are strongly encouraged to sit in on intermediate level classes or higher level classes which they are not taking for credit, though no credit will be given for such audits. Students will do daily preparation but not take exams or do projects.

LAT 101/LAT 102 Survey Latin Literature. Selections from principal Roman authors.

GRK 051 Intermediate. Review of syntax. Readings from Plato, Herodotus, and Euripides.

GRK 052 Intermediate. Review of syntax. Readings from Homer. (These intermediate-level courses include a good deal of syntax review and vocabulary building. As such, they admirably complement the graduate-level courses. The pace is slower and there is more emphasis on explaining syntax and building vocabulary.) The aim of auditing lower level courses concomitantly with their credit-bearing work is to give certificate students something closer to a language immersion experience.

In some cases, other graduate courses may be used in fulfillment of requirements, with explicit approval from the Classics Faculty. Certificate students must maintain a GPA of 3.00.

## HIGHER EDUCATION AND STUDENT AFFAIRS ADMINISTRATION

### OVERVIEW

The Higher Education and Student Affairs Administration (HESA) graduate program prepares professionals to apply human development, organizational, foundational, multicultural and administrative principles to work with college students. Working closely with faculty and in-place practitioners, graduate students in the program are challenged to experience an unparalleled learning experience.

Graduates from the HESA graduate program pursue national and international careers as professionals in colleges and universities, as well as in fields related to higher education. Professionals in this field serve as policy makers, advisors, student service providers, researchers, programmers, consultants, and administrators. Common to each functional area in student affairs and higher education is the goal to design opportunities conducive to students' growth and development.

The curriculum, including courses, practica internships, and professional practice opportunities with the university and local institutions, integrates conceptual theory with administrative practice. Students gain an understanding of the student affairs profession, social justice, college student development, history of and trends within U.S. higher education, organizational theory, and professional ethics. Social justice and pluralism, realities of American life and U.S. higher education, are emphasized in the HESA graduate program. These emphases are expressed through course and experiential opportunities highlighting the diversity of people, experiences, perspectives, and structures.

### DEGREES

- Higher Education and Student Affairs Administration M.Ed. (p. 80)

### FACULTY

**Garnett, Bernice Raveche;** Assistant Professor; Department of Education; ScD, Harvard University

**Hunter, Deborah Ellen;** Associate Professor; Department of Leadership and Developmental Sciences; PHD, Indiana University Bloomington

**Hurley, Sean M.;** Assistant Professor; Department of Leadership and Developmental Sciences; PHD, Vanderbilt University

**Manning, Kathleen;** Professor; Department of Leadership and Developmental Sciences; PHD, Indiana University Bloomington

**Smith, Sherwood E.;** Lecturer; Department of Leadership and Developmental Sciences; EDD, Ball State University

**Tarule, Jill Mattuck;** Professor; Department of Leadership and Developmental Sciences; EDD, Harvard University

## HIGHER EDUCATION AND STUDENT AFFAIRS ADMINISTRATION M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 158)

### OVERVIEW

The HESA graduate program enrolls approximately 18 students per year in the full-time two-year program. Part-time enrollment is also an option over a three- or four-year period. The small cohort size encourages strong and enduring relationships among students and faculty. A wide spectrum of undergraduate majors, geographic locations, previous experiences, and cultural backgrounds are represented in the class cohorts. These diverse perspectives enrich the educational environment and expand social awareness.

An array of 60 practicum internships, 25 graduate assistantship placements, and paid and volunteer professional practice opportunities help students integrate their conceptual knowledge with student affairs and higher education practice. Assistantships are housed in the Center for Cultural Pluralism, ALANA Student Center, College of Education and Social Services, Student Services Offices, Center for Cultural Pluralism, Honors College, Office of Student Life, Orientation, Leadership and Civic Engagement, and Residential Life (these offerings change from year to year). Assistantships cover tuition for twenty credits of study each year and a bimonthly stipend.

The assistantship application process (December 15 deadline) is separate from the admissions process but interviews, upon invitation, for both are held concurrently in the spring of each year. Practica experiences (three selections during the course of the degree) are available within university and local college offices.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Education

- Undergraduate transcript(s)
- Three letters of reference
- Resume (a resume is extremely important for HESA admission consideration)
- Graduate College Admission application including the student's Statement of Purpose

Extensive information about the program is available at HESA website. Inquiries regarding this program should be addressed to:

University of Vermont  
Higher Education and Student Affairs Administration  
208 Mann Hall  
Burlington, Vermont 05405  
email: [hesa.admissions@uvm.edu](mailto:hesa.admissions@uvm.edu)

### Minimum Degree Requirements

Students are urged to hold either a full-time position in college and/or student affairs administration, if a part-time student; or a twenty

hours per week professional practice opportunity (e.g., volunteer position, graduate assistantship), if a full-time student.

Courses required for the M.Ed. degree in Higher Education and Student Affairs (EDHI) include:

The following courses comprise the 40 credit hour program of study required for completion of the master's degree in Higher Education and Student Affairs Administration. The course sequence varies depending on the student's enrollment status (e.g., full or part-time) and enrollment in summer classes.

Note: EDHI courses are those that have a higher education focus, and EDFS courses are foundational courses within the College of Education and Social Services.

EDHI 385	Student Affairs Profession	3
EDHI 361	The (Un)Changing Academy	3
EDHI 297	Special Topics	1-3
EDHI 375	Cultural Pluralism Higher Ed	3
EDHI 362	The American College Student	3
EDHI 380	Professional Problems in Educ (Student Development II)	3
EDHI 380	Professional Problems in Educ (Intro to Research Methods in Higher Education)	3
EDHI 395	Lab Experience in Education ( three choices)	2
EDHI 383	Higher Ed Admin & Organization	3
EDHI 396	Capstone:Eth,Val&Mean/High Ed	3
EDFS Educational Foundations Electives		
Electives chosen from approved list (EDFS, EDCO, EDLP)		

Forty credits (including required classes, six credits of EDFS, practica, and one elective) are required for the M.Ed. degree.

There is also a Higher Education concentration in the Educational Leadership and Policy Studies doctoral degree (Ed.D.) that requires core courses (see Educational Leadership Ed.D.) and a program of studies focusing on the administration in higher education.

## Comprehensive Examination

1. The student will take the comprehensive examination orally.
2. The examination will entail three questions prepared for the candidate by program faculty and one question specifically written for the student.
3. The examination will consist of a one-hour oral presentation to a comprehensive examination committee whose membership will include two HESA faculty members and one additional member to be chosen by the student from other UVM academic units or administrators with whom the student has worked (e.g., faculty, assistantship, or practica supervisors). Any requests for

exception to these membership parameters must be discussed with the HESA coordinator.

Additional information about the comprehensive examination will be circulated by the program faculty.

## Requirements for Advancement to Candidacy for the Degree of Master of Education

Successful completion of any pre-requisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.



## HISTORIC PRESERVATION

### 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 M.S. (p. 82)

### FACULTY

**McCullough, Robert L.;** Associate Professor, Department of History; PHD, Cornell University

**Visser, Thomas Durant;** Associate Professor, Department of History; MS, University of Vermont

## HISTORIC PRESERVATION M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

All graduate students enter the program in the fall. Most complete their studies after three 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 architecture, architectural history, history, planning, business administration, economics, engineering, interior design, law, or environmental studies.
- Applicants must take the general (aptitude) portion of the Graduate Record Examination and submit a writing sample.

#### Minimum Degree Requirements for the Master of Science

Thirty-six credits of course work. A minimum of thirty-three credits (including an internship or thesis) must be taken in historic preservation.

Required courses in Historic Preservation:		36
HP 200	History American Architecture	
HP 201	History on the Land	
HP 204	Historic Pres: Devlpmnt Econ	
HP 205	Historic Preservation Law	
HP 206	Rschg Historic Structure/Sites	

HP 302	Community Preservation Project	
HP 304	Contemp Preservation Plan&Pol	
HP 305	Hst Preservation Pract Methods	
HP 306	Architectural Conservation I	
HP 307	Architectural Conservation II	
HP 303	Grad Internship	
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 two or three semesters of concentrated course work		
Students also take one elective unless they elect to do a thesis instead of an internship. For the thesis option, a total of six credits is required for HP 391		

### 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 for the second week of November. 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

Admission to this highly competitive program constitutes acceptance to candidacy as well.

## HISTORY

### OVERVIEW

The Department of History offers a comprehensive program of courses in the history of the Americas, Europe, and Asia/Africa/Middle East/Global. Students may pursue the M.A. on either a part-time or full-time basis.

### DEGREES

- History M.A. (p. 83)

### FACULTY

**Brown, Dona L.;** Professor, Department of History; PHD, University of Massachusetts Amherst

**Buchanan, Andrew N.;** Lecturer, Department of History; PHD, Rutgers University

**Carr, Jacqueline B.;** Associate Professor, Department of History; PHD, University of California Berkeley

**Deslandes, Paul Raymond;** Associate Professor, Department of History; PHD, University of Toronto

**Ergene, Bogac A.;** Associate 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;** Associate Professor, Department of History; PHD, Northwestern University

**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

**Nicosia, Francis R.;** Professor, Department of History; PHD, McGill University

**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.;** Associate Professor, Department of History; PHD, University of Munich

**Steinweis, Alan E.;** Professor, Department of History; PHD, University of North Carolina

**Stilwell, Sean Arnold;** Associate Professor, Department of History; PHD, York University

**Whitfield, Harvey Amani;** Associate Professor, Department of History; PHD, Dalhousie University

**Youngblood, Denise J.;** Professor, Department of History; PHD, Stanford University

**Zdatny, Steven M.;** Professor, Department of History; PHD, University of Pennsylvania

**Zelko, Frank S.;** Associate Professor, Department of History; PHD, University of Kansas

## HISTORY M.A.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The Department of History offers a comprehensive program of courses in the history of the Americas, Europe, and Asia/Africa/Middle East/Global. 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. They must take the Graduate Record Examination and submit, with the application, letters of recommendation and a sample of writing, such as a research paper done in an undergraduate history course.

To be considered for admission, a candidate must have a grade point average of 3.00 (B) in his or her last two years of undergraduate study, with evidence of better work 3.30 (B+) in history. Students will normally score above the 65th percentile on the Graduate Record Examination Verbal section.

Applicants seeking fellowships or assistantships for the upcoming fall semester must have their completed application submitted by February 15th. No applications for fall admission will be accepted after May 1st. In those rare instances when a student seeks admission for the spring semester, applications must be submitted by November 1st.

#### Minimum Degree Requirements for the Degree of Master of Arts

Option A (Thesis)	
Requires twenty-four credits of 200- and 300-level course work, six credits of HST 391, and satisfactory performance on a comprehensive examination in two areas of historical knowledge. The thesis must be successfully defended in an oral examination	
Option B (Non-Thesis)	
Requires thirty credits of 200- and 300-level course work and the successful completion of a comprehensive examination in two areas of historical knowledge	
Both Options	

During their first year of study, all students enrolled in the M.A. program are required to take HST 301. While at least fifteen credits of course work must be earned in seminars, 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, six 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	
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**Description and Timing of Comprehensive Examination**

Comprehensive Examinations are typically taken in September or January of the second year of the program. They involve two separate fields in which the candidate is asked to reflect (either in written or oral form) on the state of scholarship in a given topic/area (such as the Progressive Era, environmental history of the British empire, the Holocaust, etc.).

**Requirements for Advancement to Candidacy for the Degree of Master of Arts**

Completion of the above requirements.

## INTERDISCIPLINARY - EDUCATION

### OVERVIEW

Students in the Interdisciplinary Studies program in education represent a variety of professions including higher education administration, public school education, law enforcement, social and human services, business, military, health care, non-profits, etc. The program is ideally suited for persons whose personal and professional development requires a combination of course work not readily available in other graduate programs, or for individuals who plan to assume new or emerging roles in the fields of education or social and human services.

### DEGREES

- Interdisciplinary M.Ed. (p. 85)

### FACULTY

**Nash, Robert James;** Professor; Department of Leadership and Developmental Sciences; EDD, Boston University

## INTERDISCIPLINARY M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 158)

### OVERVIEW

This degree program is for students who wish to pursue an individually designed, integrated program of study. The program draws primarily from graduate courses in Educational Leadership, Counseling, and Higher Education and Student Affairs Administration but 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:

- First, schedule a face-to-face interview with the program director at a time that is convenient for you.
- After the interview, and depending on whether the program fit is a satisfying one, submit an online application through the Graduate College of the University of Vermont.
- 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 five-year period can be transferred into the program.

### Minimum Degree Requirements

The Interdisciplinary degree is self-designed. No two programs look the same. 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 late afternoon or early evening. Summer continuing education courses are also available. Most of these 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, EDFS 304 Religion, Spirituality and Education, and/or EDFS 309 Scholarly Personal Narrative Writing. 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 multicultural education.
- A minimum of 18 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 transferred into the Interdisciplinary program. 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. Currently over two-thirds of students elect to write a thesis. This is the only master's thesis option in the College. 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, written, 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

### OVERVIEW

This 18 credit Certificate integrates graduate level courses, independent study and fieldwork into an individualized plan, exploring disability across different field of study and academic disciplines. Participants come from a broad range of programs and professional backgrounds. The program is designed to complement work done in traditional discipline-specific programs.

### DEGREES

- Interdisciplinary Study of Disabilities (ISD) CGS (p. 86)

### FACULTY

**Beatson, Jean E.;** Clinical Associate Professor, Department of Nursing; EDD, University of Vermont

**Prelock, Patricia;** Professor, Department of Medicine- Pediatrics; PHD, University of Pittsburgh

**Ryan, Susan Marie;** Executive Director and Professor, Center on Disability and Community Inclusion; PHD, University of Oregon

**Salembier, George;** Associate Professor, Department of Education; EDD, University of Vermont

## INTERDISCIPLINARY STUDY OF DISABILITIES (ISD) CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### 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 studies to enhance their education and instructional needs in disability studies. The certificate includes a total of eighteen credits, nine in core courses and nine 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 including three required courses (nine credits) and three elective courses (nine credits).

The one required course for all students enrolled in the certificate is:

EDSP/CSD 274	D2: Culture of Disability	3
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Depending on the chosen field of study, students work with their graduate and/or the coordinator of this certificate program to identify two other required courses and three electives (nine credits).

Additional information about this program in the ISD is available from the Certificate of Graduate Study website.



## MATERIALS SCIENCE

### 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. 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 three tracks (engineering, physics and chemistry) 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. 87)
- Materials Science M.S. (p. 88)
- Materials Science Ph.D. (p. 88)

### FACULTY

**Clougherty, Dennis Paul;** Professor, Department of Physics; PHD, Massachusetts Institute of Technology

**Del Maestro, Adrian G;** Assistant Professor, Department of Physics; PHD, Harvard University

**Dubief, Yves C.;** Associate Professor, School of Engineering; PHD, Institut National Polytechnique de Grenoble

**Furis, Madalina Ioana;** Associate Professor, Department of Physics; PHD, University of Buffalo

**Headrick, Randall L.;** Professor, Department of Physics; PHD, University of Pennsylvania

**Hitt, Darren Lee;** Professor, School of Engineering; PHD, Johns Hopkins University

**Kotov, Valeri N.;** Assistant Professor, Department of Physics; PHD, Clarkson University

**Leenstra, Willem R.;** Associate Professor, Department of Chemistry; PHD, University of Washington

**Oldinski, Rachael;** Assistant Professor, School of Engineering; PHD, Colorado State University

**Sansoz, Frederic P.;** Associate Professor, School of Engineering; PHD, Ecole Des Mines de Paris

**Titcomb, Stephen;** Associate Professor, School of Engineering; PHD, Lehigh University

**Varhue, Walter John;** Professor, School of Engineering; PHD, University of Virginia

**Whalley, Adam;** Assistant Professor, Department of Chemistry; PHD, Columbia University

**Waterman, Rory;** Associate Professor, Department of Chemistry; PHD, University of Chicago

**Wu, Jun-Ru;** Professor, Department of Physics; PHD, University of California Los Angeles

**Xia, Tian;** Associate Professor, School of Engineering; PHD, University of Rhode Island

**Yang, Jie;** Associate Professor, Department of Physics; PHD, Princeton University

## MATERIALS SCIENCE AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

The Accelerated Master's Program leads to both B.S. and M.S. degrees in five 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 six credits of approved graduate course work 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 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 A (Thesis)	
Thirty graduate credits of an approved program of study including at least eighteen credits of course work; completion of at least one three-credit course in each of the following categories; solid state theory, quantum mechanics, applied mathematics, and materials properties of solids; 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)	
Thirty graduate credits of an approved program of study; completion of at least one three-credit course in each of the following categories: solid state theory, quantum mechanics, applied mathematics, and materials properties of solids, 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 four 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 two attempts to pass the exam. Offered annually, the three-hour exam requires students to solve a minimum of four problems that cover the following topics: quantum mechanics, mathematical physics, mechanical behavior of materials, thermal physics, solid state physics, advanced inorganic chemistry 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. 156)

## 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 A (Thesis)	
Thirty graduate credits of an approved program of study including at least eighteen credits of course work; completion of at least one three-credit course in each of the following categories: solid state theory, quantum mechanics, applied mathematics, and materials properties of solids; satisfactory completion of a comprehensive examination; and satisfactory completion of an M.S. thesis including its defense at an oral examination	30
Option B (Non-thesis)	
Thirty graduate credits of an approved program of study; completion of at least one three-credit course in each of the following categories: 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 four 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 two attempts to pass the exam. Offered annually, the three-hour exam requires students to solve a minimum of four problems that cover the following topics: quantum mechanics, mathematical physics, mechanical behavior of materials, thermal physics, solid state physics, advanced inorganic chemistry 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. 159)

## OVERVIEW

The Materials Science Ph.D. leads to a degree in five years. Students must engage in research and defend a dissertation. Successful completion of a comprehensive exam within the first two 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 seventy-five graduate credits including a minimum of twenty in dissertation research. An overall grade point average in graduate courses of 3.25 or better
- Completion of at least one three-credit course in each of the following five categories:
  - Solid state theory
  - Quantum mechanics
  - Applied mathematics
  - Thermodynamics and kinetics
  - Materials properties of solids
- 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 four 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 two attempts to pass the exam. Offered annually, the three-hour exam requires students to solve a minimum of four problems that cover the following topics: quantum mechanics, mathematical physics, mechanical behavior of materials, thermal physics, solid state physics, advanced inorganic chemistry 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

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Doctor of Philosophy in Mathematical Sciences (the Ph.D. degree under the program heading of MASC). Students are encouraged to take courses in both core mathematics and applied mathematics, thereby gaining an appreciation of the connections between theory and applications.

Opportunities for research arise from the research interests of the Department faculty, which include analysis, algebra, biomathematics, combinatorics complex systems, differential equations, fluid mechanics, graph theory, mathematics education, modeling, and number theory.

### DEGREES

- Mathematical Sciences Ph.D. (p. 90)

### FACULTY

**Archdeacon, Dan Steven;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Ashikaga, Takamaru;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford

**Bunn, Janice Yanushka;** Research Associate Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Burgmeier, James William;** Professor, Department of Mathematics and Statistics; PHD, University of New Mexico

**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Cole, Bernard F.;** Professor, Department of Mathematics and Statistics; PHD, Boston University

**Danforth, Christopher M.;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park

**Dinitz, Jeffrey Howard;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Dodds, Peter S.;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology

**Dummit, David Steven;** Professor, Department of Mathematics and Statistics; PHD, Princeton University

**Foote, Richard Martin;** Professor, Department of Mathematics and Statistics; PHD, University of Cambridge

**Golden, Kenneth Ivan;** Professor, Department of Mathematics and Statistics; PHD, University De Paris

**Gross, Kenneth Irwin;** Professor, Department of Mathematics and Statistics; PHD, Washington University in St Louis

**Jefferys, William;** Lecturer I, Department of Mathematics and Statistics; PHD, Yale University

**Lakoba, Taras Igorevich;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Mickey, Ruth Mary;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Sands, Jonathan Winslow;** Professor, Department of Mathematics and Statistics; PHD, University of California San Diego

**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

**Son, Mun Shig;** Professor, Department of Mathematics and Statistics; PHD, Oklahoma State University

**Warrington, Gregory S.;** Assistant 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

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## MATHEMATICAL SCIENCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Doctor of Philosophy in Mathematical Sciences (the Mathematical Sciences Ph.D. degree). There are two areas of concentration: core mathematics and applied mathematics. While concentrating in one of these areas, students are encouraged to take courses in both core mathematics and applied mathematics, so as to gain an appreciation of the methods of both, and the connections between theory and applications.

Opportunities for research arise from the research interests of the Department faculty, which include analysis, algebra, biomathematics, combinatorics complex systems, differential equations, fluid mechanics, graph theory, mathematics education, modeling, and number theory.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

Because of the breadth of pure and applied mathematics, it is recognized that applicants for admission will have diverse backgrounds. Admission requirements are therefore flexible. Applicants should have demonstrated strength in either core or applied mathematics, a bachelor's degree with a major in mathematics or a closely related discipline, and satisfactory scores on both the general and subject (mathematics) sections of the Graduate Record Examination.

#### 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 seventy-five 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 two semesters of college-teaching experience. Students are expected to demonstrate appropriate proficiency in the use of technology. There is no formal language requirement.

### **Comprehensive Examination**

The Examination consists of three parts, two written and one oral. Syllabi for these exams are available from the Director of Graduate Studies in Mathematics. They are taken at distinct times and all three must be satisfactorily completed in order to advance to candidacy. For students with a concentration in Core Mathematics, one three-hour written exam is in real and complex analysis, and the other three-hour written exam is in algebra. For students with a concentration in Applied Mathematics, one three-hour written exam is in numerical analysis and the other three-hour written exam is in differential equations.

The two-hour oral examination is conducted by the studies committee on a topic chosen by the student in consultation with the committee.

One written examination must be passed by the middle of the second year in the program. All three exams must be passed by the beginning of the third year.

### **Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy**

Successful completion of the comprehensive examination.



## MATHEMATICS

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Master of Science (the Mathematics M.S.degree), the Master of Science in Teaching (the Mathematics M.S.T. degree), and the Doctor of Philosophy (the Mathematical Sciences Ph.D. degree). The Department also offers Master of Science degrees in Statistics and Biostatistics, described under the headings of Statistics and Biostatistics in this catalog.

Opportunities for research arise from the research interests of the Department faculty, which include analysis, algebra, biomathematics, combinatorics complex systems, differential equations, fluid mechanics, graph theory, mathematics education, modeling, and number theory.

Students in the M.S. and Ph.D. degree programs are encouraged to take courses in both core and applied mathematics, thereby gaining an appreciation of the connections between theory and applications.

The Department offers an Accelerated Master's Program (AMP) leading to a B.S. and an M.S. degree in five years. Interested students should contact the department by the beginning of their junior year.

The Department of Mathematics and Statistics is also home to the Vermont Mathematics Initiative (VMI), a mathematics content focused professional development program for K-12 teachers. Teachers who complete the VMI program are eligible to receive the Master of Science in Teaching (M.S.T.) degree, provided that requirements for the degree have also been met.

### DEGREES

- Mathematics AMP (p. 92)
- Mathematics M.S. (p. 93)
- Mathematics M.S.T. (p. 94)

### FACUTLY

**Archdeacon, Dan Steven;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Ashikaga, Takamaru;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford

**Bunn, Janice Yanushka;** Research Associate Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Burgmeier, James William;** Professor, Department of Mathematics and Statistics; PHD, University of New Mexico

**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

**Cole, Bernard F.;** Professor, Department of Mathematics and Statistics; PHD, Boston University

**Danforth, Christopher M.;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park

**Dinitz, Jeffrey Howard;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University

**Dodds, Peter S.;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology

**Dummit, David Steven;** Professor, Department of Mathematics and Statistics; PHD, Princeton University

**Foote, Richard Martin;** Professor, Department of Mathematics and Statistics; PHD, University of Cambridge

**Golden, Kenneth Ivan;** Professor, Department of Mathematics and Statistics; PHD, University of Paris

**Gross, Kenneth Irwin;** Professor, Department of Mathematics and Statistics; PHD, Washington University in St Louis

**Jefferys, William;** Lecturer I, Department of Mathematics and Statistics; PHD, Yale University

**Lakoba, Taras Igorevich;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University

**Mickey, Ruth Mary;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles

**Sands, Jonathan Winslow;** Professor, Department of Mathematics and Statistics; PHD, University of California San Diego

**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

**Son, Mun Shig;** Professor, Department of Mathematics and Statistics; PHD, Oklahoma State University

**Warrington, Gregory S.;** Assistant 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

**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## MATHEMATICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### 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 one additional year, because six credits of undergraduate courses can also be counted concurrently toward the M.S. degree requirements.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science for Accelerated Students

Students must declare their wish to enter the Accelerated Master's Program in writing to the Department Chair, apply to and be accepted by the Graduate College before taking a course 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 six credits of 200 level courses approved for graduate credit. Please refer to the Handbook for Graduate Studies in Mathematics, available on the Department website, for detailed information.

Students should discuss the possibility of an Accelerated Master's Program in mathematics, statistics or biostatistics with the respective program director as soon as they think they may be interested in this program.

### Minimum Degree Requirements for the Degree of Master of Science

Each student must complete one of the following options:

<b>Option A (Thesis)</b>	
Twenty-four semester hours of acceptable graduate credits in advanced mathematics courses, and six semester hours of thesis research culminating in a master's thesis.	30
<b>Option B (Non-thesis)</b>	
Thirty semester hours of acceptable graduate credits in advanced mathematics courses. No thesis is required.	30
<b>Both Options</b>	
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 four 300-level mathematics courses and the seminar MATH 382.	
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 nine approved credits in advanced mathematics courses in the respective area, three of which must be at the 300-level; students writing a thesis may count the six hours of thesis credit toward these nine hours.	
With approval of the student's advisor up to six credits of courses outside mathematics may be used to fulfill the major, minor, or degree requirements.	

### Comprehensive Examination

The comprehensive examination must be taken no later than five weeks before the end of the semester preceding the conferral of the M.S. degree. It is an oral examination covering three topics in the case of a student pursuing the non-thesis option, and covering two topics in the case of a student pursuing the thesis option. The first topic for all students is real analysis, including functions of several real variables, measure theory and integration theory. The second topic for all students is complex analysis. In the case of a student pursuing the non-thesis option, the third topic is the student's major subject, including material from three courses related to that subject that have been approved by the student's examination committee. 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

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. Satisfactory performance on the general and subject portions of the GRE exams (to be taken by the fall semester of the applicant's senior year);
3. Completion of at least two 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 MATH 242 and the two 200-level courses required for admission to the program); and
4. Completion of a 300-level course in Mathematics with a grade of B or better. This course will count towards the master's 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.

## MATHEMATICS M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The Department of Mathematics and Statistics offers programs towards the Master of Science (the Mathematics M.S. degree). Students are encouraged to take courses in both core mathematics and applied mathematics, thereby gaining an appreciation of the connections between theory and applications. 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.

Opportunities for research arise from the research interests of the Department faculty, which include analysis, algebra, biomathematics, combinatorics complex systems, differential equations, fluid mechanics, graph theory, mathematics education, modeling, and number theory.

See the Department of Mathematics and Statistics website for further details.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Because of the breadth of pure and applied mathematics, it is recognized that applicants for admission will have diverse backgrounds. Admission requirements are therefore flexible. Applicants should have demonstrated strength in either core or applied mathematics, a bachelor's degree with a major in mathematics or a closely related discipline, and satisfactory scores on both the general and subject (mathematics) sections of the Graduate Record Examination.

### Minimum Degree Requirements for the Degree of Master of Science

Each student must complete one of the following options:

<b>Option A (Thesis)</b>	
Twenty-four semester hours of acceptable graduate credits in advanced mathematics courses; and six semester hours of thesis research culminating in a master's thesis.	30
<b>Option B (Non-thesis)</b>	
Thirty semester hours of acceptable graduate credits in advanced mathematics courses. No thesis required.	30
<b>Both Options</b>	
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 four 300-level mathematics courses and the seminar MATH 382.	
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 nine approved credits in advanced mathematics courses in the respective area, three of which must be at the 300-level; students writing a thesis may count the six hours of thesis credit toward these nine hours.	
With approval of the student's advisor, up to six credits of courses outside mathematics may be used to fulfill the major, minor, or degree requirements.	

### 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. It is an oral examination covering three topics in the case of a student pursuing the non-thesis option, and covering two topics in the case of a student pursuing the thesis option. The first topic for all students is real analysis, including functions of several real variables, measure theory and integration theory. The second topic for all students is complex analysis. In the case of a student pursuing the non-thesis option, the third topic is the student's major subject, including material from three courses related to that subject that have been approved by the student's examination committee. 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

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 (p. 156)

## OVERVIEW

The Mathematics Master of Science in Teaching (M.S.T.) degree is intended primarily for licensed K-12 teachers, and the Department has instituted courses specifically designed for elementary, middle school, and high school teachers. These courses are designated as MAED (Mathematics for Educators) courses. They emphasize mathematics and statistics content together with the application of content knowledge to the K-12 classroom.

The Department of Mathematics and Statistics is home to the Vermont Mathematics Initiative (VMI). Teachers who wish to pursue the M.S.T. degree may also apply for admission to the VMI.

The VMI is a comprehensive mathematics content intensive 3-year program designed to train elementary, middle school, and high school teachers to serve as mathematics leaders in their schools and districts. The VMI emphasizes four core areas: increased knowledge of mathematics content; transfer of content knowledge to effective classroom instruction; action research that informs classroom practice or school or district mathematics goals; and teacher leadership in support of mathematics teaching and learning in the school or district. Teachers who enroll in the VMI may apply to the Master of Education (M.Ed.) in Curriculum Instruction rather than for the M.S.T. degree if they so choose.

For more information about the VMI and the M.S.T. degree please see the Department of Mathematics and Statistics website.

## 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.

### Minimum Degree Requirements for the Degree of Master of Science for Teachers

Thirty-six hours of course work in Mathematics for Educators (MAED) courses, MATH courses or STAT courses. With the approval of their advisor, students may choose courses from 100-level and higher mathematics or statistics courses or from closely related fields. The student must have a curriculum program approved by her/his advisor.

### 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.



## MECHANICAL ENGINEERING

### 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 weekly graduate student seminars and invited speaker presentations.

### Graduate

Since its creation, 200 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. For example, more than 42% of our graduating Ph.D. students in the past five years are women. 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. Recently, our faculty has won major awards from the Department of Defense, the Department of Energy, NASA, NIH and the National Science Foundation, including the recipients of one ARO Young Investigator Award, one DoE Early Career Award, and three NSF CAREER Awards. Clearly, our focus is to create a research environment that is highly interdisciplinary and collaborative from which our students can flourish.

### DEGREES

- Mechanical Engineering AMP (p. 96)
- Mechanical Engineering M.S. (p. 97)
- Mechanical Engineering Ph.D. (p. 98)

### FACULTY

**Dubief, Yves C.;** Associate Professor, School of Engineering; PHD, Institut National Polytechnique de Grenoble

**Dunlop, Mary J.;** Assistant Professor, School of Engineering; PHD, California Institute of Technology

**Fletcher, Douglas G.;** Professor, School of Engineering; PHD, University of Virginia

**Hitt, Darren Lee;** Professor, School of Engineering; PHD, Johns Hopkins University

**Huston, Dryver R.;** Professor, School of Engineering; PHD, Princeton University

**Jenkins, Robert;** Professor Emeritus, School of Engineering; PHD, University of Leeds

**Marshall, Jeffrey Scott;** Professor, School of Engineering; PHD, University of California Berkeley

**Oldinski, Rachael Ann;** Assistant Professor, School of Engineering; PHD, Colorado State University

**Sansoz, Frederic P.;** Associate Professor, School of Engineering; PHD, Ecole Des Mines de Paris

## MECHANICAL ENGINEERING AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

Qualified undergraduate students who plan to earn a master's degree in mechanical engineering may enroll in the Accelerated Master's Program, 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. Following acceptance by the Graduate College, students may take up to nine graduate credits while still an undergraduate. Of these, up to six credits can be counted toward both the B.S. and the M.S. degrees, subject to approval of the student's graduate advisor. Students in the Accelerated Masters Program are required to follow the requirements of the thesis option M.S. degree, and typically begin work toward their master's thesis starting 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 for 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.

The Accelerated Master's Program is only available for electrical engineering and mechanical engineering students who are planning a thesis-based degree.

#### 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 thirty 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 nine core course credits which cover areas of advanced engineering, mathematics, continuum mechanics, and numerical methods	
Six course credits in the area of specialization for their degree	6

Currently, the program offers areas of specialization in:

- Bioengineering and Biomechanics;
- Control Theory and Mechanical Systems;
- Solid Mechanics and Materials; and
- Thermal Sciences and Fluids.

Further details on the core course requirements and the areas of specialization can be obtained from the Mechanical Engineering Graduate Program website.

<b>Option A (Thesis)</b>	
In addition to core courses, students selecting the thesis option must complete between six and nine 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 six-credit thesis must complete an additional three credits of approved course work.	
<b>Option B (Non-thesis)</b>	
Students selecting the non-thesis option must complete an additional fifteen credits of course work beyond the core credits in lieu of a thesis. Of the additional course work, a minimum of nine credits must be in a chosen area of specialization.	

## Comprehensive Examination

The comprehensive examination for the thesis option is the oral defense of the thesis.

The comprehensive examination for the non-thesis option tests the proficiency of the students in four 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 three to four graduate faculty, one of whom should hold an appointment outside of mechanical engineering (one 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 eight hours (two hours 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 is allowed to take no more than two comprehensive examinations. Comprehensive examinations are typically scheduled at the end of the Fall or Spring semesters.

## 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. 156)

## 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: Smart Structures, Aerospace Engineering, Turbulence, Complex Fluids, Multiscale Mechanics, Micro and Nano Engineering, Nanomaterials, Energy Harvesting, Conversion and Storage, Control Systems, Microorganisms and Cells, Biomaterials, and Theory and Simulation using 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.

### 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 thirty 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 nine core course credits which cover areas of advanced engineering, mathematics, continuum mechanics, and numerical methods	
Six course credits in the area of specialization for their degree	6

Currently, the program offers areas of specialization in:

- Bioengineering and Biomechanics;
- Control Theory and Mechanical Systems;
- Solid Mechanics and Materials; and
- Thermal Sciences and Fluids.

Further details on the core course requirements and the areas of specialization can be obtained from the Mechanical Engineering Graduate Program website.

<b>Option A (Thesis)</b>	
In addition to core courses, students selecting the thesis option must complete between six and nine 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 six-credit thesis must complete an additional three credits of approved course work	
<b>Option B (Non-thesis)</b>	
Students selecting the non-thesis option must complete an additional fifteen credits of course work beyond the core credits in lieu of a thesis. Of the additional course work, a minimum of nine credits must be in a chosen area of specialization.	

## Comprehensive Examination

The comprehensive examination for the thesis option is the oral defense of the thesis.

The comprehensive examination for the non-thesis option tests the proficiency of the students in four 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 three to four graduate faculty, one of whom should hold an appointment outside of mechanical engineering (one 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 eight hours (two hours 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 is allowed to take no more than two comprehensive examinations. Comprehensive examinations are typically scheduled at the end of the Fall or Spring semesters.

## 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. 159)

## 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 bachelor's degree and/or a master'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. Areas of research interest in the program currently include: Smart Structures, Aerospace Engineering, Turbulence, Complex Fluids, Multiscale Mechanics, Micro and Nano Engineering, Nanomaterials, Energy Harvesting, Conversion and Storage, Control Systems, Microorganisms and Cells, Biomaterials, and Theory and Simulation using High-performance Computing.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

An accredited bachelor's and/or master's degree in mechanical engineering or closely related discipline is required.

### Minimum Degree Requirements for the Degree of Doctor of Philosophy

The degree of Doctor of Philosophy requires of candidates a minimum of seventy-five credits to be earned in course work and in dissertation research. The seventy-five credits must be distributed in such a way that at least thirty-nine credits must be earned in courses and seminars and a minimum of twenty-one credits must be earned in dissertation research. Students must complete at least fifteen credits in graduate-level mechanical engineering course work at UVM from the different areas of specialization. This can include M.S. course credits earned at UVM. Currently, the program offers areas of specialization in:

- Bioengineering and Biomechanics;
- Control Theory and Mechanical Systems;
- Solid Mechanics and Materials; and
- Thermal Sciences and Fluids.

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 four 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 three to four graduate faculty, one of whom should hold an appointment outside of mechanical engineering (one 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 eight hours (two hours 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 two 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 in his/her first year of studies.

**Requirements for Advancement to Candidacy for  
the Degree of Doctor of Philosophy**

Successful completion of the Ph.D. comprehensive examination.

## NATURAL RESOURCES

### 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 M.S. (p. 101)
- Natural Resources Ph.D. (p. 102)
- Natural Resources: Master of Environmental Law and Policy/  
Master of Science in Natural Resources (MELP/MSNR) (p. 103)

### FACULTY

**Adair, Elizabeth Carol;** Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, Colorado State University

**Ali, Saleem Hassan;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Massachusetts Institute of Technology

**Bowden, William Breck;** Professor; Rubenstein School of Environment and Natural Resources; PHD, North Carolina State University Raleigh

**Chase, Lisa Cheryl;** Extension Associate Professor; Extension - Programming and Faculty Support; PHD, Cornell University

**Danks, Cecilia Marie;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of California Berkeley

**DeHayes, Donald;** Professor Emeritus; Rubenstein School of Environment and Natural Resources; PHD, Michigan State University

**Dennis, Donald;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Yale University

**Donovan, Therese M.;** Research Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Missouri Columbia

**Emery, Marla;** Adjunct Assistant Professor; Department of Geography; PHD, Rutgers University

**Erickson, Jon;** Professor; Gund Institute; PHD, Cornell University

**Galford, Gillian Laura;** Research Assistant 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

**Grove, J. Morgan;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Yale University

**Hudspeth, Thomas Richard;** Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Michigan Ann Arbor

**Hughes, Jeffrey Winston;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Cornell University

**Ivakhiv, Adrian J.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, York University

**Jenkins, Jennifer;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of New Hampshire

**Kaza, Stephanie;** Professor; Rubenstein School of Environment and Natural Resources; MDiv, Starr King School for Ministry

**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;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin Madison

**Laven, Daniel;** Adjunct Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Lawson, Steven R.;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Levine, Suzanne Nanette;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Manitoba

**Manning, Robert Emmet;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Michigan State University

**Marsden, J. Ellen;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Cornell University

**McIntosh, Alan W.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Michigan State University

**Mitchell, Brian;** Adjunct Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of California Berkeley

**Morrissey, Leslie A.;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Oregon State University

**Murdoch, James D.;** Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Oxford

**Parrish, Donna;** Research Professor; 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; Rubenstein School of Environment and Natural Resources; PHD, University of New Hampshire

**Ricketts, Taylor H.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, Stanford University

**Roman, Joseph;** Research Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, Harvard University

**Schaberg, Paul;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Shanley, James;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Wyoming

**Stockwell, Jason Dana;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Toronto

**Stokowski, Patricia A.;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Washington



**Strong, Allan Matthew;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Tulane University

**Todd, John;** Research Professor Emeritus; Rubenstein School of Environment and Natural Resources; PHD, University of Michigan

**Troy, Austin R.;** Adjunct Professor; Rubenstein School of Environment and Natural Resources; PHD, University of California Berkeley

**Twery, Mark;** Adjunct Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Yale University

**Vatovec, Christine M.;** Research Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin Madison

**Ventriss, Curtis L.;** Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Southern California

**Voigt, Brian G.;** Research Assistant Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Vermont

**Wallin, Kimberly F.;** Research Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, University of Wisconsin Madison

**Wang, Deane;** Associate Professor; Rubenstein School of Environment and Natural Resources; PHD, Yale University

## NATURAL RESOURCES M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 fifteen to twenty-four credits of advanced course work and write and defend a thesis or project. This experience will further their knowledge and proficiency in natural resource fields including five areas of concentration:

Aquatic Ecology and Watershed Science (p.        )

Environment, Society and Public Affairs (p.        )

Environmental Thought and Culture (p.        )

Forestry (p.        )

Wildlife Biology (p.        )

Other areas of studies can be pursued through the 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.

Students may also pursue a MELP/MSNR dual degree with the Vermont Law School.

Students choosing to emphasize advanced course work (twenty-seven credits) will pursue academic and work experiences leading to development of professional skills emphasizing conservation leadership, ecological planning, and sustainable forestry. A three 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; satisfactory scores on the General Test of the Graduate Record Examination; 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 fifteen to twenty-seven credits of course work in related fields (including NR 385: 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 three to six credits of project research, or six to fifteen 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.

### 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 enrollment in a one credit special topics seminar organized by faculty and students in the concentration, and at least twelve additional 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 six 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 twenty-one to twenty-four credits of advanced courses (including a methods course, three courses from an approved list of courses reflecting this concentration's emphasis, and one ecology course), and three to six credits of project research or six credits of thesis research. Students pursue a project or thesis.

### 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 eighteen to twenty-one credits of advanced courses and fifteen credits in a specialization within environmental thought and culture, and six credits of project research or six to nine 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 eighteen to twenty-one credits of advanced forestry and related courses, a comprehensive examination with both a written and oral component, and six credits of project research or six to nine 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 eighteen to twenty-one credits of course work in wildlife and related fields, a comprehensive examination with both a written and oral component, and three to six credits of project research or six to nine credits of thesis research. Students pursue a thesis or project.

## NATURAL RESOURCES PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

## 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

Satisfactory scores on the General Test of the Graduate Record Examination. Acceptability to a potential faculty advisor holding an appointment in the Rubenstein School of Environment and Natural Resources and the Graduate College. Applicants with a Master of Science degree are preferred.

## Minimum Degree Requirements

The Doctor of Philosophy requires seventy-five total credits (including NR 385: Applied Ecology, Environment and Society, and NR 306: Envisioning a Sustainable Future). For students entering the program with a completed master's degree, fifteen total graded course credits are required. For students entering the program without a master's degree, thirty total graded credits are required. Credits must include no less than twenty 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 and written 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:

- one year of full-time graduate study in residence at the University of Vermont;
- at least twelve credits of research;
- at least fifteen credits of course work at the graduate level acceptable to the student's graduate studies committee;
- satisfactory performance on a comprehensive examination;
- delivery of a public proposal seminar; and
- a dissertation proposal accepted by the student's graduate studies committee.

## 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. 156)

## OVERVIEW

### Dual Degree Program with Vermont Law School

The Master of Environmental Law and Policy (M.E.L.P.)/Master of Science in Natural Resources (M.S. - Natural Resources) 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; satisfactory scores on the General Test of the Graduate Record Examination; 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 both schools.

### Minimum Degree Requirements at the University of Vermont

Students in the Dual Degree Program may earn both degrees with a total of forty-two credits. Students must meet each school's degree requirements, including required courses and thesis preparation. Students take a minimum of twenty-one credits at VLS toward the M.E.L.P. degree and a minimum of twenty-one credits at UVM toward the M.S. (Natural Resources) degree. Students may transfer a maximum of nine credits between the two 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 five years to complete the Dual Degree Program. Course credits to be transferred must be taken within that five year period.

The master of science requires from fifteen to twenty-seven credits of course work in related fields (including NR 385: 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 three to six credits of project research, or six to fifteen 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 in compilation of the graduate GPA. A GPA of 3.00 or greater is also required.

## NEUROSCIENCE

### 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. 106)
- Neuroscience Ph.D. (p. 106)

### FACULTY

**Althoff, Robert;** Associate Professor, Department of Psychiatry; MD, University of Illinois

**Ballif, Bryan A.;** Associate Professor, Department of Biology; PHD, Harvard University

**Berger, Christopher Lewis;** Associate Professor, Department of Molecular Physiology and Biophysics; PHD, University of Minnesota Twin Cities

**Bongard, Joshua C.;** Associate Professor, Department of Computer Science; PHD, University of Zurich

**Bouton, Mark Earhart;** Professor, Department of Psychology; PHD, University of Washington

**Brayden, Joseph Elliott;** Professor, Department of Pharmacology; PHD, University of Vermont

**Brewer, Matthias;** Associate Professor, Department of Chemistry; PHD, University of Wisconsin Madison

**Cannizzaro, Michael S.;** Associate Professor, Department of Communication Sciences; PHD, University of Connecticut

**Cipolla, Marilyn Jo;** Professor, Department of Neurological Sciences; PHD, University of Vermont

**Cornbrooks, Carson Justis;** Associate Professor, Department of Neurological Sciences; PHD, Virginia Commonwealth University

**Delay, Eugene Raymond;** Associate Professor, Department of Biology; PHD, University of Georgia

**Delay, Rona J.;** Associate Professor, Department of Biology; PHD, Colorado State University

**Dostmann, Wolfgang R. G.;** Professor, Department of Pharmacology; MD, University of Munich

**Dumas, Julie Anna;** Associate Professor, Department of Psychiatry; PHD, University of North Carolina

**Eckenstein, Felix;** Professor, Department of Neurological Sciences; PHD, University of Basel

**Eppstein, Maggie;** Associate Professor, Department of Computer Science; PHD, University of Vermont

**Falls, William A.;** Professor, Department of Psychology; PHD, Yale University

**Forehand, Cynthia Jean;** 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, University of Colorado Boulder

**Garavan, Hugh P.;** Associate Professor, Department of Psychiatry; PHD, Bowling Green State University

**Gorman, Mark;** Professor, Department of Neurological Sciences; MD, Wayne State University

**Green, John Thomas;** Associate Professor, Department of Psychology; PHD, Temple University

**Hammack, Sayamwong E.;** Associate Professor, Department of Psychology; PHD, University of Colorado

**Henry, Sharon Margaret;** Professor, Department of Rehabilitation and Movement Science; PHD, University of Vermont

**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

**Jacobs, Jesse V.;** Assistant Professor, Department of Rehabilitation and Movement Science; PHD, Oregon Health Sciences University

**Jaworski, Diane Marie;** Professor, Department of Neurological Sciences; PHD, Texas Woman's University

**Langevin, Helene M.;** Professor, Department of Neurological Sciences; MD, McGill University

**Lenck-Santini, Pierre-Pascal;** Assistant Professor, Department of Neurological Sciences; PHD, Universite de Provence

**Li, Dawei;** Assistant Professor, Department of Microbiology and Molecular Genetics; PHD, Shanghai Jiao Tong University

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**Mawe, Gary Michael;** Professor, Department of Neurological Sciences; PHD, Ohio State University

**May, Victor;** Professor, Department of Neurological Sciences; PHD, Northwestern University

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Berkeley

**Naylor, Magdalena Raczkowska;** Professor, Department of Psychiatry; MD, Warsaw Medical Academy

**Nelson, Mark Tuxford;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Nishi, Rae;** Professor, Department of Neurological Sciences; PHD, University of California San Diego

**Parsons, Rodney Lawrence;** Professor, Department of Neurological Sciences; PHD, Stanford University

**Potter, Alexandra S.;** Assistant Professor, Department of Psychiatry; PHD, University of Vermont

**Prelock, Patricia;** Professor, Department of Pediatrics; PHD, University of Pittsburgh

**Schermerhorn, Alice C.;** Assistant Professor, Department of Psychology; PHD, University of Notre Dame

**Scott, Rodney;** Professor, Department of Neurological Sciences; MD, University of Zimbabwe

**Sibold, Jeremy S.;** Assistant Professor, Department of Rehabilitation and Movement Science; EDD, West Virginia University



**Sigmon, Stacey C.;** Associate Professor, Department of Psychiatry; PHD, University of Vermont

**Spees, Jeffrey L.;** Associate Professor, Department of Medicine-Vascular Biology; PHD, University of California Davis

**Teuscher, Cory;** Professor, Department of Medicine-Immunobiology; PHD, University of New Mexico

**Toufexis, Donna J.;** Assistant Professor, Department of Psychology; PHD, McGill University

**Van Houten, Judith Lee;** Professor, Department of Biology; PHD, University of California Berkeley

**Vizzard, Margaret A.;** Professor, Department of Neurological Sciences; PHD, Thomas Jefferson University

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

## NEUROSCIENCE M.S.

All students must meet the Requirements for the Master's Degree

### OVERVIEW

The Neuroscience Graduate Program only awards an M.S. to students who have matriculated into the Ph.D. granting program, but cannot continue to the Ph.D. These individuals must be recommended by their advisory committee for the M.S., and are required to complete the minimum requirements for the M.S. as defined by the university, and must write a research-based master's thesis.

## NEUROSCIENCE PH.D

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### 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

Bachelor's degree in a biological science, neuroscience, chemistry, physics, engineering, psychology, mathematics, communication sciences or computer science. Additional courses with better than average grades in calculus, chemistry, organic chemistry, physics, biopsychology, neuroscience, or biology are recommended. Research experience not necessary, but favorably considered.

GRE General Test scores are required, and scores on the Subject Test in Biology, Biochemistry, Cell and Molecular Biology, or Psychology are highly recommended. Applicants whose native language is not English must submit scores from Test of English as a Foreign Language (TOEFL).

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. A complete application for fall admission must be received by December 1.

### Minimum Degree Requirements

BIOL 261	Neurobiology (for students who have not taken any neurobiology classes)	3
NSCI 306	Techniques in Neurobiology	3
PSYC 303	Biobehavioral Proseminar	3
GRMD 354	Medical Human Struc & Fnction	4-8
GRMD 357	Medical Neural Science	6
PSYC 340	Adv Statistical Methods I	3
or STAT 211	Statistical Methods I	
NSCI 327	Resp Conduct in Biomed Rsch	1
NSCI 381	Seminar in Neuroscience (Must be taken twice)	1
NSCI 382	Seminar in Neuroscience (Must be taken twice)	1
NSCI 491	Doctoral Dissertation Research (Minimum of 20 required total)	1-18
Advanced Neuroscience Selectives		6

### APPROVED COURSES FOR GRADUATE CREDIT

Below is a list of approved selectives. A student, in conjunction with their advisor, may request another course to fulfill the selective requirement. The request will need to be approved by the NGP Director. The curriculum committee will be consulted if content is questioned.

#### Courses eligible for Advanced Neuroscience Selectives:

NSCI 320	Developmental Neurobiology	3
NSCI 323	Neurochemistry	3
NSCI 326	Basic Sci-Neurologic Disease	1
NSCI 328	Techniques in Microscopy	3
NSCI 329	Topics in Excitable Membranes	2
NSCI 330	Comparative Neurobiology	2
BIOC 301	General Biochemistry	3
BIOL 262	Neurobiology Techniques	4
CLBI 301	Cell Biology	3
CSD 353	Adult Neuropathologies	3
MPBP 310	Molecular Control of the Cell	3
PHRM 272	Toxicology	3
PHRM 290	Topics Molecular&Cell Pharm	3
PSYC 305	Seminar in Learning Theory	3



PSYC 320	Animal Minds	3
PSYC 322	Neurobio of Learning & Memory	3
PSYC 323	Neuropsychopharmacology	3
PSYC 380	Contemporary Topics	3
PSYC 385	Advanced Readings & Research	1-3

### **Comprehensive Examination**

The qualifying examination for advancement to candidacy for a Ph.D. in Neuroscience must be taken prior to the end of the first semester of the third year. The exam will consist of two portions, a research proposal and an oral defense of the research proposal. The review of the written proposal will be done by a committee of three faculty members representing three different sub-specialties of neuroscience. The same committee will evaluate the student's performance in an oral examination. Should the student fail the examination, only one re-examination is allowed. All examinations are taken on the University of Vermont campus in Burlington, VT.

### **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 OVERVIEW

The Department of Nursing offers a graduate program leading to a Master of Science degree in nursing that prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, to develop expertise in a specialized area 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 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 horizontal leadership positions through which evidenced-based care for groups of patients will be managed.

Application deadline: April 3, 2015

### Direct Entry Program in Nursing (DEPN)

The Direct Entry Program in Nursing (DEPN) replaces the Master's Entry Program in Nursing (MEPN) ([http://www.uvm.edu/~cnhs/nursing/?Page=masters\\_entry.html](http://www.uvm.edu/~cnhs/nursing/?Page=masters_entry.html)). This 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.

Application deadline: Dec. 1, 2014 for fall 2015

### Doctor of Nursing Practice (DNP)

The Doctor of Nursing Practice (DNP) degree program is planned to begin in the fall of 2015. There will be two entry options: one for registered nurses with a baccalaureate or higher degree (in nursing or another field), and another for post-master's applicants who want to pursue the DNP.

Application deadline: April 3, 2015 for fall 2015

### Post-Master's Doctor of Nursing Practice (DNP)

The Post-Master's Doctor of Nursing Practice (DNP) degree program began in the spring of 2014.

Application deadline: June 1, 2015

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 essential 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 M.S. (p. 108)
- Nursing Practice DNP (p. 109)

## FACULTY

**Abrams, Sarah Elise;** Associate Professor, Department of Nursing; PHD, University of California

**Beatson, Jean E.;** Clinical Associate Professor, Department of Nursing; EDD, University of Vermont

**Bosek, Marcia Sue;** Associate Professor, Department of Nursing; DNSC, Rush Medical College

**Buck-Rolland, Carol L.;** Clinical Associate Professor, Department of Nursing; EDD, University of Vermont

**Carr, Jeanine M.;** Associate Professor, Department of Nursing; PHD, University of South Carolina Aiken

**Coffey, Jean S.;** Assistant Professor, Department of Nursing; PNP, Northeastern University

**Cohen, Judith Ann;** Professor, Department of Nursing; PHD, Wayne State University

**Dale, Rosemary Louise;** Clinical Professor, Department of Nursing; EDD, Ball State University

**Hamel-Bissell, Brenda Pauline;** Professor, Department of Nursing; EDD, Boston University

**Laurent, Jennifer S.;** Assistant Professor, Department of Nursing; MS, University of Massachusetts Lowell

**Maltby, Hendrika J.;** Professor, Department of Nursing; PHD, Curtin University of Technology

**Palumbo, Mary Val;** Associate Professor, Department of Nursing; DNP, Rush Medical College

**Rambur, Betty A.;** Professor, Department of Nursing; DNSC, Rush Medical College

**Whitney, Stuart Luhn;** Clinical Associate Professor, Department of Nursing; EDD, University of Vermont

## NURSING M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

## OVERVIEW

The Department of Nursing offers a graduate program leading to a Master of Science degree in nursing that prepares nurses to assume leadership roles within health care systems in a variety of settings, to expand knowledge of the discipline of nursing, to develop expertise in a specialized area 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 graduate curriculum includes five core courses essential for all students that address the theoretical basis of nursing care:

professional issues and role development of advanced practice registered nurses; research utilization and evidence-based practice; health policy and financing; theoretical foundations of nursing; and biostatistics and epidemiology. Students apply core content to their chosen area of specialization. Students may select a course of study in: Primary Care Nursing with preparation either as an Adult Gerontology, Family Nurse Practitioner, or Clinical Nurse Leader. After successful completion of program requirements students are eligible to take national exams.

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 essential 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
- Eligibility for licensure as an RN in Vermont
- Graduate Record Examination (GRE)
- College grade point average of 3.00 or higher
- Undergraduate statistics course
- Previous basic physical assessment course
- Three letters of recommendation
- 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
- Comprehensive examination
- Grade point average of 3.00 or higher
- 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. Students may take the examination any time after the core courses have been successfully completed, but must be completed prior to the final track courses and practicums. Students will be expected to respond orally to specific questions provided to the student two weeks prior to the exam date. Questions will be formulated by the student's thesis/

project committee or Graduate Faculty on the Comprehensive Exam Committee. The student can expect questions related to:

Research and relationships to evidence-base practice; research utilization.

Relationship of nursing theory to nursing research and practice.

Role dimensions and core characteristics of advanced practice nurses.

Health care policy and role of the APRN/ CNL.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. Satisfactory performance requires that in response to the questions, the student demonstrates analysis and synthesis of content addressed throughout the program of study. We then further detail grading criteria.

### Requirements for Advancement to Candidacy for the Degree of Master of Science

Meet all of the above criteria.

## NURSING PRACTICE DNP

### OVERVIEW

The following Doctor of Nursing Practice programs are being offered:

#### Direct Entry Program in Nursing (DEPN)

The Direct Entry Program in Nursing (DEPN) replaces the Master's Entry Program in Nursing (MEPN). This 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.

Application deadline: Dec. 1, 2014 for fall 2015

#### Doctor of Nursing Practice (DNP)

The Doctor of Nursing Practice (DNP) degree program is planned to begin in the fall of 2015. There will be two entry options: one for registered nurses with a baccalaureate or higher degree (in nursing or another field), and another for post-master's applicants who want to pursue the DNP. Post-master's nurse practitioners wishing to complete the DNP program may begin part-time study in the spring of 2014.

Application deadline: April 3, 2015 for fall 2015

#### Post-Master's Doctor of Nursing Practice (DNP)

The Post-Master's Doctor of Nursing Practice (DNP) degree program began in the spring of 2014.

## 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)
- 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 must be met to complete your minimum degree requirements:

- Core, track, and elective courses
- Comprehensive Examination
- Grade point average of 3.00 or higher
- DNP Project

### **Requirements for Admission to Graduate Studies for the Degree of Post Master's DNP Nurse Practitioner and Post Master DNP Executive Nurse Leader**

- Master's Degree 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 DNP Nurse Practitioner and Post Master DNP Executive Nurse Leader**

- Core, track, and elective courses
- Grade point average of 3.00 or higher
- DNP 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. Students may take the examination any time after the core courses have been successfully completed, but must be completed prior to the final track courses and practicums. Students will be expected to respond orally to specific questions provided to the student two weeks prior to the exam date. Questions will be formulated by the student's thesis/project committee or Graduate Faculty on the Comprehensive Exam Committee. The student can expect questions related to:

Research and relationships to evidence-based practice; research utilization.

Relationship of nursing theory to nursing research and practice.

Role dimensions and core characteristics of advanced practice nurses.

Health care policy and role of the APRN/Executive Nurse Leader.

The Comprehensive Examination is rated on a satisfactory/unsatisfactory basis. Satisfactory performance requires that in response to the questions, the student demonstrates analysis and synthesis of content addressed throughout the program of study. We then further detail grading criteria.

### **Requirements for Advancement to Candidacy for the Degree of Doctor of Nursing Practice, Post Master DNP Nurse Practitioner, and Post Master DNP Executive Nurse Leader**

Meet all of the above criteria.

## NUTRITION AND FOOD SCIENCES

### 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 or community aspects of human nutrition and food science and technology. Research is being conducted on: the impact of attitudes and behaviors toward eating and exercise on body weight and composition; web-based interactive multimedia tools for use in teaching and research; behavior modification programs to improve individual eating behaviors; testing the effectiveness of Internet support on the long term management of obesity; factors affecting the nutritional status of children; milk chemistry and cheese technology (i.e., structure, function, and properties of mozzarella and goat's milk cheese); chemistry and processing of infant formula; and food microbiology.

For more information, contact the Department of Nutrition and Food Sciences, 250 Carrigan Wing, (802) 656-3374.

### DEGREES

- Nutrition and Food Sciences M.S. (p. 111)

### FACULTY

**Berlin, Linda;** Extension Assistant Professor, Department of Nutrition and Food Sciences; PHD, Tufts University

**Carew, Jr., Lyndon;** Professor Emeritus, Department of Nutrition and Food Sciences; PHD, Cornell University

**Donnelly, Catherine Wright;** Professor, Department of Nutrition and Food Sciences; PHD, North Carolina State University Raleigh

**Guo, Ming Ruo;** Professor, Department of Nutrition and Food Sciences; PHD, University College Cork

**Harvey, Jean Ruth;** Professor, Department of Nutrition and Food Sciences; PHD, University of Pittsburgh

**Johnson, Rachel K;** Professor, Department of Nutrition and Food Sciences; PHD, Pennsylvania State University

**Kindstedt, Paul Stephen;** Professor, Department of Nutrition and Food Sciences; PHD, Cornell University

**Pintauro, Stephen Joseph;** Associate Professor, Department of Nutrition and Food Sciences; PHD, University of Rhode Island

**Ross, Jane Kaye;** Professor, Department of Nutrition and Food Sciences; PHD, Oregon State University

**Trubek, Amy B.;** Associate Professor, Department of Nutrition and Food Sciences; PHD, University of Pennsylvania

**Tyzbir, Robert Stanley;** Professor, Department of Nutrition and Food Sciences; PHD, Oregon State University

## NUTRITION AND FOOD SCIENCES M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 or community aspects of human nutrition and food science and technology. Research is being conducted on: the impact of attitudes and behaviors toward eating and exercise on body weight and composition; web-based interactive multimedia tools for use in teaching and research; behavior modification programs to improve individual eating behaviors; testing the effectiveness of Internet support on the long term management of obesity; factors affecting the nutritional status of children; milk chemistry and cheese technology (i.e., structure, function, and properties of mozzarella and goat's milk cheese); chemistry and processing of infant formula; and food microbiology.

For more information, contact the Department of Nutrition and Food Sciences, 250 Carrigan Wing, (802) 656-3374.

### 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. An undergraduate course in biochemistry. Satisfactory scores on the Graduate Record Examination, general (aptitude) portion.

#### Minimum Degree Requirements for the Degree of Master of Science

Thirty credits, including six to fifteen credits of thesis research. A minimum of fifteen credits of graded graduate-level course work. Courses in statistics, Research Methods in Nutrition and Food Sciences, and Nutrition and Food Sciences Seminar are required.

#### Comprehensive Examination

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 two 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.

#### Requirements for Advancement to Candidacy for the Degree of Master of Science

Completion of the above requirements.



## 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. 112) (This program is not accepting students at this time)

### FACULTY

**Anathy, Vikas;** Assistant Professor; Department of Pathology; PHD, Madurai Kamaraj University

**Heintz, Nicholas;** Professor, Department of Pathology; PHD, University of Vermont

**Janssen-Heininger, Yvonne;** Professor, Department of Pathology; PHD, University of Lumburg

**Shukla, Arti;** Associate Professor, Department of Pathology; PHD, Benaras Hindu University

**Taatjes, Douglas J.;** Professor, Department of Pathology; PHD, University of Basel

**Tracy, Russell P.;** Professor, Department of Pathology; PHD, Syracuse University

**van der Vliet, Albert;** Professor, Department of Pathology; PHD, University of Amsterdam

## PATHOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

THIS PROGRAM IS NOT CURRENTLY ACCEPTING STUDENTS.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Masters of Science

- Satisfactory undergraduate or graduate course work in chemistry and the biological sciences.
- Course work in microbiology, molecular genetics, and immunology are also recommended but not required.
- Satisfactory scores on the Graduate Record Examination (GRE) general aptitude sections is required; students for whom English is not a native language must take and provide official scores from the Test Of English as a Foreign Language (TOEFL).
- Students must submit an official transcript from undergraduate colleges attended and any previous graduate training.

- Three letters of recommendation are required, addressing the student's intellectual maturity, communication skills, and aptitude for an advanced degree.

Persons interested in a Ph.D. program may wish to consider the interdisciplinary program in Cellular, Molecular, and Biomedical Sciences in which Pathology participates.

### Minimum Degree Requirements

PATH 303	Translational Pathology	3
PATH 305	Molecular Mech Environ Disease	3
PATH 306	Pathobiology of Disease	1
CLBI 301	Cell Biology	3
NSCI 327	Resp Conduct in Biomed Rsch	1
Additional elective courses, subject to approval		
PATH 391	Master's Thesis Research (six to fifteen credits)	1-18

### Comprehensive Examination

A written examination is taken following completion of the core courses listed above.

### Requirements for Advancement to Candidacy for the Degree of Masters of Science

Completion of core courses listed above and passing the comprehensive examination.

## PHARMACOLOGY

### OVERVIEW

The Department of Pharmacology offers a Thesis Master's for a Master of Science degree. This is a course and research based program, with 24 credits in course work, and 6 in research. A thesis is written and there is a defense. Research interests are diverse, with special emphasis on cardiovascular and cerebrovascular pharmacology, physiology, neurovascular coupling, signal transduction, and medicinal chemistry/cancer chemotherapy. In addition to the Pharmacology M.S., the pharmacology faculty participate in interdisciplinary doctoral programs in neuroscience, and cellular, molecular, and biomedical sciences found elsewhere in this catalogue.

### DEGREES

- Pharmacology M.S. (p. 113)

### FACULTY

**Brayden, Joseph Elliott;** Professor, Department of Pharmacology; PHD, University of Vermont

**Carr, Frances Eileen;** Professor, Department of Pharmacology; PHD, University of Illinois Chicago

**Dostmann, Wolfgang R. G.;** Professor, Department of Pharmacology; PHD, University of Munich

**Heppner, Thomas Jon;** Assistant Professor, Department of Pharmacology; PHD, Iowa State University

**Howe, Alan K.;** Associate Professor, Department of Pharmacology; PHD, Northwestern University

**Lounsbury, Karen M.;** Professor, Department of Pharmacology; PHD, University of Pennsylvania

**McCormack, John;** Professor Emeritus, Department of Pharmacology; PHD, Yale University

**Morielli, Anthony D.;** Associate Professor, Department of Pharmacology; PHD, University of California Berkeley

**Nelson, Mark Tuxford;** Professor, Department of Pharmacology; PHD, Washington University in St Louis

**Wellman, George C.;** Professor, Department of Pharmacology; PHD, University of Vermont

## PHARMACOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The Department of Pharmacology offers a Thesis Master's for a Master of Science degree. This is a course and research based program, with 24 credits in coursework, and 6 in research. A thesis is written and there is a defense. Research interests are diverse, with special emphasis on cardiovascular and cerebrovascular pharmacology, physiology, neurovascular coupling, signal transduction, and medicinal chemistry/cancer chemotherapy.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Master of Science

Year courses in biology, organic chemistry, physics, analytic geometry and calculus; physical chemistry and/or a reading knowledge of one foreign language may be additional prerequisites, depending on the requirements of the research supervisor; and acceptable scores on the general (verbal, quantitative) section of the Graduate Record Examination.

### Minimum Requirements

BIOC 301	General Biochemistry	0 or 3
BIOC 302	General Biochemistry	3
MPBP 301	Human Physiology & Pharm I	4
MPBP 302	Human Physiology & Pharm II	4
PHRM 240	Molecules & Medicine	3
PHRM 302	Pharmacological Techniques	2
PHRM 303	Pharmacological Techniques	2
PHRM 381	Seminar	1
PHRM 391	Master's Thesis Research	1-12
STAT 308	Applied Biostatistics	3

Total of thirty credits, to include twenty-four from graded course work and six from Master's Thesis Research. Pass qualifying exams. Successful Thesis Defense.

### Comprehensive Examination

The comprehensive exam consists of an oral and written component. For the written exam, the student requests five "areas of focus" from their thesis committee. Each committee member will submit one question related to their assigned area of focus. Of these questions, the student chooses any three to answer in essay format. The oral exam is taken within 6 weeks of the written exam and consists of a research proposal presentation followed by questions from the student's thesis committee. A single re-take is permitted for both the written and oral exams. Both components should be completed by the end of the second semester of the two year M.S. program.

### 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 or better, including all core courses.

## PHYSICAL THERAPY

### OVERVIEW

The Doctor of Physical Therapy (D.P.T.) is a professional entry-level degree. The D.P.T. program requires full-time study over a period of 3 years, including summers. The curriculum includes course work related to the basic sciences of anatomy and neuroscience, the clinical sciences of pathophysiology and pharmacology, and the applied clinical sciences related to management of patients across the lifespan. The curriculum also includes courses related to evidence-based practice, practice management, healthcare ethics, policy and quality improvement, and health promotion. In addition, students engage in 36 weeks of full-time clinical internships in a variety of settings under the supervision of clinical instructors who are licensed physical therapists. Our clinical instructors are:

Lee Nelson, Clinical Professor, PT, MS, DPT (DPT, MGH Institute of Health Professions)

Rebecca Ouellette-Morton, Clinical Instructor, PT, MS (MS University of Vermont)

Justine Dee, Clinical Assistant Professor, PT, MS, OCS (MS University of Vermont)

Susan Cromwell, Clinical Assistant Professor, PT, MS, NCS (MS Virginia Commonwealth University)

Karen Westervelt, Clinical Assistant Professor, PT, OCS

Kerry Wood, Clinical Assistant Professor, PT, DPT (DPT Simmons College)

The Clinical Education program is an integral part of the curriculum, offering students opportunities to apply knowledge and practice skills and behaviors in the clinical setting. Clinical internships are provided across the U.S. and offer a wide variety of experiences. Internships are assigned based on students' educational needs and availability of clinical sites in each time frame. Students are responsible for their own transportation to and from clinical sites. Most of the clinical internships occur outside of the Burlington, Vermont area. Students must be prepared to travel and secure living arrangements during those clinical internships. Internships are scheduled as indicated in the curriculum plan unless insufficient clinical sites are available; in that case, students may be required to complete internship in an alternate time period.

All students in the program are required to carry professional liability insurance and have all required health clearances prior to engaging in any clinical education experience. Students should plan their finances to include these expenses. Clinical sites may require students to have a criminal background check before starting an internship. Evidence of a Criminal Record may prevent students from being eligible for clinical placement, and/or professional licensure.

The Doctor of Physical Therapy program at the University of Vermont is accredited by:

Commission on Accreditation in Physical Therapy Education

1111 North Fairfax Street  
Alexandria, VA, 22314  
(703) 706-3245  
email: [accreditation@apta.org](mailto:accreditation@apta.org)

### DEGREES

- Physical Therapy D.P.T. (p. 114)

### FACULTY

**Henry, Sharon Margaret;** Professor, Department of Rehabilitation and Movement Science; PHD, University of Vermont

**O'Rourke, Deborah Anne;** Clinical Professor, Department of Rehabilitation and Movement Science; PHD, University of Vermont

**Reed, Brian;** Associate Professor, Department of Rehabilitation and Movement Science; PHD, Temple University

## PHYSICAL THERAPY D.P.T.

### OVERVIEW

The Doctor of Physical Therapy (D.P.T.) is a professional entry-level degree. The D.P.T. program requires full-time study over a period of 3 years, including summers. The curriculum includes course work related to the basic sciences of anatomy and neuroscience, the clinical sciences of pathophysiology and pharmacology, and the clinical sciences related to management of patients across the lifespan. The curriculum also includes courses related to evidence-based practice, practice management, healthcare ethics, policy and quality improvement, and health promotion. In addition, students engage in 36 weeks of full-time clinical internships in a variety of settings under the supervision of clinical instructors who are licensed physical therapists. Our clinical instructors are:

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Justine Dee, Clinical Assistant Professor, PT, MS, OCS (MS University of Vermont)

Susan Cromwell, Clinical Assistant Professor, PT, MS, NCS (MS Virginia Commonwealth University)

Karen Westervelt, Clinical Assistant Professor, PT, OCS

Kerry Wood, Clinical Assistant Professor, PT, DPT (DPT Simmons College)

Clinical internships are an integral part of the curriculum, offering students opportunities to apply knowledge and practice skills and behaviors in the clinical setting. Clinical internships are provided across the U.S. and offer a wide variety of experiences. Internships are assigned based on students' educational needs and availability of clinical sites in each time frame. Students are responsible for their own transportation to and from clinical sites. Most of the clinical internships occur outside of the Burlington, Vermont area. Students must be prepared to travel and secure living arrangements during those clinical internships. Internships are scheduled as indicated in

the curriculum plan unless insufficient clinical sites are available; in that case, students may be required to complete internship in an alternate time period.

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The Doctor of Physical Therapy program at the University of Vermont is accredited by:

Commission on Accreditation in Physical Therapy Education  
1111 North Fairfax Street  
Alexandria, VA, 22314  
(703) 706-3245  
email: accreditation@apta.org

## 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 at UVM or a regionally accredited institution. Applicants with a baccalaureate degree from institutions outside the U.S. will also be considered.

Students applying to the Physical Therapy program must have a GPA of 3.00 or greater in their undergraduate studies. All applicants must complete the following prerequisite courses with a cumulative GPA of 3.00 or greater prior to entry into the D.P.T. program:

- Two semesters of anatomy/physiology
- Two semesters of college chemistry with labs
- Two semesters of physics with labs
- One semester of biology
- One semester of exercise physiology
- One semester of psychology
- One semester of statistics

### APPLICATION PROCESS:

Complete the Physical Therapy Common Application through the Physical Therapist Centralized Application Service (PTCAS), a division of the American Physical Therapy Association. Follow all instructions on the site. All application materials should be submitted directly to PTCAS. This includes:

- Three letters of recommendation.
- Official Transcript(s) from all U.S. and Canadian schools attended. PTCAS and the UVM D.P.T. program accept prerequisite credits from regionally 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.

- Official Graduate Record Exam (GRE) scores. For UVM D.P.T. applicants only, the GRE Code is 7708.
- The college will accept both the old and new version of the GRE, but scores must be received by the application deadline. The program prefers a minimum score of 144 Quantitative (500 on previous version), 153 Verbal (500 on previous version), and 4.0 Writing. Applicants may retake the GRE and the highest score in each section will be counted. Average scores under the new scoring criteria for the most recently admitted class were: Verbal Score = 157; Quantitative Score = 155; Analytical/Writing score = 4.2.

Complete pages one and two of the UVM Graduate Online Application form. Include the following information with the UVM application:

- In the box calling for an essay, please write: "See essay on the PTCAS application."
- Application Fee
- No transcripts or letters of recommendation should be sent to the University of Vermont. Names of references can be included but do not include contact information.

Complete the D.P.T. Prerequisite Course Completion form which can be found on the Department of Rehabilitation and Movement Science website.

Application Deadline: December 15th.

### Minimum Degree Requirements

Completion of all required courses with a GPA of 3.00 or better.  
Satisfactory completion of all clinical education experiences.  
Completion of requirements for comprehensive examination.

### Comprehensive Examination

The examination takes the form of a project that results in a written paper and formal poster presentation at the CNHS Research Day. Students work either in groups or individually with faculty members to complete their projects. The written paper must be completed by June 30<sup>th</sup> of the 2<sup>nd</sup> year of matriculation.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Physical Therapy

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses and the comprehensive/qualifying examination.



## 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 one of the few laboratories in New England where time-resolved, spin-dependent spectroscopy imaging at magnetic fields as high as five 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. 117)
- Physics M.S. (p. 118)

## FACULTY

**Chu, Kelvin;** Associate Professor, Department of Physics; PHD, University of Illinois Urbana-Champaign

**Clougherty, Dennis Paul;** Professor, Department of Physics; PHD, Massachusetts Institute of Technology

**Del Maestro, Adrian G.;** Assistant 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.;** Assistant Professor, Department of Physics; PHD, Clarkson University

**Rankin, Joanna Marie;** Professor, Department of Physics; PHD, University of Iowa

**Wu, Jun-Ru;** Professor, 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. 156)

### 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 one of the few laboratories in New England where time-resolved, spin-dependent spectroscopy imaging at magnetic fields as high as five 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 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 six credits of approved graduate course work may be taken that may be counted toward both the undergraduate and graduate degree requirements. Generally, AMP students must begin a research project by or during the summer prior to their senior year.

### Minimum Degree Requirements for the Degree of Master of Science

A total of thirty credits including:

A minimum of six credits of thesis research	6
At least nine 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 two 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

Physics:		9
PHYS 211	Classical Mechanics	
PHYS 213	Electricity & Magnetism	
PHYS 273	Quantum Mechanics I	
Two additional semester courses in physics above the sophomore-level		
Two semester courses in mathematics above the sophomore-level		

## PHYSICS M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

## 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 one of the few laboratories in New England where time-resolved, spin-dependent spectroscopy imaging at magnetic fields as high as five Tesla may be carried out.

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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.

## 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 thirty credits including:

A minimum of six credits of thesis research	6
At least nine 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 two 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

Physics:		9
PHYS 211	Classical Mechanics	
PHYS 213	Electricity & Magnetism	
PHYS 273	Quantum Mechanics I	
Two additional semester courses in physics above the sophomore-level		
Two semester courses in mathematics above the sophomore-level		

## PLANT AND SOIL SCIENCE

### OVERVIEW

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of crops 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 enable people to produce healthy crops through 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, and the Doctor of Philosophy (Ph.D.) degree in either soil science or entomology. A thesis or dissertation, based on original research, is required for these degrees. Completion of the requirements normally takes two and one-half years for the M.S. degree and typically three years for the Ph.D.

The department is comprised of faculty representing the disciplines of agronomy, entomology, horticulture, 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
- Constructed wetland systems for water pollution control
- 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
- 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. 120)
- Plant and Soil Science Ph.D. (p. 121)

### FACULTY

**Aleong, John;** Professor, Department of Plant and Soil Science; PHD, Iowa State University

**Bosworth, Sidney Carl;** Extension Associate Professor, Department of Plant and Soil Science; PHD, University of Kentucky

**Darby, Heather Marie;** Extension Associate Professor, Extension - Programming and Faculty Support; PHD, Oregon State University

**Fanslow, Yolanda H. Chen;** Assistant Professor; Department of Plant and Soil Science; PHD, University of California Berkeley

**Gorres, Josef H.;** Associate Professor; Department of Plant and Soil Science; PHD, University of Manchester

**Gouli, Vladimir V.;** Research Associate Professor; Department of Plant and Soil Science; PHD, Institutes of Biology and Cytology (Russia)

**Hurley, Stephanie E;** Assistant Professor; Department of Plant and Soil Science; DDES, Harvard University

**Mendez, Victor E.;** Associate Professor; Department of Plant and Soil Science; PHD, University of California Santa Cruz

**Neher Weicht, 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

**Perry, Leonard Payne;** Extension Professor; Department of Plant and Soil Science; PHD, Cornell University

**Ross, Donald Savage;** Research Professor; 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. 156)

### OVERVIEW

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of crops 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 enable people to produce healthy crops through 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 two and one-half years for the M.S. degree.



The department is comprised of faculty representing the disciplines of agronomy, entomology, horticulture, 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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- Constructed wetland systems for water pollution control
- 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
- 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. Satisfactory scores on the Graduate Record Examination, general (aptitude) section.

### Minimum Degree Requirements for the Degree of Master of Science

Eighteen to twenty-two credits in Plant and Soil Science and closely related fields	18-22
Satisfactory participation in seminars during residency	
Thesis research	6-12
All master's students must take part in the department's undergraduate teaching program	

### Comprehensive Examination

Comprehensive examinations are typically taken after one 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 one academic year of graduate study in the Department of Plant and Soil Science and a written or oral comprehensive examination. The decision on the type of comprehensive exam will be made by the major professor after consulting with the student.

## PLANT AND SOIL SCIENCE PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

The mission of the Department of Plant and Soil Science is to expand, integrate, and extend the knowledge of crops 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 enable people to produce healthy crops through environmentally, economically, and socially sound practices.

The department offers graduate programs leading to the Doctor of Philosophy (Ph.D.) degree in either Soil Science or Entomology. A dissertation, based on original research, is required for this degree. Completion of the requirements typically takes three years for the Ph.D.

The Department is comprised of faculty representing the disciplines of agronomy, entomology, horticulture, 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
- Constructed wetland systems for water pollution control
- 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



- 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.

Satisfactory completion of a written and oral qualifying doctoral examination as prescribed by the department.

## 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. Satisfactory scores on the Graduate Record Examination, general (aptitude) section.

### Minimum Degree Requirements for the Degree of Doctor of Philosophy

A total of at least forty credits of which a minimum of thirty must be taken in Plant and Soil Science and closely related disciplines (e.g. botany, chemistry, forestry, microbiology, biochemistry or geology)	40
Satisfactory participation in seminars during residency is required	
All master and doctoral students must take part in the department's undergraduate teaching program	

### Comprehensive Examination

Comprehensive examinations are typically taken after two years in residence or at the completion of the majority of all coursework. A written AND oral comprehensive examination must be passed by the candidate at least six 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. Failure to pass the preliminary oral examination terminates the student's relationship with this Department, unless the committee recommends a re-examination. Only one re-examination is permitted.

### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

Satisfactory completion of two academic years of graduate study in the Department of Plant and Soil Science at the University of Vermont. With the approval of the Dean of the Graduate College and the Department of Plant and Soil Science, a master's degree may be accepted in partial fulfillment of this requirement.

## PLANT BIOLOGY

### OVERVIEW

Graduate students within the Department of Plant Biology can pursue thesis research within a diverse set of disciplines including developmental genetics, ecological genomics, plant-microbe interactions, systematics and biogeography, plant cell and molecular biology, and ecology of plant population and community dynamics. Information on specific faculty research programs may be found on the department's web page.

The Plant Biology Department offers three graduate degree programs: an M.S. in Plant Biology, an M.S. - Field Naturalist option and a Ph.D. in Plant Biology.

### DEGREES

- Plant Biology M.S. (p. 123)
- Plant Biology Ph.D. (p. 124)

### FACULTY

**Barrington, David Stanley;** Professor, Department of Plant Biology; PHD, Harvard University

**Beckage, Brian;** Associate Professor, Department of Plant Biology; PHD, Duke University

**Ceroni, Marta;** Lecturer I, Department of Plant Biology; PHD, University of Parma

**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

**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

**Perkins, Timothy David;** Research Professor, 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

**Tierney, Mary Laurretta;** 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

**Vogelmann, Thomas;** Professor, Department of Plant Biology; PHD, Syracuse University

### PLANT BIOLOGY M.S.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The Department of Plant Biology has ongoing research programs in: ecology and evolution including physiological ecology of aquatic plants; effects of acid depositions on forest ecosystems; physiological ecology of acid depositions; systematics and evolution of vascular plants; biogeography; physiology including morphogenesis and developmental biology of embryonic plant systems; mineral nutrition; growth and development; translocation; cellular electrophysiology; membrane function; amino acid transport; aluminum effects on cell membranes; cell and molecular biology including molecular genetics; recombinant DNA of fungi; and plant molecular development.

The department participates actively in the Cellular, Molecular and Biomedical Program which provides opportunities for interdisciplinary research with other life science departments.

The department offers a multidisciplinary non-thesis program leading to the degree of Master of Science, Field Naturalist Option. Enrollment is limited to a small number of mature, highly talented individuals who have demonstrated sustained interest in field aspects of the natural sciences. The program is designed to provide students with:

1. a solid grounding in field-related sciences;
2. the ability to integrate scientific disciplines into a coherent whole at the landscape level;
3. the ability to evaluate sites from a number of perspectives and/or criteria;
4. the ability to translate scientific insights into ecologically sound decisions; and
5. the ability to communicate effectively to a wide range of audiences.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science

The equivalent of a UVM major or minor in a natural or physical science. Satisfactory scores on the Verbal and Math sections of the Graduate Record Examination.

#### Requirements for Admission to Graduate Studies for the Degree of Master of Science, Field Naturalist Option

An undergraduate or graduate degree in earth or life sciences is expected; additionally, a demonstrated commitment to field sciences (e.g., participation in environmental and conservation organizations, workshops, field trips, research); strong scores on the Graduate Record Examination. A subject (advanced) test in biology or geology is advised for students who lack an undergraduate degree in natural sciences. Recent college graduates are encouraged to pursue interests outside academe before application to the Field Naturalist Program.

## Minimum Degree Requirements

A total of thirty credits of course work and thesis research. A minimum of fifteen credits of course work should be in botany, other natural sciences, and supporting fields, and at least nine credits should be in thesis research.

## Minimum Degree Requirements, Field Naturalist Option

Thirty credits of courses to include:

At least two courses in each of three core areas, with course selection to be determined by the student's graduate studies committee:		
Life science		
Earth science		
Ecology		
PBIO 223	Fundamentals of Field Science	3
NR 378	Integrating Analyses NR Issues	3
Enrollment in Field Naturalist Practicum (PBIO 311) each semester		
Written field research project (PBIO 392) at the end of the fourth semester		

## Comprehensive Examination

A written and oral examination is completed by end of the student's second year in the program. The written exam consists of questions from each of the student's committee members, and after successful completion an oral exam is scheduled.

## Comprehensive Examination, Field Naturalist Option

An oral examination takes place in the student's third semester. 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 The Nature Conservancy.

## Requirements for Advancement to Candidacy for the Degree of Master of Science

Satisfactory completion of PBIO 223, PBIO 311, and NR 378.

## PLANT BIOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

## OVERVIEW

The Department of Plant Biology has ongoing research programs in: ecology and evolution including physiological ecology of aquatic plants; effects of acid depositions on forest ecosystems; physiological ecology of acid depositions; systematics and evolution of vascular plants; biogeography; physiology including morphogenesis and developmental biology of embryonic plant systems; mineral

nutrition; growth and development; translocation; cellular electrophysiology; membrane function; amino acid transport; aluminum effects on cell membranes; cell and molecular biology including molecular genetics; recombinant DNA of fungi; and plant molecular development.

The department participates actively in the Cellular, Molecular and Biomedical Sciences Program which provides opportunities for interdisciplinary research with other life science departments.

The department offers a multidisciplinary non-thesis program leading to the degree of Master of Science, Field Naturalist Option. Enrollment is limited to a small number of mature, highly talented individuals who have demonstrated sustained interest in field aspects of the natural sciences. The program is designed to provide students with:

1. a solid grounding in field-related sciences;
2. the ability to integrate scientific disciplines into a coherent whole at the landscape level;
3. the ability to evaluate sites from a number of perspectives and/or criteria;
4. the ability to translate scientific insights into ecologically sound decisions; and
5. the ability to communicate effectively to a wide range of audiences.

## SPECIFIC REQUIREMENTS

### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

The equivalent of a UVM major in a natural or physical science. Also required are satisfactory scores on the Graduate Record Examination and evidence of previous research experience.

### Minimum Degree Requirements

A total of 75 credits of course work and dissertation research. A minimum of 30 credits of course work must be in plant biology and supporting fields, and at least 20 credits must be in dissertation research. Also required is satisfactory completion of a dissertation and comprehensive examination. In addition, each candidate must participate in six semester hours 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, and then the oral exam starts out focusing on the proposal and then broadens out to be more complete.

**Requirements for Advancement to Candidacy for  
the Degree of Doctor of Philosophy**

Completion of one academic year in graduate study at the University of Vermont.

## PSYCHOLOGY

### OVERVIEW

Additional clinical, research, and adjunct faculty supervise students in clinical and research placements.

The Ph.D. program in General/Experimental Psychology admits students in four 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.

Further information about both programs can be obtained electronically from the Department of Psychological Science website, or by requesting a department graduate studies brochure from the Department of Psychological Science. Both contain details of requirements, funding opportunities, clinical and research facilities, specialty areas, ongoing research, and faculty, as well as general information about the university and the area.

Applicants must apply for the Ph.D. degree only. Students whose goal is a terminal master's degree are not accepted. The application deadline for admission is December 1st for the clinical program, January 2nd for the general/experimental program.

### DEGREES

- Psychology M.A. (p. 126)
- Psychology Ph.D. (p. 127)

### FACULTY

**Abaied, Jamie L.;** Assistant Professor, Department of Psychology; 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; MD, University of Illinois

**Bond, Lynne Anne;** Professor, Department of Psychology; PHD, Tufts University

**Bouton, Mark Earhart;** Professor, Department of Psychology; PHD, University of Washington

**Burt, Keith B.;** Assistant Professor, Department of Psychology; PHD, University of Minnesota Twin Cities

**Delay, Eugene Raymond;** Associate Professor, Department of Biology; PHD, University of Georgia

**Dumas, Julie Anna;** Associate Professor, Department of Psychiatry; PHD, University of North Carolina

**Falls, William A.;** Professor, Department of Psychology; PHD, Yale University

**Fondacaro, Karen Marie;** Clinical Professor, Department of Psychology; PHD, University of Vermont

**Forehand, Rex L.;** Professor, Department of Psychology; PHD, University of Alabama

**Gaalema, Diann E.;** Assistant Professor, Department of Psychiatry; PHD, Georgia Institute of Technology

**Garavan, Hugh P.;** Associate Professor, Department of Psychiatry; PHD, Bowling Green State University

**Green, John Thomas;** Associate Professor, Department of Psychology; PHD, Temple University

**Guilar, Barry Estill;** Professor, Department of Communication Sciences; PHD, University of Wisconsin Madison

**Hammack, Sayamwong E.;** Associate Professor, Department of Psychology; PHD, University of Colorado

**Harder, Valerie Susan;** Assistant Professor, Department of Psychiatry; PHD, Johns Hopkins University

**Heil, Sarah H.;** Associate Professor, Department of Psychiatry; PHD, Dartmouth College

**Higgins, Stephen Thomas;** Professor, Department of Psychiatry; PHD, University of Kansas

**Hoza, Betsy;** Professor, Department of Psychology; PHD, University of Maine

**Hughes, John Russell;** Professor, Department of Psychiatry; MD, University of Massachusetts Amherst

**Miller, Carol Therese;** Professor, Department of Psychology; PHD, Purdue University

**Murray-Close, Dianna Katharine;** Associate Professor, Department of Psychology; PHD, University of Minnesota Twin Cities

**Pinel, Elizabeth C.;** Associate Professor, Department of Psychology; PHD, University of Texas Austin

**Potter, Alexandra S.;** Assistant Professor, Department of Psychiatry; PHD, University of Vermont

**Price, Matthew;** Assistant Professor, Department of Psychology; PHD, Georgia State University

**Rellini, Alessandra;** Associate Professor, Department of Psychology; PHD, University of Texas Austin

**Rohan, Kelly Joanna;** Professor, Department of Psychology; PHD, University of Maine

**Schermerhorn, Alice C.;** Assistant Professor, Department of Psychology; PHD, University of Notre Dame

**Sigmon, Stacey C.;** Associate Professor, Department of Psychiatry; PHD, University of Vermont

**Solomon, Sondra Elice;** Associate Professor, Department of Psychology; PHD, University of Vermont

**Stickle, Timothy R.;** Associate Professor, Department of Psychology; PHD, University of Arizona

**Toufexis, Donna J.;** Assistant Professor, Department of Psychology; PHD, McGill University

## PSYCHOLOGY M.A.

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

There is no entry level M.A. degree in Psychology, the M.A. degree is earned as a prerequisite to the Psychology Ph.D. in General/Experimental Psychology. The minimum requirements for the M.A. degree are 15 credits of graded course work and completion of an empirical master's thesis. There is no comprehensive exam required for the M.A. degree.



## PSYCHOLOGY PH.D.

All students must meet the Requirements for the Doctor of Philosophy Degree (p. 159)

### OVERVIEW

Additional clinical, research, and adjunct faculty supervise students in clinical and research placements.

The Ph.D. program in General/Experimental Psychology admits students in four 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.

Further information about both programs can be obtained electronically from the Department of Psychological Science website, or by requesting a department graduate studies brochure from the Department of Psychological Science. Both contain details of requirements, funding opportunities, clinical and research facilities, specialty areas, ongoing research, and faculty, as well as general information about the university and the area.

Applicants must apply for the Ph.D. degree only. Students whose goal is a terminal master's degree are not accepted. The application deadline for admission is December 1st for the clinical program, January 2nd for the general/experimental program.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy

A major or its equivalent in undergraduate psychology including courses in statistics and experimental psychology; and satisfactory scores on the Graduate Record Examination, including the subject subtest in psychology. A telephone interview is required of top applicants to the clinical program.

#### Minimum Degree Requirements for the Degree of Doctor of Philosophy

Both the general/experimental and the clinical programs require a minimum of eighty-one credits. A minimum of twenty credits must be accumulated in dissertation research and the remainder in course credits numbered in the 200 through 400 sequences of the psychology curriculum, or acceptable courses at 200- or 300-level from other curricula. Detailed information on courses of study is available from the department. Satisfactory performance on the department final oral examination is required. There is no foreign language requirement. Although the requirement differs, both programs have a required preliminary examination.

#### Comprehensive Examination

In the General/Experimental Psychology program, the comprehensive exam ("preliminary exam") is taken in the next academic year after the academic year of the successful defense of

a master's thesis. The examination consists of a two-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 examination is structured to provide assessment in four formats: two oral and two written. The four phases of this exam should be satisfactorily completed before the end of the third year and before the dissertation is proposed: (1) Phase I Written Examination constituting a proposed study. Timing: By end of second year; (2) Phase II Oral Examination on scientific knowledge in area of study. Timing: By end of second year; (3) Phase III Written Examination constituting the completed study in manuscript form. Timing: By end of third year; (4) Phase IV Oral Examination on completed study. Timing: By end of third year.

#### Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy

For the general/experimental program, satisfactory completion of the minimum degree requirements for the Master of Arts degree or equivalent; for the clinical program, satisfactory performance of the Ph.D. comprehensive examination.

## PUBLIC ADMINISTRATION

### 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. Inquiries can be made through email: [mpa@uvm.edu](mailto:mpa@uvm.edu) or by phone (802) 656-0009.

### DEGREES

- Public Administration AMP (p. 128)
- Public Administration M.P.A. (p. 129)

### FACULTY

**Farley, Joshua C.;** Professor, Department of Community Development and Applied Economics; 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  
**McRae, Glenn;** Adjunct Lecturer, Department of Community Development and Applied Economics; PHD, Union Institute and University  
**Watts, Richard A.;** Research Assistant Professor, Department of Community Development and Applied Economics; PHD, University of Vermont  
**Zia, Asim;** Associate 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. 156)

### OVERVIEW

The Accelerated Master's 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 Program requires that students fulfill the same entrance requirements as for all master's candidates for the M.P.A. Program and be accepted in order to matriculate and advance to candidacy. The following criteria is used to determine admission: a sound academic record, satisfactory scores on the general aptitude section of the GRE, three letters of recommendation attesting to the candidate's academic performance; and a strong motivation and academic potential for graduate work articulated in a statement of purpose. Required academic prerequisites include course work in economics, statistics, and American government. These prerequisites can be completed at any accredited institution of higher education. Admission into the M.P.A. program is not contingent on completion of these prerequisites, but they must be completed within the first year of course work. Following formal Graduate College admission to the Accelerated Master's Program, up to six 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:		15
PA 301	Foundations of Public Admin	
PA 302	Org Theory & Behavior	
PA 303	Research & Evaluation Methods	
PA 305	Public and Nonprofit Budgeting	
PA 306	Policy Systems	
An approved sequence of elective courses which may include up to nine credits of course work from approved disciplines related to public administration		9
All graduate students in the M.P.A. program are required to complete an approved three-credit internship as part of their sequence of courses beyond the core courses		3

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.

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. Six of these courses are required core courses:

- PA 301 Foundations of Public Administration (Fall)
- PA 302 Organizational Theory and Behavior (Spring)
- PA 303 Research and Evaluation Methods (Fall)
- PA 305 Public and Non-Profit Financial Resource Management (Fall)
- PA 306 Policy Systems (Spring)
- 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 institutions 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, 5 years. All courses are offered as on-campus lectures or seminars. 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.

## PUBLIC ADMINISTRATION M.P.A.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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](mailto: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 M.P.A. program is a professional interdisciplinary degree that prepares pre- and in-service leaders, managers, and policy analysts by combining the theoretical and practical foundations of public administration focusing on the complexity of governance systems and the democratic, collaborative traditions that are a hallmark 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
- Satisfactory scores on the general aptitude section of the Graduate Record Examination (GRE)
- Three letters of recommendation attesting to the candidate's academic potential for graduate work and motivation for pursuing the M.P.A.

Past experience in public service will be considered.

Persons currently employed in administrative positions are encouraged to apply.

An additional requirement:

- Completion of these prerequisite courses: economics, American government, and statistics.

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 acceptable scores for admission to the Graduate College at UVM:

Internet-based 90

Minimum acceptable scores for a student receiving funding from UVM:

Internet-based 100

Institution code for test scores for UVM is 3920.

Note: The application deadlines for the M.P.A. program are mid-February (for an acceptance decision by March 1) for fall funding consideration. Open enrollment for others.

### Minimum Degree Requirements

Successful completion of thirty-six credits, including:

Core Courses:		15
PA 301	Foundations of Public Admin	
PA 302	Org Theory & Behavior	
PA 303	Research & Evaluation Methods	
PA 305	Public and Nonprofit Budgeting	
PA 306	Policy Systems	
An approved sequence of elective courses which may include up to nine credits of course work from approved disciplines related to public administration		18
All graduate students in the M.P.A. program are required to complete an approved three-credit internship as part of their sequence of courses beyond the core courses		3

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 three-credit internship is required of all students, and students may apply up to 6 credits of internship experience toward the degree.

### THESIS OPTION

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. 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.

### 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. Six of these courses are required core courses:

- PA 301 Foundations of Public Administration (Fall)
- PA 302 Organizational Theory and Behavior (Spring)
- PA 303 Research and Evaluation Methods (Fall)
- PA 305 Public and Non-Profit Financial Resource Management (Fall)
- PA 306 Policy Systems (Spring)
- 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 institutions 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, 5 years. All courses are offered as on-campus lectures or seminars. 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.



## PUBLIC HEALTH

### OVERVIEW

The University of Vermont Program in Public Health is an innovative, online, interdisciplinary, accredited Public Health Program offering the Master of Public Health (MPH) degree and the Certificate of Graduate Study in Public Health (GCPH). 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 MPH program. Graduates will complete sufficient course work to attain depth and breadth in the six 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.

The University of Vermont's online Certificate of Graduate Study in Public Health is a concise, six-course introduction to the interdisciplinary field of public health. Completing the Certificate of Graduate Study in Public Health will provide students with competency in core areas of public health as well as 18 applicable credits should they decide to pursue the MPH degree.

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 CGS (p. 131)
- Public Health MPH (p. 132)

### FACULTY

**Carney, Jan Kirk;** Professor, Department of Medicine; MD, University of Cincinnati; MPH, Harvard University

## PUBLIC HEALTH CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### 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 one college-level course in mathematics and one college-level course in science.

#### Minimum Degree Requirements

The Certificate of Graduate Study in Public Health requires eighteen credits including five courses (fifteen credits) from five core content areas and one elective course (three credits).

Five required core competency courses:		15
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	
or BSAD 331	Health Care Management	
or PA 312	Mgmt in Hlth Services&Med Care	
Choose one elective (three credits) from a list of approved elective courses including:		3
PH 306	Social&Behavioral Public Hlth	
PH 307	Epidemiology 2	
PH 308	Environmental Public Health 2	
PH 310	Public Health Law and Ethics	
PH 311	Global Public Health	



PH 312	Food Systems & Public Health	
PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
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 MPH

All students must meet the Requirements for the Master's Degree (p. 156)

### OVERVIEW

The UVM public health program offers a generalist MPH program. Graduates will complete sufficient course work to attain depth and breadth in the six 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, one semester of college biology or other science course, and one 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 and GRE examinations will be required for applicants, with some exceptions:

- The GRE is waived for those applicants who have an advanced degree including master's and doctoral degrees from an accredited U.S. institution. This includes M.S., M.A., MD., Ph.D., Ed.D., Pharm.D., etc.
- The GRE is waived for foreign medical doctors with ECFMG certification.
- The GRE is waived for those applicants with a Bachelor's degree plus at least 5 years of full-time professional experience in public health or health care. This experience must be documented on the application. (Volunteer and service-related work does not count.)
- The GRE is waived for students who have completed the UVM Certificate of Graduate Study in Public Health.
- The GRE is **required** for those applicants with a bachelor's degree and less than 5 years of professional full-time experience.

#### Minimum Degree Requirements

The MPH degree requires 42 total credits and includes 18 credits of core courses (6 courses), 9 required course credits (3 courses), 9

elective credits (3 courses), and a required culminating (capstone) 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	
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	
or BSAD 331	Health Care Management	
or PA 312	Mgmt in Hlth Services & Med Care	
PH 306	Social & Behavioral Public Hlth	
9 credits in required advanced core courses (3 courses)		
PH 307	Epidemiology 2	
PH 308	Environmental Public Health 2	
PH 310	Public Health Law and Ethics	
6 credits of required culminating (capstone) project experience		
PH 392	Culminating Project Experience	
9 elective course credits (3 courses)		
PH 311	Global Public Health	
PH 312	Food Systems & Public Health	
PH 314	Environmental Risk & Risk Comm	
PH 315	Public Health Surveillance	
PH 395	Special Topics	

### Comprehensive Examination

A comprehensive examination is an assessment of students understanding of public health and ability to synthesize and apply knowledge learned throughout their program of study. This requirement is fulfilled through the completion of the MPH Culminating Project Experience. This experience includes both practical skills (experiential learning) and a culminating Applied Public Health project experience. The culminating experience requires analysis, synthesis, and evaluation of knowledge and skills learned throughout the MPH program.

The 6-credit experience (PH 392) is further divided into three components with specific objectives measured by faculty assessment. Practical skills (experiential learning) will be assessed by the mentor at the agency or organization that is the site of the culminating project experience. The culminating project experience will be supervised by a faculty member, who may also be the student's advisor.

A faculty committee comprised of faculty from the program will review proposals, recommending approval or modification prior to

approval. This same faculty committee that approves projects will also review and determine whether a students' culminating project experiences meet objectives and requirements, and achieve a passing grade. It is expected that some project mentors will also be on the committee.

**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.

## SOCIAL WORK

### 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 thirty credits of foundation course work, including one elective. The curriculum comprises course work in five 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 four 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. 134)

### FACULTY

**Burford, Gale E.;** Professor, Department of Social Work; PHD, University of Stirling

**Comerford, Susan Ann;** Associate Professor, Department of Social Work; PHD, Case Western Reserve University

**Heading-Grant, Wanda;** Clinical Associate Professor, Department of Social Work; EDD, University of Vermont

**Leibowitz, George S.;** Associate Professor, Department of Social Work; PHD, University of Denver

**Patterson, Fiona M.;** Associate Professor, Department of Social Work; DSW, University of Pennsylvania

**Roche, Susan E.;** Associate Professor, Department of Social Work; PHD, Rutgers University New Brunswick/Piscataway

**Solomon, Brenda M.;** Associate Professor, Department of Social Work; PHD, Syracuse University

**Strolin, Jessica S.;** Associate Professor, Department of Social Work; PHD, University of Albany

**Widrick, Gary Charles;** Lecturer, Department of Social Work; PHD, University of Vermont

**Witkin, Stanley L.;** Professor, Department of Social Work; PHD, University of Wisconsin Madison

## SOCIAL WORK M.S.W.

All students must meet the Requirements for the Master's Degree (p. 156)

### 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 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.
- Graduate Record Examination (GRE) scores (no minimum score is required) from tests taken within five years of the date of application.
- Prior work or volunteer experience in human services is preferred.
- International students must submit TOEFL scores (from tests taken within two years of the date of application) of:

Paper Test	577 or higher
Internet-based Test	90 or higher

#### 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

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).
- Scores from appropriate GRE tests (Verbal, Quantitative, and Analytic Writing) taken within 5 years of the date of application.
- Official transcripts from each college or university attended.
- Resume of work and professional experience.
- Three (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 \$40.00 for online application.

### Minimum Degree Requirements

The Master of Social Work degree requires sixty 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 thirty-nine 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	Concentration Yr Field Pract (taken twice credits will double)	3-4

Four approved focus courses (Elective and Focus courses require advanced approval of faculty advisor)	12
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### 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	Concentration Yr Field Pract (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

To fulfill the UVM Graduate College comprehensive examination requirement, concentration year students complete a final project which is embedded in the capstone course SWSS 316. The project extends learning across the concentration curriculum and builds upon inquiry begun in the Advanced Research course. The project is the culmination of the student's studies in the concentration year and provides integration and closure to the student's educational experience.

### Requirements for Advancement to Candidacy for the Degree of Master of Social Work

Successful completion of any prerequisite courses, and at least 15 graded graduate credits with a 3.00 GPA or better, including all core courses.

## SPECIAL EDUCATION

### OVERVIEW

This 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 integrated school and community settings. There are two possible tracks in this program with different requirements:

- **Early Childhood Special Education:** The Early Childhood Special Education program is designed to provide students with the perspectives and skills necessary to work with young children from birth through kindergarten and their families in a range of family-centered, culturally responsive, inclusionary and developmentally appropriate settings. The program leads to teacher licensure.
- **Special Education:** This master's 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 integrated school and community settings. The program requires that students have appropriate professional experience.

### DEGREES

- Special Education M.Ed. (p. 136)

### FACULTY

**Datchuk, Shawn M;** Assistant Professor, Department of Education; PHD, Pennsylvania State University

**Giangreco, Michael Francis;** Professor, Department of Education; PHD, Syracuse University

**Haines, Shana Jackson;** Assistant Professor, Department of Education; PHD, University of Kansas

**Hurley, Jennifer Jo;** Associate Professor, Department of Education; PHD, Vanderbilt University

**Salembier, George B.;** Associate Professor, Department of Education; EDD, University of Vermont

**Shepherd, Katharine Green;** Associate Professor, Department of Education; EDD, University of Vermont

## SPECIAL EDUCATION M.ED.

All students must meet the Requirements for the Master of Education Degree (p. 158)

### OVERVIEW

Three primary areas of emphasis within the program are Consulting Teacher/Learning Specialist, Early Childhood Special Education and Intensive Special Education. All three areas have State of Vermont approved licensure endorsement tracks, and successful completion leads to a licensure endorsement for special education in Vermont.

1. **Special Educator - Consulting Teacher/Learning Specialist :** Students are prepared to collaborate with families, educators and other professionals in the design, implementation and evaluation of instruction for learners with mild to moderate

disabilities in integrated regular elementary, middle or high school classrooms.

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 in rural areas.
3. **Intensive Special Education :** Students are prepared to provide direct and collaborative instruction to learners with moderate to severe disabilities on the basis of identified activities, skills, adaptations, and transitions needed for learners to function in current and future integrated school, home and other community environments, with services involving learners' parents and a variety of professional disciplines.

Additional information on the above 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 in a related field that includes at least 30 hours of course work in a specific content area, and a GPA of at least a 3.00 in this course work. Preference is given to candidates with two years of teaching and/or related experience in special education.

Candidates for the degree of Master of Education in Early Childhood Special Education must have a bachelor's degree in a related field that includes at least 30 hours of course work in a specific content area, and a GPA of at least a 3.00 in this course work. Preference is given to candidates with two years of teaching and/or related experience in early childhood education.

#### Minimum Degree Requirements

Specific courses are required for each area (Special Educator - Consulting Teacher/Learning Specialist, Early Childhood Special Education or Intensive Special Education), as well as a full year internship. Students seeking admission to a licensure endorsement track must meet additional requirements.

#### SPECIFIC REQUIREMENTS FOR THE SPECIAL EDUCATION TRACK INCLUDE:

EDSP 201	D2:Foundations of Special Ed	3
EDSP 202	Severe Disabil Char&Intervent	3
EDSP 217	Behavior Analysis in SpecialEd	3
EDSP 224	Meeting Inst Needs/All Stdnts	3
EDSP 280	Assessment in Special Ed	3
EDSP 290	Early Lit and Math Curriculum	3
EDSP 297	Adolescent Lit & Math Curric	3



EDSP 322	Intern: Triadic Model Consult	1-6
EDSP 323	Intern: Systems Development	1-6
EDSP 387	Collaborative Consultation	3

### **SPECIFIC REQUIREMENTS FOR THE SPECIAL EDUCATION TRACK INCLUDE:**

ECSP 202	D2:Introduction to EI/ECSE	3
ECSP 310	Curriculum in EI/ECSE	3
ECSP 311	Assessment in EI/ECSE	3
ECSP 320	Seminar in EI/ECSE	3
ECSP 386	Internship: EI/ECSE	1-12
Strongly Recommended Courses (6 credit hours from the Master's Courses in Special Education)		
EDSP 202	Severe Disabil Char&Intervent	3
EDSP 387	Collaborative Consultation	3
Substitutions can be made for the courses listed in Master's Courses in Special Education from this list of electives at the Advisor's discretion to accommodate schedule conflicts and enable candidates to complete the program timely (3 semester hours)		
CSD 299	Autism Spect Dis:Assess&Interv	3
CSD 313	Augmentative Communication	3
EDSP 200	Contemporary Issues	1-3
EDSP 201	D2:Foundations of Special Ed	3
EDSP 217	Behavior Analysis in SpecialEd	3
EDSP 274	D2:Culture of Disability	3
ECSP 397	Problems in Education	1-6

### **Comprehensive Examination**

The Special Education and Early Childhood Special Education does not have a comprehensive examination.

### **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.

## STATISTICS

### OVERVIEW

The Statistics Program offers biostatistics, statistics, 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 business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical principles and methods. 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, sequential analysis, three stage sampling, time series analysis, survival data analysis, discriminant analysis, bootstrap methods, 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. 138)
- Statistics M.S. (p. 139)

### FACULTY

**Archdeacon, Dan Steven;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University  
**Ashikaga, Takamaru;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles  
**Bentil, Daniel E.;** Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford  
**Bunn, Janice Yanushka;** Research Associate Professor, Department of Mathematics and Statistics; PHD, Ohio State University  
**Burgmeier, James William;** Professor, Department of Mathematics and Statistics; PHD, University of New Mexico  
**Buzas, Jeff Sandor;** Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh  
**Callas, Peter W.;** Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst  
**Danforth, Christopher M.;** Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park  
**Dinitz, Jeffrey Howard;** Professor, Department of Mathematics and Statistics; PHD, Ohio State University  
**Dodds, Peter S.;** Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology

**Dummit, David Steven;** Professor, Department of Mathematics and Statistics; PHD, Princeton University  
**Foote, Richard Martin;** Professor, Department of Mathematics and Statistics; PHD, University of Cambridge  
**Golden, Kenneth Ivan;** Professor, Department of Mathematics and Statistics; PHD, University De Paris  
**Gross, Kenneth Irwin;** Professor, Department of Mathematics and Statistics; PHD, Washington University in St Louis  
**Jefferys, William;** Lecturer I, Department of Mathematics and Statistics; PHD, Yale University  
**Lakoba, Taras Igorevich;** Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University  
**Mickey, Ruth Mary;** Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles  
**Sands, Jonathan Winslow;** Professor, Department of Mathematics and Statistics; PHD, University of California San Diego  
**Single, Richard M.;** Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook  
**Son, Mun Shig;** Professor, Department of Mathematics and Statistics; PHD, Oklahoma State University  
**Warrington, Gregory S.;** Assistant 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  
**Yu, Jun;** Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

## STATISTICS AMP

All students must meet the Requirements for the Accelerated Master's Degree Programs (p. 156)

### OVERVIEW

The Statistics Program offers biostatistics, statistics, 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 business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical principles and methods. 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, sequential analysis, three stage sampling, time series analysis, survival data analysis, discriminant analysis, bootstrap methods, 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 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 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 one or two 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 thirty credit program requiring twenty-four credits of statistics course work. The program must include:		
STAT 221	Statistical Methods II	3
STAT 223	Applied Multivariate Analysis	3
STAT 231	Experimental Design	3
STAT 251	Probability Theory	3
STAT 261	Statistical Theory	3
STAT 360	Linear Models	3
Six additional course credits are required. STAT 233 and/or STAT 235 is recommended. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281, STAT 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
Six credits of thesis research is required:		6
STAT 391	Master's Thesis Research	

Option B (Non-thesis)		
A thirty credit program requiring twenty-seven credits of course work. The program must include:		
STAT 221	Statistical Methods II	3
STAT 223	Applied Multivariate Analysis	3
STAT 231	Experimental Design	3
STAT 251	Probability Theory	3
STAT 261	Statistical Theory	3

STAT 360	Linear Models	3
Nine additional course credits are required. STAT 233 and/or STAT 235 is recommended. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281, STAT 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
The research project requirement is met by taking three semester hours of:		3
STAT 381	Statistical Research	
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

A written comprehensive examination is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261. The comprehensive exam is typically held two weeks after the final exam in the spring semester. The student can take the exam a maximum of two times.

### 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. 156)

## OVERVIEW

The Statistics Program offers biostatistics, statistics, 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 business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical principles and methods. 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, sequential analysis, three stage sampling, time series analysis, survival data analysis, discriminant analysis, bootstrap methods, 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. Three semesters of calculus, a course in matrix methods, and one semester of statistics. Provisional acceptance can be given prior to the completion of these requirements. Satisfactory scores on the general (aptitude) portion of the Graduate Record Examination are required for most sources of financial aid. Computer 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 thirty credit program requiring twenty-four credits of statistics course work. The program must include:		
STAT 221	Statistical Methods II	3
STAT 223	Applied Multivariate Analysis	3
STAT 231	Experimental Design	3
STAT 251	Probability Theory	3
STAT 261	Statistical Theory	3
STAT 360	Linear Models	3
Six additional course credits are required. STAT 233 and/or STAT 235 are recommended. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281, STAT 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
Six credits of thesis research is required:		6
STAT 391	Master's Thesis Research	

Option B (Non-thesis)		
A thirty credit program requiring thirty credits of course work. The program must include:		
STAT 221	Statistical Methods II	3
STAT 223	Applied Multivariate Analysis	3
STAT 231	Experimental Design	3

STAT 251	Probability Theory	3
STAT 261	Statistical Theory	3
STAT 360	Linear Models	3
Nine additional course credits are required. STAT 233 and/or STAT 235 are recommended. Other 200-300 level statistics courses (except STAT 211, STAT 241, STAT 281, STAT 308) or (if approved) other courses in mathematics, quantitative methods, or specialized fields of application can be selected.		
The research project requirement is met by taking three semester hours of:		3
STAT 381	Statistical Research	
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

A written comprehensive examination is based on the courses STAT 211, STAT 221, STAT 223, STAT 231, STAT 251, and STAT 261. The comprehensive exam is typically held two weeks after the final exam in the spring semester. The student can take the exam a maximum of two times.

### 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 TRANSPORTATION SYSTEMS AND PLANNING

### OVERVIEW

Transportation is a transdisciplinary field of study that broadly examines the movement of people and goods over space as well as the economic, public health, environmental, and social impacts of those systems.

Local, regional, and global transportation systems are vital to building community, the economy, and quality of life. Transportation designs, programs, and policies impact the environment, energy, culture, equitable mobility between regions and groups, as well as quality of life. Critical transportation system issues and problems in the 21st century will require interdisciplinary teams to design innovative solutions. The overall goal of the certificate is to establish a baseline of transportation system knowledge and to develop advanced critical thinking around interdisciplinary partnerships addressing problems in planning for transportation and mobility.

### DEGREES

- Sustainable Transportation Systems and Planning CGS (p. 141)

### FACULTY

**Aultman-Hall, Lisa M.;** Professor, School of Engineering; PHD, McMaster University

**Lee, Brian H. Y.;** Assistant Professor, School of Engineering; PHD, University of Washington

**McRae, Glenn;** Adjunct Lecturer, Department of Community Development and Applied Economics; PHD, Union Institute and University

## SUSTAINABLE TRANSPORTATION SYSTEMS AND PLANNING CGS

All students must meet the Requirements for the Certificates of Graduate Study (p. 156)

### OVERVIEW

Transportation is a transdisciplinary field of study that broadly examines the movement of people and goods over space as well as the economic, public health, environmental, and social impacts of those systems.

Local, regional, and global transportation systems are vital to building community, the economy, and quality of life. Transportation designs, programs, and policies impact the environment, energy, culture, equitable mobility between regions and groups, as well as quality of life. Critical transportation system issues and problems in the 21st century will require interdisciplinary teams to design innovative solutions. The overall goal of certificate is to establish a baseline of transportation system knowledge and to develop advanced critical thinking around interdisciplinary partnerships addressing problems in planning for transportation and mobility.

The academic merit of the STSP Certificate is multifaceted. It includes the development of technical knowledge of transportation and mobility systems as well as research skills, academic writing, direct experience with transdisciplinary work and the development of a scholarly and practitioner-based student cohort around transportation research.

There are three important outcomes of the study and application of sustainable transportation systems: (1) Knowledge; wherein we employ original data gathering, analysis and modeling to gain fundamental insights regarding how humans make travel decisions and how transportation systems function, (2) Innovative Solutions; wherein we explore how combinations of policy, education, design and technology intersect to advance new or improved systems of mobility and access, and (3) Informed Decision-Making; wherein we provide transportation research results, education and outreach to inform the development of sustainable transportation policies.

### SPECIFIC REQUIREMENTS

#### Requirements for Admission to Graduate Studies for the Certificate of Graduate Study

Admission to the graduate college and approval by the TRC Graduate Coordinator.

#### Minimum Degree Requirements

The Certificate of Graduate Study in Sustainable Transportation Systems and Planning requires fifteen graduate credits distributed as follows:

TRC 312	Sustainability & Transportatn <sup>1</sup>	3
TRC 314	Risk/Behavior in Transportatn <sup>1</sup>	3
TRC 316	Land Use Policy & Economics	3
Two additional courses (six credits total) selected from a list of electives approved by the TRC Graduate Coordinator		6

<sup>1</sup> Credits for TRC 312 and TRC 314 may be earned either in conjunction with or independent of a UVM graduate degree program.

Additional information on the Certificate of Sustainable Transportation Systems and Planning is available from the CGS in Sustainable Transportation Systems and Planning website.





## 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. 143)
- Conferral of Graduate Degrees (p. 143)
- Continuous Graduate Registration (p. 143)
- Enrollment Policies and Procedures (p. 144)
- Grading Policies (p. 145)
- Inactivation, Deactivation and Reactivation (p. 146)
- Leave of Absence (p. 146)
- Requirements for Visiting Graduate Students (p. 146)
- Rights and Responsibilities (p. 147)
- Time Limits for Graduate Degree Completion (p. 148)
- Transfer Credit and Credit by Examination (p. 148)
- Withdrawal from a Graduate Degree Program (p. 149)

## 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. The time limit for completion of the degree runs from the date of matriculation in the new program; however, all credits applied to the degree must be earned within 7 years of degree completion for master's students and 9 years for doctoral students.

## CONFERRAL OF GRADUATE DEGREES

Degrees are conferred only in October, January, and May of each year. Diplomas are issued in May and mailed in October and January.

It is the graduate student's responsibility to make sure that their name has been submitted by their department or program to the Graduate College dean's office for graduation by completing an Intent to Graduate form.

Departments with graduate programs must submit a "List of Potential Graduating Students" along with an "Intent to Graduate" form for

each student by August 1st, November 1st, and February 1st for the October, January, and May graduation deadlines.

## 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 removing incomplete grades, passing the comprehensive examination, or completing a thesis or dissertation.

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 (\$311). 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 (\$311) 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	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>3</sup> , federal financial aid eligibility, eligible for GTA/GRA funding, ski pass eligibility
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<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 ¼ credits.

<sup>2</sup> Students funded as a GTA, GRA or GA must be enrolled at least half time, so must register for GRAD 902 or GRAD 903.

<sup>3</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.

## ENROLLMENT POLICIES AND PROCEDURES

### HEALTH RECORD

The university requires that F-1 Visa students file an immunization record with the Center for Health and Wellbeing at the time of first enrollment. Appropriate forms are emailed directly to newly enrolled students through the Office of International Education and/or the Center for Health and Wellbeing.

### REGISTRATION

Consult the UVM Academic Calendar ([http://www.uvm.edu/~rgweb/?Page=importantdates/i\\_ac1314.html&SM=i\\_menu.html](http://www.uvm.edu/~rgweb/?Page=importantdates/i_ac1314.html&SM=i_menu.html)) and the Registration Schedule (<http://www.uvm.edu/~rgweb>) 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 which may apply towards a graduate program are numbered 200 and above. Not all 200-level courses are for graduate credit; check the Courses Approved for Graduate Credit in this catalogue. 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 nine to twelve credit hours per semester, with normal maximum enrollment being fifteen credits per semester and nine hours summer. Enrollment in excess of the normal full-time course load requires written approval from the student's advisor and the Dean of the Graduate College.

### AUDITING CLASSES

Courses may be taken for audit; however, tuition for the credit hours is charged as for courses for credit. Under no circumstances will graduate credit or a grade be allowed for audited courses. A student wishing to audit a course must meet minimum levels of performance set by the instructor at the time of registration in order to receive an audit grade on a transcript. Tuition scholarships funded by 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 tuition scholarships do not cover tuition or any fees for physical education activities.

### ADD/DROP

Courses may be added through the first five instructional days of the semester without instructor permission, unless indicated. Adding a course between the sixth and tenth 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 ten 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.

Drops will only be allowed after the tenth day of instruction if a student did not attend the class. The disposition of such cases is handled by the registrar's office.

### WITHDRAWAL FROM COURSES

From the end of the tenth day of instruction until the second business day after the 60% point in the semester, students may withdraw from courses. Students who wish to withdraw fill out the course withdrawal form, consult with their advisor, and submit the form to the instructor for signature. The student is then responsible for delivering the form to the registrar's office no later than 4 p.m. on the second business day after the 60% point in the semester. Students give a copy to their dean for information purposes. The instructor also records the withdrawal grade (W) on the final grade sheet which is submitted to the registrar.

After the second business day after the 60% point in the semester and until the last day of classes, students may withdraw only if they are unable to continue in the course due to circumstances beyond their control. They must petition the Dean of the Graduate College and provide in that petition conclusive evidence, properly documented, of the situation which prevents completion of the course. Acceptable

reasons do not include dissatisfaction with performance in a course or with an expected grade, with the course or the instructor, or the desire to change a major or program. If the petition is approved, the withdrawal procedure follows the process described above. The withdrawal window for summer courses is determined by course length and start date.

## UNDERGRADUATE COURSE ENROLLMENT FOR GRADUATE CREDIT (NON-ACCELERATED MASTER'S STUDENTS)

During their final semester, UVM senior undergraduates may enroll for graduate credit at UVM under the following circumstances: the course must be available for graduate credit; the course must not be computed as part of the bachelor's degree; permission to seek such graduate credit must be requested of the Dean of the Graduate College in writing by the dean of the undergraduate college or school prior to enrollment for such credit. Such graduate credit is limited to six credits. It can be used only at UVM if and when the student is admitted to a UVM graduate program and only if the course is judged appropriate by the student's advisor for 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.

## 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.

Students are billed according to their primary affiliation with UVM. These categories are residential or distance. When tuition differs between these categories, tuition is billed according to the primary affiliation of the student for any courses taken.

## DISMISSAL

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 or Seminar.

## 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
XF	Failure resulting from academic dishonesty. <sup>1</sup>	

<sup>1</sup> The XF grade is equivalent to the grade of F in the determination of grade point averages and academic standing. (Effective fall, 2005)

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

**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.

## 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 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 deactivated from the college.

Reactivation into a program 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.

## LEAVE OF ABSENCE

A Leave of Absence may be awarded for a period of up to one year. The leave suspends the 5 year time limit for master's 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 master's: 5 years; doctoral: 9 years. All credit used for the degree, including transfer credit and credit by exam, and irrespective of a Leave of Absence, must be earned within 7 (master's) and 9 (doctoral) years of graduation.

## PROCEDURE

Students request a Leave of Absence from their graduate program coordinator or chair. If the program approves the request, the chair or program faculty completes the Leave of Absence form available on the Graduate College (<http://www.uvm.edu/~gradcoll>) website and forwards it to the dean 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 Policies and General Information in this catalog.
6. With the equivalent of half-time student status (GRAD 902), visiting graduate students will be eligible to enroll in the UVM student insurance plan. Normally, visitors will be required to show proof of existing medical insurance coverage comparable to or greater than the UVM student insurance plan, or else 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 Students and Scholars Tax Information for Foreign National Students and Scholars (<http://www.uvm.edu/controller/taxadmin/Nonresidents.pdf>).

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 Visitor 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. A form to request Visitor Status can be found on the Graduate College Resources ([http://www.uvm.edu/~gradcoll/?Page=facstaff/services.php&SM=facstaff/\\_facstaffmenu.html#form](http://www.uvm.edu/~gradcoll/?Page=facstaff/services.php&SM=facstaff/_facstaffmenu.html#form)) website.

<sup>1</sup> 2014-2015 fees are \$200 per semester for GRAD 902 and \$611 per semester for GRAD 903. The fee for students in GRAD 902 who wish to purchase UVM health insurance is \$511. The estimated annual premium for the 2014-2015 school year is not yet available; the 2013-2014 premium was \$2740 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/~uvmppg/ppg>) 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 two weeks after the initiation of course work in a given graduate program, the student is encouraged to contact the Graduate College. Many times, one 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 Ethics and Standards (<http://www.uvm.edu/~cse>) 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 Bailey/Howe Library.

## DISCRIMINATION

The university community will not tolerate discrimination. Information and resources may be found at The Office of Affirmative Action and Equal Opportunity (<http://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 appeals process are grievances that contest grades on grounds other than due process, or grading that is arbitrary and capricious.

## TIME LIMITS FOR GRADUATE DEGREE COMPLETION

**Master's Degree** - 5 years from matriculation

**Doctoral Degree** - 9 years from matriculation

**Certificate of Graduate Study** - 5 years from matriculation (all courses)

All courses applied towards the degree must be taken within 7 years for master's degrees, 9 years for doctorates. Individual departments may set deadlines within these time limits.

## TRANSFER CREDIT AND CREDIT BY EXAMINATION

A limited number of graduate course credits acquired elsewhere, 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 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

Master's degree and Doctor of Education students are allowed nine hours of transfer credit, and/or credit by examination, and an additional six 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 twenty-four credits, and an additional six credits acquired from appropriate courses taken at UVM. This means that all master's students take at least twenty-one credits at the University of Vermont (at least fifteen after admission); Doctor of Philosophy students at least fifty-one credits (at least forty-five after admission); and Doctor of Education students at least forty-seven credits (at least forty-one after admission). For master's programs that require more than thirty credits, program faculty may, in individual cases, recommend more transfer credits. In all cases, students must take at least one half of their degree credits at the University of Vermont after admission and adhere to all requirements stipulated by the graduate program.

## 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. thesis or dissertation research credits, and
5. credit by examination given by another institution.

## CURRENCY OF CREDIT

Transfer credit and credit by examination must be taken within seven years of completion of the master's degree and within nine years of completion of the doctoral 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. 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 twenty-four 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. No provision is made for a person to employ the same credit to satisfy two master's degrees at the University of Vermont. Students must

still complete a minimum of fifteen graded credits as part of the Ph.D. curriculum.

## **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. It will be necessary to apply for reactivation and pay a reactivation fee if the student wishes to resume the graduate program.

## ADMISSION AND FINANCIAL INFORMATION

- Admissions (p. 150)
- Tuition and Fees (p. 150)
- Financial Aid (p. 151)
- Financial Aid Programs (p. 152)
- Fellowships, Assistantships, Traineeships, Stipends, and Grants (p. 152)
- Sponsored and Institutional Research (p. 154)

## ADMISSIONS

Admissions criteria, procedures and deadlines for graduate programs vary by individual program. Current information about graduate admissions can be found on the Graduate College Admissions (<http://www.uvm.edu/~gradcoll/?Page=admissions.html>) page of the Graduate College website.

## ADMISSION TESTS

Information about admission tests is available from the GRE (<http://www.gre.org>) 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 (<http://www.mba.com/mba>) website for the Graduate Management Admission Test. Those considering application to a graduate program must remember that it can take four to six weeks 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. Students who are seeking financial aid in the form of assistantships or fellowships must submit GRE or GMAT scores. 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) or the International English Language Testing System (IELTS), academic version.

Minimum acceptable TOEFL scores for admission to the Graduate College at the University of Vermont:

Internet Based	90
Paper Based	577

Minimum acceptable scores for a student to qualify for receiving funding at the University of Vermont:

Internet Based	100
Paper Based	600

Institution Code for test scores for UVM is 3920. Questions about the TOEFL examination may be directed to:

TOEFL/TSE Services, ETS  
Box 6154  
Princeton, NJ 08541-6154

Telephone, (609) 771-7100.

Minimum acceptable scores on the IELTS (academic version) are 6.5 for admission and 7.0 to qualify for funding.

## TUITION AND FEES

The student expenses outlined in the following paragraphs are **anticipated charges** for the 2014-2015 academic year for graduate students enrolled in on-campus degree programs. **Changing costs may require adjustment of these charges before the beginning of the fall semester.** To view charges approved by the UVM Board of Trustees after the May 2014 board meeting please visit the Student Financial Services (<http://www.uvm.edu/sfs>) website.

## APPLICATION FEE

The application fee is \$65.

## TUITION

Estimated tuition rates for the 2014-15 academic year are as follows:

For Vermont residents, \$591 per credit hour. For out-of-state students, \$1,493 per credit hour.

The lower rates for Vermont residents are made possible by a subvention to the university from the state of Vermont.

## CONTINUOUS REGISTRATION TUITION FEE: GRAD 901/902/903

Students who are actively working toward their degree completion and have completed all credits required for the degree, but have not completed all graduation requirements, must enroll each semester for Continuous Registration and pay a fee ranging from \$100-\$300 for the Continuous Registration fee each semester until all degree requirements are completed, including removing incomplete grades, passing the comprehensive examination, or completing a thesis or dissertation. Those registering for GRAD 903 must also pay the student health fee of \$311.

## COMPREHENSIVE FEE

Estimated 2014-15 per semester comprehensive fee schedule:

Credits Enrolled/Semester	Fee
1	\$10
2	\$20
3	\$30
4	\$40
5	\$373
6	\$417
7	\$470
8	\$521
9 and above	\$892



## STUDENT HEALTH FEE

A health fee is included in the Comprehensive fee for students enrolled in nine or more credits. The health fee is a required fee for any student enrolled in fewer than nine credits who purchases UVM health insurance. The health fee for 2014-15 is estimated at \$311 per semester, and is subject to change. Visit the Student Financial Services (<http://www.uvm.edu/~stdfinsv/?Page=graduate-tuition.html&SM=tuitionsubmenu.html>) website for updated cost information.

## STUDENT ACCIDENT AND SICKNESS INSURANCE

Through an arrangement with a commercial insurance company, students are able to procure health insurance which is designed to provide coverage for services beyond those provided by the Center for Health and Wellbeing. There is an additional charge for this extended coverage beyond the student health fee. The 2013-14 cost for one year's coverage for single students is \$2,740 and is subject to change for 2014-2015. Married students may obtain coverage for their spouse and children. Further details are available from the Center for Health and Wellbeing (<http://www.uvm.edu/~chwb>). To participate in this insurance, the student health fee must be paid each semester as well as the additional insurance premium.

## CREDIT BY EXAMINATION

A student may, under certain circumstances, 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. Appropriate forms to initiate the process of credit by examination are available in the registrar's office.

## REACTIVATION FEE

Reactivation following withdrawal without an approved leave of absence requires 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 which is available online at the Student Financial Services (<http://www.uvm.edu/~stdfinsv/?Page=refunddates.html&SM=billssubmenu.html>) website.

## 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 (<http://www.uvm.edu/policies/student/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, there will be no refund of tuition, room, meal

plan, or comprehensive fees paid for semester, nor will there be any reduction in amounts due to the university for the semester if the bill has not been fully paid at the time of suspension or dismissal.

## DEATH

In case of death of the student, tuition, room and fees which has been paid for the semester during which the death occurs will be refunded fully.

## FINANCIAL AID

Federal education loans are the primary sources of financial assistance for graduate students. Visit the Student Financial Services Information for Grad Students ([http://www.uvm.edu/~stdfinsv/?Page=grad\\_students.html](http://www.uvm.edu/~stdfinsv/?Page=grad_students.html)) website for detailed information about financial aid programs. Those students with financial need who do not receive supplemental assistance in the form of assistantships or fellowships may find that their need based financial assistance is insufficient to meet their entire cost of attendance. It is important, therefore, for graduate students to fully 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), 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 (five credits per semester).

For students seeking a Graduate Certificate, financial aid will generally not be available. For information on financial aid and financing options for a Certificate program, please visit the Student Financial Services Tuition, Financial Aid and Financing Options for UVM Certificate Programs (<http://www.uvm.edu/~stdfinsv/?Page=typeocr.html&SM=finaidmenu.html>) website.

## APPLICATION FOR FINANCIAL AID

Students should apply for financial aid as soon after application for admission to the university as possible. The only financial aid application required is the Free Application for Federal Student Aid (FAFSA). Submit the FAFSA application online at the FAFSA (<http://www.fafsa.gov>) website by March 1st (the university's priority financial aid deadline) for the following school year to ensure consideration for all available sources of financial aid. Applications submitted after that date will be considered late, which may limit availability of certain types of aid. Late filing of the FAFSA will not affect eligibility for Federal Stafford or Federal Graduate PLUS Loans. The UVM Title IV School Code is 003696. This number is required on the FAFSA to have the record sent to UVM. Student Financial Services will contact students via e-mail if any 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. For example, if the program starts in summer 2014, students will need to file the 2013-2014 FAFSA to be considered for aid for the summer term, and the 2014-2015 FAFSA to be



considered for aid for the fall 2014 and spring 2015 terms. Graduate students enrolling in an on-campus program must also submit a Graduate Student Data Form to Student Financial Services each year. Download this form from the Worksheets and Forms section of the Student Financial Services (<http://www.uvm.edu/sfs>) website. Applicants will be notified of financial aid eligibility after admission to the university and the submission and review of any additional required documentation, but no earlier than late March of the academic year prior to enrollment.

**Students must reapply for financial aid each year. The FAFSA should be submitted online at the FAFSA (<http://www.fafsa.gov>) website each year by March 1 for the following school year.**

## 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

Fax: (802) 656-4076

Please visit the Student Financial Services (<http://www.uvm.edu/~stdfinsv>) website for additional information on financial aid.

## CHANGES IN CREDIT HOUR LOAD

A student who adds courses during an enrollment period will be billed additional tuition and fees applicable to the adjusted credit hour load. 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 (<http://www.uvm.edu/~uvmppg/ppg/student/billadjust.pdf>) which is subject to change. Financial aid will be reviewed and adjusted for any changes to the course load. It is recommended that financial aid recipients speak with Student Financial Services before withdrawing from or dropping courses.

## SATISFACTORY ACADEMIC PROGRESS 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 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 LOAN PROGRAMS

The Federal Direct Unsubsidized Stafford and Federal Direct Graduate PLUS Loan programs are the primary source of financial assistance for graduate students. Admitted students who submit the Free Application for Federal Student Aid (FAFSA) will be reviewed for loan eligibility. The financial aid award provided by Student Financial Services will indicate

loan eligibility and provide information on loan application procedures. Learn more about federal financial aid for graduate students at UVM's Student Financial Services Types of Aid Available to Graduate Students (<http://www.uvm.edu/~stdfinsv/?Page=typegrad.html&SM=finaidmenu.html>) website.

## 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. For general information regarding application for and use of GI Bill benefits, including the Yellow Ribbon Program, please visit the Information for Veterans (<http://www.uvm.edu/sfs/veterans>) website.

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) 656-2045.

## 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 rates for some programs that are not offered by the home state university but are offered in another New England state. A list of the available graduate programs is listed in the "Apple Book" and may be examined in the Graduate College admissions office or obtained from:

New England Board of Higher Education  
45 Temple Place  
Boston, MA 02111

Applicants must indicate clearly, both in their initial inquiries and on their application forms, that they are seeking admission under the terms of the New England Regional Student Program. In cases where the program of study is clearly unique or distinctive to the out-of-state institution, the UVM Graduate College dean's office will certify directly the applicant's eligibility to apply under the New England Regional Student Program. In cases where an apparently similar program of study is available at both institutions involved, the graduate deans of the two institutions will determine whether regional student status is appropriate.

## FELLOWSHIPS, ASSISTANTSHIPS, TRAINEESHIPS, STIPENDS, AND GRANTS

Students who wish to be considered for fellowships as well as admission must submit completed applications, with supporting materials, by March 1st of the academic year preceding that for which application is made, or the program's application deadline, whichever is earlier. Any applicant requesting fellowship, assistantship, or

traineeship support must submit an official copy of the Graduate Record Examination score report.

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.

## GRADUATE COLLEGE FELLOWSHIPS

The Graduate College offers ten fellowships in support of master's degree programs in the social sciences and humanities. These fellowships provide a full tuition scholarship (48-credit hour maximum) for the degree program (two years maximum).

The fellowships are open to prospective students in the social sciences and humanities at the time they apply to graduate study. Holders of Graduate College Fellowships are required to carry minimum enrollment of nine credits per semester towards an advanced degree. The fellowships are not renewable.

## GRADUATE TEACHING/RESEARCH ASSISTANTSHIPS

Graduate Teaching or Research assistantships are awarded by the Graduate College through many of the departments offering graduate work. Graduate Teaching or Research assistants are generally appointed for nine months with stipends of \$15,500 for master's and \$17,500 for doctoral students for 2013-2014. Graduate Research/Teaching combination assistantships are awarded in some of the science departments offering graduate work. Graduate Research/Teaching assistants may be appointed for 12 months with stipends generally ranging from \$20,467 to \$24,000 and a tuition scholarship.

Graduate Teaching, Research or Research/Teaching assistants must enroll for a minimum of five credits (or GRAD 902) per semester. Typical enrollment is nine to twelve credits per semester (or GRAD 903). In addition to the stipend, the assistantship award includes a tuition scholarship covering the number of credits specified in the award letter, but not to exceed twelve per semester, during the period of the assistantship.

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.

## STUDENT AND CAMPUS LIFE GRADUATE ASSISTANTSHIPS

Within the Division of Student Affairs, a number of assistantships are made available annually. Each assistantship provides graduate students a professional opportunity to support and develop the Division's goals and activities in its work with students. The candidates selected to fill these positions are assigned administrative and advisory positions in the residence halls, departments within the Division, and in other student services areas. Graduate students who hold Student Affairs Assistantships will gain valuable experience in the areas of group advising, administration, personnel advising, and educational programming. Such positions are open to either married or single students who have been accepted for graduate work in any of the academic programs of the university. The majority of graduate students are enrolled in the Higher Education and Student Affairs graduate program.

Selection is based upon academic record, character, recommendations, and quality of related experiences. A personal interview is required. Requests for applications and additional information should be addressed to:

University of Vermont  
Student and Campus Life Graduate Assistantships  
Nicholson House  
41 South Prospect Street  
Burlington, VT 05405-0094

Or preferably by email to [scigrads@uvm.edu](mailto:scigrads@uvm.edu). Questions can also be directed via email: [DeanofStudents@uvm.edu](mailto:DeanofStudents@uvm.edu). Completed applications must be received by January 1st for full consideration. Applications received after January 1st will be considered only for unanticipated openings. Appointments will be announced on or about April 1st.

## EXTRAMURALLY-FUNDED GRADUATE ASSISTANTSHIPS

Graduate assistantships are generally available when a faculty member receives a grant from a source external to the university. Graduate Assistants are generally appointed for twelve months with minimum stipends of \$20,666 for master's and \$24,000 for doctoral students for 2014-2015. These stipend levels are pro-rated for reduced lengths. Students will receive a tuition scholarship of at least six credits (nine for international students) and a maximum of nine per semester from a combination of grant, department and/or Graduate College resources.

Approximately 20 hours of effort per week on the grant-sponsored project is required of extramurally-funded Graduate Assistants. More than one academic year will be necessary for the completion of the master's degree, and more for completion of the doctoral degree. For information on the availability of extramurally funded assistantships, contact the chair or graduate program coordinator of the department.

## **GRADUATE FELLOWSHIPS/TRAINEESHIPS**

Graduate Fellowships/Traineeships are available in some departments through grants from various state and federal agencies. Fellowships/Traineeships may include both a stipend and tuition scholarship.

## **UVM OPPORTUNITY FELLOWSHIPS**

The Graduate College dean's office administers fellowships to increase campus diversity in graduate programs. Opportunity Fellowships, which are generally funded at a level equivalent to Graduate Teaching Assistantships, are available to students in all UVM graduate programs.

## **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.

## **OTHER FELLOWSHIPS**

Fellowships established by private donors are available periodically in some departments.

## **SPONSORED AND INSTITUTIONAL RESEARCH**

The university received over \$106 million in sponsored funding, about \$79 million of this total for research, during fiscal year 2013. UVM ranks nationally as one of the 100 leading universities in terms of federal grant support. In addition, there are a substantial number of faculty research projects supported, in part, by institutional research committees. Graduate students frequently serve as integral parts of faculty research projects in a wide range of disciplines.

## ACADEMIC AND STUDENT LIFE RESOURCES

### GRADNET

GRADNET is the electronic forum where graduate students, faculty, and staff discuss issues, research topics, graduate student life, and announcements that pertain to the graduate community. Information on subscribing is provided at Graduate Student Orientation and at the Graduate College. For more information, visit the Graduate College GRADNET ([http://www.uvm.edu/~gradcoll/?Page=current/gradnet.php&SM=current/\\_currentmenu.html](http://www.uvm.edu/~gradcoll/?Page=current/gradnet.php&SM=current/_currentmenu.html)) website.

### GRADUATE STUDENT SENATE

The Graduate Student Senate (<http://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.

### 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.

### 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.

## 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.

- Requirements for Accelerated Master's Programs (p. 156)
- Requirements for Certificates of Graduate Study (p. 156)
- Requirements for the Master's Degree (p. 156)
- Requirements for the Master of Education Degree (p. 158)
- Requirements for the Doctor of Philosophy Degree (p. 159)

## REQUIREMENTS FOR ACCELERATED MASTER'S DEGREE PROGRAMS

Accelerated Master's Degree (AMP) programs are designed to allow current UVM undergraduate students to earn both bachelor's and master's degrees within a total of five years. 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 that do are listed at under the Accelerated Degree Programs Policy.

AMP students may use up to six (6) 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.

In some programs an additional graduate-level course taken prior to award of the bachelor's, beyond the six double counted credits, may be used for the master's, provided the course does not also count toward the bachelor's degree.

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. 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 normally 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 as the intent is for them to be full time and complete the master's one year beyond the bachelor's degree. In order to receive assistantship funding, an AMP student must present scores from the GRE or GMAT, as is required for other funded students.

## 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 fifteen graded credits of graduate-level course work is required. Some certificates require more than fifteen credits. The courses must be in a defined subject area and approved for the specific certificate. At least nine 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.
2. All credits must be completed at UVM within a five year period. Graduate credits taken at other institutions may not transfer into a UVM Certificate of Graduate Study program. Credit (but not grades) from courses taken at UVM prior to matriculation in the certificate may transfer, but only for those certificates requiring more than fifteen credits and only for the credits in excess of the fifteen graded credit minimum.
3. A minimum grade point average of 3.00 must be achieved in the certificate program.
4. 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 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 catalog 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 thirty credits; some programs require more. A minimum of fifteen graded credits used in compilation of the graduate GPA must be taken in residence at UVM. 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 six (minimum) and fifteen (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 Catalog 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 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 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. All comprehensive examinations are taken on the University of Vermont campus in Burlington. 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 before the List of Potential Graduates is due.

## 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 office. A formatted copy of the thesis must be submitted to the Graduate College for a Format/Record Check at least three 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 two weeks before the scheduled examination. Individual departments may require earlier deadlines.

Students must notify the Graduate College of the thesis defense 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 three University of Vermont faculty members, at least two of whom must be regular 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 must be approved by the Graduate College dean upon nomination by the thesis advisor. For University-wide interdisciplinary programs, 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 acceptance page of the thesis following a successful defense.

The acceptability of the thesis is determined by the thesis defense examination committee. A grade of "S" or "U" is awarded. 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/uvm> 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 licensure for middle school or high school teaching. The M.A.T. degree in Greek and Latin is intended for people who are already licensed as secondary school teachers or who will complete teacher licensure requirements before graduation. For already licensed teachers, the program requires a minimum of thirty credits of

course work; at least twenty-one credits in the field of specialization and at least six in education. For those seeking teacher licensure, the program requires at least thirty credits of education course work and at least twenty-one credits in the field of specialization. The individual program of study for each M.A.T. student must be approved by their faculty advisor in their field of specialization and their faculty advisor in the Department of Education.

In addition to the comprehensive examination in the field of specialization, students must also take a comprehensive examination in the field of education.

## 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 three-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. Before the degree is awarded, the candidate must have completed one year of successful teaching experience or other educational service. This requirement may be fulfilled by satisfactory completion of student teaching, an internship, or a practicum.

Each program must include a minimum of thirty approved credits (Higher Education and Student Affairs, forty; Interdisciplinary Studies, thirty-six). Contingent on a candidate's background and interests and on program specification, additional credits may be required. 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 three to six semester hours of graduate work in the foundations of education unless this requirement or its equivalent has been met previously. Graduate courses which currently fulfill this requirement include:

EDFS 200	Contemporary Issues	3
EDFS 204	Sem in Educational History	3
EDFS 205	History of American Education	3
EDFS 206	D2: Comparative Education	3
EDFS 207	Traditionalist Education	3
EDFS 209	Intro to Research Methods	3
EDFS 255	School as Social Institution	3
EDFS 302	Philosophy of Education	3

EDFS 303	Ethics Helping Relationships	3
EDFS 304	Religion, Spirituality & Ed	3
EDFS 309	Schol Pers Narr Writing:ED&SS	3
EDFS 314	Modes of Inquiry	3
EDFS 320	Technology, Schooling, Society	3
EDFS 322	D1:Chall Multicult/Ed&Soc Inst	3
EDFS 347	Qualitative Research Methods	3
EDFS 348	Analyze&Write Qualitative Rsch	3
EDFS 352	Aesthetic Ed & Social Justice	3
EDFS 354	Anth Persp on Ed & Soc Serv	3
EDFS 369	Ethics in Ed & Soc Serv Admin	3
EDFS 377	Seminar Educational Psychology	3
EDFS 380	Professional Problems in Educ	3
EDFS 397	Problems in Education	1-6
EDCI 200	Contemporary Issues	0-6
EDCI 207	Univ and Third World Devel	3
EDCI 211	Educational Measurements	3
EDCI 215	The Gifted Child	3
EDCI 238	Teach'g w/Global Perspective	3
EDCI 241	Science for the Elem School	3
EDCI 245	Computer Apps in Elem&Sec Curr	3
EDCI 261	Current Direction in C&I	3
EDCI 321	Learning, Design & Technology	3
EDCI 322	Differentiation & Technology	3
EDCI 323	Inquiry and Technology	3
EDCI 324	Assessment and Technology	3
EDCI 325	Leadership and Technology	3
EDCI 333	Curr Concepts/Planning/Develop	3
EDCI 363	Analysis of Curr & Instruc Sem	3
EDCI 397	Problems in Education	1-6
EDPE 265	Exercise & Sport Science	3
EDPE 266	Ex Prescrip:Sprt,Hlth,Fit,Perf	3
EDPE 267	Sci Strength Training&Condtng	3

## 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 chair or advisor regarding program policy.

## THESIS OPTION

If the thesis option is elected (not available in the Higher Education and Student Affairs master's program), the oral or written comprehensive examination must be successfully completed prior to the thesis defense.

## REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF EDUCATION

Eighteen credits of Education and related areas or appropriate professional certification. The Education courses prerequisites may not apply to the Higher Education and Student Affairs Administration, Educational Leadership, or Interdisciplinary Major Program in the Department of Leadership and Developmental Sciences, i.e., persons seeking positions which do not require public school certification.

## MINIMUM DEGREE REQUIREMENTS

Eighteen graduate credits in courses in Education, including a minimum of six in the foundations of education;<sup>1</sup> twelve additional credits in approved graduate courses or six additional credits and thesis research; a year of successful experience in teaching or in a related educational activity.

<sup>1</sup> This requirement no longer applies to the program in Special Education.

## 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 seventy-five credits earned in courses and in dissertation research, including a minimum of thirty credits of course work, at least fifteen of which must be graded and may not count towards a master's degree, and a minimum of twenty credits of dissertation research. A minimum of fifteen 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 six credits of 100-level, or 200-level courses (and not listed in the Graduate Catalog 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 six 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. Success in the written comprehensive examination is prerequisite to standing for the Dissertation Defense Examination. All examinations are taken on the University of Vermont campus in Burlington. Some programs also require an oral comprehensive 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 twenty 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 in order to defend. The Intent to Graduate form must be submitted to the candidate's department before the List of Potential Graduates is due.

## 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 office and the program. A formatted copy of the dissertation must be submitted to the Graduate College for a Format/Record Check at least three weeks prior to the scheduled oral defense. Each student must also provide defensible copies of the dissertation to members of the dissertation defense examination committee at least two weeks before the scheduled examination. Individual departments may require earlier deadlines.

Students must notify the Graduate College prior to defending their dissertations.

The oral defense of a dissertation can be scheduled 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

Upon receipt of a completed dissertation, the Dean of the Graduate College will appoint a dissertation defense examination committee based upon nominations submitted by the candidate's advisor. The dissertation defense examination committee consists of a minimum of four University of Vermont faculty members, all regular members of the graduate faculty. At least two 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 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, the chair must be outside the department of the candidate's advisor. The chair will be designated by the Graduate College dean upon nomination by the dissertation advisor. Individual programs may require more than four committee members or have other specific membership requirements. 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 acceptance page of the dissertation 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. A grade of "S" or "U" is awarded. 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/uvm> for approval by the Graduate College within the time period specified by the dissertation defense examination committee, and/or the Graduate College.



## COURSES

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 registrar of this action.

Courses are divided into three levels: introductory, intermediate, and advanced. Where appropriate, a department may limit enrollment in a particular course. Such limitations, other than class size, must be explicitly stated.

Some departments will make further subdivisions of courses at some levels.

## ABOUT UVM COURSES

Courses numbered from 001 to 099 are introductory courses. Introductory courses emphasize basic concepts of the discipline. In general, they presuppose no previous college work in the subject. The only exceptions to this rule are those cases in which there is a two-semester introductory sequence. In such cases, the second-semester course may have the first-semester course as a prerequisite.

**Note for graduate students:** Under no circumstances will graduate credit be allowed for a course numbered below 100.

Courses numbered from 100 to 199 are intermediate courses. An intermediate course covers more advanced material than that treated in introductory courses. Students will be expected to be familiar with the basic concepts of the subject, and the course will present more difficult ideas. Intermediate courses will generally be more specialized than introductory courses. An intermediate course will always have a minimum prerequisite of three hours' prior study in the discipline or in another specified discipline.

**Note for graduate students:** Courses numbered 100 to 199 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 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 courses beyond those values, but graduate credit will not be allowed for such courses. 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.

**Note for graduate students:** Some, but not all, 200-level courses carry graduate credit. Graduate students should refer to the list of courses approved for graduate credit to identify these courses. To obtain graduate credit, the graduate student generally is expected to meet higher qualitative and/or quantitative expectations than the undergraduate student. Seniors who wish to take a course for graduate credit must receive permission through the office of their dean (see Undergraduate Course Enrollment for Graduate Credit under the Enrollment Policies and Procedures section of this catalogue) prior to enrolling in the course.

Courses numbered 300 to 399 are generally limited to graduate students. Courses numbered 400 or above are limited to candidates for the degrees of Doctor of Education and Doctor of Philosophy.

## SPECIAL TOPICS COURSE POLICY

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.

## COURSES APPROVED FOR GRADUATE CREDIT:

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- Animal, Nutrition & Food Sci (ANFS) (p. 163)
- Animal Sciences (ASCI) (p. 163)
- Anthropology (ANTH) (p. 163)
- Art History (ARTH) (p. 164)
- Astronomy (ASTR) (p. 164)
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- Bioengineering (BIOE) (p. 165)
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- Buckham Overseas Program (BUCK) (p. 168)
- Business Administration (BSAD) (p. 168)
- Cell Biology (CLBI) (p. 170)
- Chemistry (CHEM) (p. 170)
- Civil & Environmental Engr (CE) (p. 172)
- Classics (CLAS) (p. 174)
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## ANATOMY & NEUROBIOLOGY (ANNB)

### Courses

#### **ANNB 201. Human Gross Anatomy. 6 Credits.**

Lectures and detailed regional cadaver dissections emphasize functional anatomy of major systems (e.g. musculoskeletal, cardiovascular, nervous). Required of Physical Therapy students; others with Department permission.

#### **ANNB 261. Neurobiology. 3 Credits.**

Focus on molecular and cellular aspects of the nervous system. Electrical signaling, synaptic transmission, signal transduction, neural development, plasticity, and diseases. Prerequisite: BIOL 103 or ANPS 019 & ANPS 020. Cross-listed with: BIOL 261.

#### **ANNB 301. Medical Gross Anatomy. 8 Credits.**

This course includes a complete cadaver dissection by all students and evaluation in embryology as required. Emphasis is placed on individualized laboratory instruction. Prerequisite: Current Medical, Osteopathic, Podiatric and Dental students or Instructor permission.

**ANNB 342. Spec Dissections in Gross Anat. 1-12 Credits.**

A detailed and independent study of a single anatomical region, utilizing gross, microscopic, and embryologic materials. Prerequisite: Permission of the Instructor.

**ANNB 382. Sem in Anatomy & Neurobiology. 1 Credit.**

Research presentations and critical review of the literature in various areas of anatomical and neurobiological sciences.

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

Credit as arranged.

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

Prerequisite: Permission of the Instructor.

**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. Prerequisites: ASCI 141 or Instructor permission.

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

Physiology of endocrine and autocrine/paracrine systems and growth factors. Prerequisites: Course in both Biology and physiology; one course in Anatomy desirable.

**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: One chemistry course and one course in anatomy and physiology, or Instructor permission.

**ASCI 230. Agricultural Policy & Ethics. 3 Credits.**

Examines American agriculture and policies from various perspectives - historical, political, ecological, technological, social, economic, and ethical. Emphasis on contemporary issues, policy options, future developments. Prerequisite: Junior standing or permission.

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

The use of case studies in companion animal medicine to develop clinical, analytical, and diagnostic skills. Prerequisite: ASCI 118; ASCI 141; Junior standing.

**ASCI 264. Clin Topics: Livestock Medicine. 3 Credits.**

An advanced study of diseases in cattle, sheep, goats, and pigs, emphasizing disease detection, pathobiology, treatment and prevention. Prerequisites: ASCI 118, ASCI 141, 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. Prerequisite: ASCI 171 and Instructor permission.

**ASCI 297. Advanced Special Topics. 0.5-15 Credits.**

Written courses, seminars or topics beyond the scope of existing offerings. See Schedule of Courses for specifics. Prerequisite: Department Chair permission. May enroll more than once for maximum of fifteen hours.

**ASCI 298. Advanced Special Topics. 0.5-15 Credits.**

Written courses, seminars or topics beyond the scope of existing offerings. See Schedule of Courses for specifics. Prerequisite: Department Chair permission. May enroll more than once for maximum of fifteen hours.

**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. 1 Credit.**

Students develop and write a formal proposal for their graduate research project. Pre/co-requisite: Graduate standing; must be taken prior to/during the semester of student's first committee meeting.

**ASCI 391. Master's Thesis Research. 1-10 Credits.****ASCI 392. Independent Literature Rsch. 1-6 Credits.**

Reading and literature research culminating in a paper on a topic of current interest in Animal Sciences.

**ASCI 395. Special Topics. 1-6 Credits.****ASCI 396. Special Topics. 1-6 Credits.****ASCI 491. Doctoral Dissertation Research. 1-12 Credits.****ANIMAL, NUTRITION & FOOD SCI (ANFS)****Courses****ANFS 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. Pre/co-requisite: NFS 203 or Instructor permission.

**ANFS 395. Special Topics. 1-4 Credits.**

Lectures, laboratories, readings, or projects relating to topics in animal, nutrition and food sciences. Pre/co-requisite: Graduate standing.

**ANFS 491. Doctoral Dissertation. 1-18 Credits.****ANTHROPOLOGY (ANTH)****Courses****ANTH 200. Field Work in Archaeology. 6 Credits.**

Methods and techniques of archaeological investigation in field situations and the laboratory analysis of data. Pre/co-requisites: ANTH 024, and one 100-level course in Anthropology or History, or Instructor permission.

**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, one 100-level Anthropology course; or HP 201; or graduate standing in Historic Preservation Program, or HIST 121, HIST 122, or HIST 149. Alternate years.

**ANTH 220. Develop & Applied Anthropology. 3 Credits.**

Seminar examines the application of anthropological knowledge and methodologies to alleviate social problems around the world, with a special focus on the cultural politics of expertise. Prerequisites: ANTH 023, three 100-level courses, or Instructor permission. Alternate years.

**ANTH 225. Anthropological Theory. 3 Credits.**

Schools of anthropological thought examined in relation to data on non-Western societies and the historical and social context in which the anthropologist works. Prerequisites: ANTH 021, one 100-level course.

**ANTH 228. Social Organization. 3 Credits.**

Examination of the basic anthropological concepts and theories used in the cross-cultural analysis of kinship and marriage. Prerequisites: ANTH 021, one 100-level course.

**ANTH 283. Colonialism. 3 Credits.**

The concepts, ideologies, and practice(s) of colonialism within a sociocultural and historical context emphasizing the cultures of the colonizer and the colonized and the interaction thereof. Prerequisites: ANTH 021, one 100-level course, or ANTH 021, six hours in the social sciences. Alternate years.

**ANTH 290. Meth of Ethnographic Field Wrk. 3 Credits.**

Examination of theoretical and ethical premises of field work methodology with practical experience in participant observation, interviewing, the genealogical method, and the recording of data. Prerequisite: Twelve hours of Anthropology. Alternate years.

**ANTH 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisites: ANTH 021, one 100-level course.

**ANTH 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisites: ANTH 021, one 100-level course.

**ANTH 297. Advanced Readings & Research. 1-3 Credits.**

Prerequisite: Junior/Senior standing.

**ANTH 298. Advanced Readings & Research. 1-3 Credits.**

Prerequisite: Junior/Senior standing.

**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. Prerequisites: Six hours of 100-level Art History, including three hours in the area of the seminar; Junior/Senior standing.

**ASTRONOMY (ASTR)****Courses****ASTR 257. Modern Astrophysics. 3 Credits.**

Prerequisite: One 100-level course in physical science or Engineering. Cross-listed with PHYS 257.

**BIOCHEMISTRY (BIOC)****Courses****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 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. Cross-listed with: CHEM 206, MMG 206.

**BIOC 207. Biochemistry Lab. 2 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. Co-requisite: BIOC 205 or BIOC 206. Cross-listed with: CHEM 207, MMG 207.

**BIOC 212. Biochemistry of Human Disease. 3 Credits.**

Molecular approach to genetic, metabolic, and infectious diseases; recombinant DNA technology and medicine; molecular biology of cancer. Prerequisites: CHEM 042 or CHEM 141.

**BIOC 240. Macromol Struct Prot&Nucl Acid. 3 Credits.**

Introduction to structural biology and macromolecular structure with an emphasis on protein-protein and protein-nucleic acids interactions. Prerequisites: BIOL 001, BIOL 002; Organic Chemistry; Junior standing recommended. Cross-listed with: MMG 240. Alternate years.

**BIOC 301. General Biochemistry. 0 or 3 Credits.**

Survey for science majors. Chemistry, structure, metabolism, and function of proteins, carbohydrates, lipids; enzymes, bioenergetics and respiratory processes. Prerequisites: CHEM 141, CHEM 142 or CHEM 143, CHEM 144, and Department permission.

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

Survey for science majors. Amino acids, nucleic acids, protein synthesis, cellular and physiological control mechanisms. Prerequisites: CHEM 141, CHEM 142 or CHEM 143, CHEM 144, and Department permission.

**BIOC 305. Medical Biochemistry. 3 Credits.**

A survey course in human biochemistry, with particular emphasis on medical applications. Prerequisite: For medical students only.

**BIOC 306. Medical Biochemistry. 3 Credits.**

A survey course in human biochemistry, with particular emphasis on medical applications. Prerequisite: For medical students only.

**BIOC 307. Special Topics in Biochemistry. 1-3 Credits.**

Areas of biochemistry not treated in concurrent advanced course offerings. Prerequisites: BIOC 301, BIOL 302.

**BIOC 308. Special Topics in Biochemistry. 1-3 Credits.**

Areas of biochemistry not treated in current advanced course offerings. Prerequisites: BIOC 301, BIOC 302 or Department permission.

**BIOC 309. Laboratory Research Rotations. 3 Credits.**

Two sequential research projects in Departmental faculty laboratories, composed of experimental work, an oral presentation, and a written report. First semester.

**BIOC 310. Laboratory Research Rotations. 3 Credits.**

Two sequential research projects in Departmental faculty laboratories, composed of experimental work, an oral presentation and a written report. Second semester.

**BIOC 325. Data Analysis&Presentation I. 2 Credits.**

Develop graduate level skills in data analysis, reading, writing, teaching and presenting your own work and that of others (Part 1 or 2). Prerequisites: Graduate standing; Enrollment in BIOC 301 and CLBI 301.

**BIOC 326. Data Analysis&Presentation II. 2 Credits.**

Develop graduate level skills in data analysis, reading, writing, teaching and presenting your own work and that of others (Part 2 of 2). Prerequisites: Graduate standing; Enrollment in BIOC 301 & CLBI 301.

**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. Prerequisites: BIOC 301, BIOC 302 or Department permission. Alternate years.

**BIOC 352. Protein: Nucleic Acid Interact. 3 Credits.**

Structure of DNA and RNA, and the structure and assembly of nucleoprotein complexes will be described using examples from prokaryotes, yeast, viruses, and mammalian cells in culture. Prerequisites: MMG 211 or equivalent; AGBI 201 or BIOC 301; BIOC 302 or equivalent. Cross-listed with: MMG 352. Alternate years.

**BIOC 353. Proteins II: Enzymology. 3 Credits.**

General consideration of enzyme nomenclature, purification, assay, kinetics, mechanisms, cofactors, active sites, subunit structure, allosteric and regulatory properties, and control of multienzyme systems. Prerequisites: BIOC 301, BIOC 302, and CHEM 162; Department permission. Alternate years.

**BIOC 354. Nucleic Acids II. 3 Credits.**

The study of structure, composition, organization, function, synthesis, and metabolism of nucleic acids and nucleoprotein particles and matrices in eukaryotic organisms. Prerequisites: BIOC 301, BIOC 302.

**BIOC 370. Physical Biochemistry. 3 Credits.**

Protein interaction, solubility and fractionation, electrophoresis, sedimentation, phase rule study, diffusion, viscosity, spectrophotometry, and related topics. Prerequisites: BIOC 301, BIOL 302 and CHEM 162, or Department permission.

**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, BIOC 302, or Department permission.

**BIOC 381. Seminar. 1 Credit.**

A review of recent developments and current literature in the various fields of biochemistry. Prerequisite: Department permission.

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

Credit as arranged.

**BIOC 392. Independent Literature Rsch. 1-12 Credits.**

Reading and literature research culminating in a paper on a topic of current interest in biochemistry.

**BIOC 395. Special Topics. 1-12 Credits.****BIOC 396. Special Topics. 1-12 Credits.****BIOC 491. Doctoral Dissertation Research. 1-12 Credits.**

Credit as arranged.

## BIOENGINEERING (BIOE)

### Courses

**BIOE 391. Master's Thesis Research. 1-18 Credits.****BIOE 395. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

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

See Schedule of Courses for specific titles.

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

## BIOLOGY (BIOL)

### Courses

**BIOL 202. Quantitative Biology. 3 Credits.**

Topics in quantitative methods in biological research, including statistics and computer-based analysis. Prerequisites: One of BCOR 101, BCOR 102, BCOR 103; MATH 019, MATH 020.

**BIOL 203. Population Ecology. 3 Credits.**

Analysis of growth, regulation, and interrelations of biological populations in theoretical, laboratory, and natural systems. Prerequisite: BCOR 102.

**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 Laboratory. 4 Credits.**

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

**BIOL 208. Morphology&Evolution Insects. 0 or 4 Credits.**

Systematics, morphology, and anatomy of insect taxa, with comparisons to related arthropods. Prerequisite: BCOR 102.



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

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

**BIOL 212. Comparative Histology. 0 or 4 Credits.**

Anatomy of tissues, chiefly vertebrate. Tissue similarities and specializations of organs among the various groups of animals in relation to function. Prerequisite: BCOR 103.

**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. Prerequisite: BCOR 101, BIOL 103.

**BIOL 225. Physiological Ecology. 3 Credits.**

Processes by which animals cope with moderate, changing, and extreme environments. Prerequisites: BCOR 102, BIOL 255.

**BIOL 238. Winter Ecology. 3 Credits.**

Natural history and winter adaptation of plants and animals of western Maine. Field work during winter break; oral and written report completed during spring semester. Prerequisite: Instructor permission.

**BIOL 246. Ecological Parasitology. 1 or 3 Credit.**

Parasite-host interactions examined with evolutionary perspective. Topics include the origin of parasites, evolution of virulence, and ecological consequences of parasitism. Laboratory includes original experiments. Prerequisite: BCOR 102.

**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. Pre/co-requisite: BCOR 101.

**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. Prerequisite: BCOR 103 or NSCI 110. Cross-listed with: ANNB 261.

**BIOL 262. Neurobiology Techniques. 4 Credits.**

Extensive study of laboratory methods used in modern research on the function of the nervous system. Techniques from electrophysiology, cell biology, biochemistry and genetics. Pre/co-requisites: BCOR 103, BIOL 261.

**BIOL 263. Genetics Cell Cycle Regulation. 3 Credits.**

Molecular events during the cell cycle; mutants defective in cell cycling; comparison of normal and transformed (cancer) cell cycling. Prerequisite: BCOR 101 or Instructor permission.

**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 265. Developmental Molecular Genetics. 3 Credits.**

Current topics in developmental genetics explored through lectures and discussions of current literature; emphasis on molecular approaches. Prerequisite: BCOR 101.

**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 267. Molecular Endocrinology. 4 Credits.**

Study of hormone action at the cellular and molecular level. Prerequisite: BCOR 101.

**BIOL 270. Speciation and Phylogeny. 3 Credits.**

Contribution of modern research in such fields as genetics, systematics, distribution, and serology to problems of evolutionary change. Prerequisite: BCOR 101, BCOR 102 recommended.

**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 275. Human Genetics. 3 Credits.**

Application of genetic techniques to the study of human biology. Topics include pedigree analysis, linkage analysis, and complex genetic disorders of medical importance. Prerequisite: BCOR 101.

**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 280. Molecular Ecology. 0 or 4 Credits.**

Molecular genetic tools and analytical methods used to investigate ecological processes in natural populations of plants and animals. Prerequisite: BCOR 102.

**BIOL 286. Forensic DNA Analysis. 3 Credits.**

Theory and techniques of modern genetics used to produce and analyze a DNA profile in forensic science. Emphasis on degraded or contaminated DNA samples. Prerequisite: BCOR 101.

**BIOL 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BIOL 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.



**BIOL 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. Cross-listed with: CLBI 301, PBIO 301.

**BIOL 302. Specialized Cells & Cell Proc. 3 Credits.**

Current issues and research in the field of plant, invertebrate, mammalian cell, and molecular biology. Prerequisite: BIOL 301. Cross-listed with: CLBI 302.

**BIOL 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 352.

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

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

**BIOL 382. Eco Lunch. 0-1 Credits.**

Review and discussion of current research. Attendance of BIOL 382 or BIOL 384 required of Biology Graduate students. Pre/co-requisites: Graduate standing and Instructor permission.

**BIOL 383. Ecology-Evolution Journal Club. 0-1 Credits.**

Review and discussion of current research.

**BIOL 384. Cell Lunch. 0-1 Credits.**

Review and discussion of current research. Attendance of BIOL 382 or BIOL 384 required of Biology Graduate students. Pre/co-requisite: Graduate standing.

**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 391. Master's Thesis Rsch. 1-10 Credits.**

Credit as arranged.

**BIOL 491. Doctoral Dissertation Rsch. 1-10 Credits.****BIOSTATISTICS (BIOS)****Courses****BIOS 200. Med Biostatistics&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. Prerequisites: STAT 111, STAT 141 or STAT 143; or STAT 211. Cross-listed with: STAT 200.

**BIOS 211. 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: Junior standing. Cross-listed with: STAT 211.

**BIOS 221. 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. Cross-listed with: STAT 221.

**BIOS 223. 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 analysis. Prerequisite: Any 200 level Statistics course; STAT 221 or STAT 225 recommended; matrix algebra recommended. Cross-listed with: STAT 223.

**BIOS 229. Survival Analysis. 3 Credits.**

Probabilistic models and inference for time-to-event data. Censored data, life tables, Kaplan-Meier estimation, logrank tests, proportional hazards regression. Specialized applications (e.g. clinical trials, reliability). Prerequisite: Any 200 level Statistics course; one year of calculus. Cross-listed with: STAT 229.

**BIOS 231. 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. Prerequisites: BIOS 211 (BIOS 221 recommended). Cross-listed with: STAT 231.

**BIOS 235. 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: BIOS 211. Cross-listed with: STAT 235.

**BIOS 241. Statistical Inference. 3 Credits.**

Introduction to statistical theory; related probability fundamentals, derivation of statistical principles, and methodology for parameter estimation and hypothesis testing. Pre/co-requisites: BIOS 151, BIOS 153 or BIOS 25; BIOS 141 or equivalent; MATH 121. Cross-listed with: STAT 241.

**BIOS 251. Probability Theory. 3 Credits.**

Distribution of random variables and functions of random variables. Expectations, stochastic independence, sampling and limiting distributions (central limit theorems). Concepts of random number generation. Pre/co-requisite: MATH 121; STAT 141 or STAT 153 recommended. Cross-listed with: MATH 207, STAT 251.

**BIOS 261. 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. Pre/co-requisites: STAT 251 or either STAT 151 or STAT 153 with Instructor permission. Cross-listed with: STAT 261.

**BIOS 308. Applied Biostatistics. 3 Credits.**

The rationale and application of biostatistical methods in the biological, health and life sciences with emphasis on interpreting and reporting. Prerequisite: STAT 141 or equivalent. Cross-listed with: MPBP 308, STAT 308.

**BIOS 350. Advanced Methods in Biostat. 3 Credits.**

Essential topics in modern biostatistics including epidemiology studies, clinical trials, statistical genetics, issues involved in secondary data analysis of complex surveys. Prerequisites: STAT 261 & STAT 200 or Instructor permission. Cross-listed with: STAT 350.

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

Credit as arranged.

**BIOS 395. Advanced Special Topics. 1-6 Credits.**

## 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. Prerequisite: BSAD 120; Senior standing.

**BSAD 226. Current Iss in Mgmt & Org Thry. 1-3 Credits.**

Subjects may include training and development, selection and recruitment, and affirmative action. Prerequisite: BSAD 120.

**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. Prerequisite: BSAD 150.

**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 251 and Instructor permission.

**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: Junior/Senior/Graduate standing; BSAD 150 or permission of the Instructor.

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

A study of the concepts and techniques underlying corporate financial statement analysis, with an emphasis on equity valuation models. Pre/co-requisites: BSAD majors/minors; Senior or Graduate standing; BSAD 180 or BSAD 308.

**BSAD 263. Environmntl & Social Reporting. 3 Credits.**

An examination of voluntary and mandatory reporting of environmental and other social activities along with related issues through readings and research. Prerequisites: Junior standing; BSAD 061 or BSAD 065 or BSAD 306.

**BSAD 264. Intro to Federal Taxation. 3 Credits.**

An introduction to US federal taxation as it applies to individuals and business entities including proprietorships, partnerships, C Corporations, S Corporations. Pre/co-requisites: BSAD majors/minors; Senior or Graduate standing; BSAD 060 and BSAD 061 or their equivalent.

**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. Pre/co-requisites: BSAD majors/minors; Senior or Graduate standing; BSAD 060 and BSAD 061 or their equivalent.

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

Focuses on accounting for business combinations and developing consolidated financial statements. Includes accounting for foreign currency transactions, foreign subsidiaries, governmental entities and not-for-profit organizations. Pre/co-requisite: 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. Pre/co-requisites: BSAD majors/minors; Senior or Graduate standing; BSAD 162, BSAD 265.

**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. Prerequisites: BSAD 061 or BSAD 306 or equivalent; Senior/Graduate standing.

**BSAD 270. Quant Anly 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. Prerequisite: STAT141, MATH 020 or MATH 021.

**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. Pre/co-requisite: BSAD 180 or BSAD 308.

**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. Pre/co-requisites: Junior Standing; BSAD 180 or BSAD 308.

**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. Prerequisites: BSAD 180; Instructor invitation only.

**BSAD 293. Integrated Product Development. 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: Junior/Senior standing or Instructor Permission. Cross-listed with: ME 265, STAT 265.

**BSAD 295. Special Topics. 1-18 Credits.**

Advanced courses on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles and prerequisites. Prerequisite: Senior standing.

**BSAD 305. Fundamentals of Marketing Mgmt. 3 Credits.**

Accelerated course on marketing principles and theory. Analytical approach to study of product pricing strategies; distribution, communication, and promotion; consumer behavior and development of corporate marketing strategy. Prerequisite: MBA 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: MBA standing.

**BSAD 307. Organization & Mgmt Studies. 3 Credits.**

A survey course of the principles of management and organization behavior. The fundamentals of planning, organizing, leading, staffing, and controlling are covered. Particular attention is given to organization theory and behavior, including topics such as motivation, group behavior and decision making. All areas are covered in an international context. Prerequisite: MBA standing.

**BSAD 308. Managerial Finance. 3 Credits.**

An introduction to financial decision making in the firm. Decisions related to acquisition and allocation of funds are examined and practiced through cases and problems. Prerequisite: MBA standing; BSAD 306.

**BSAD 309. Political Envir of Business. 3 Credits.**

Explore the rationale for government interaction with business. Analyze (1) business, and the broader society's demand for public policy, as well as (2) the political institutions that supply public policy in both domestic and international contexts. Pre/co-requisite: MBA Standing.

**BSAD 331. Health Care Management. 3 Credits.**

Addresses changing challenges confronted by managers in health services delivery organizations. Examines applications and limitations of management concepts and processes in the health care context. Prerequisite: MBA standing. Cross-listed with: PA 312.

**BSAD 340. Production & Operations Mgmt. 3 Credits.**

Study of the operations function in manufacturing and service organizations. Design, planning, and control are examined, with emphasis on managerial analysis and decision making. Prerequisite: One course in STAT.

**BSAD 345. Management Information Systems. 3 Credits.**

An introduction to the design and implementation of management information systems. A theoretical framework is developed and applied by students to an information system. Prerequisite: MBA standing.

**BSAD 352. Business to Business Marketing. 3 Credits.**

Exploration and analysis of the marketing of goods and services to organizations. Topics include organizational buying, market segmentation, positioning, pricing, communication, physical distribution and customer services, and sales management. Prerequisite: MBA standing; BSAD 305.

**BSAD 357. Analysis for Mktg Planning. 3 Credits.**

A post-introductory MBA marketing course that combines managerial and analytic approaches to gaining insight into customer attitudes and behaviors and improving market decision-making. Pre/co-requisites: BSAD 305; MBA standing.

**BSAD 360. Contemporary Financial Acctg. 3 Credits.**

Focuses on contemporary issues in financial accounting and reporting under both U.S. generally accepted accounting principles and International Reporting Standards; impact of regulatory agencies. Prerequisites: Graduate standing; BSAD 306 or BSAD 308 or their equivalent.

**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. Pre/co-requisites: BSAD 266 and MAcc standing.

**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: Graduate standing.

**BSAD 364. Ind Readings & Rsch for MAcc. 1-3 Credits.**

Allows a student to pursue independent research under the direction of a faculty member. Normally, course includes a research paper. Prerequisite: Graduate student standing in Masters in Accountancy program (MAcc).

**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. Prerequisites: Graduate standing. BSAD 306 and BSAD 308 or their equivalent.



**BSAD 366. Advanced Accounting. 3 Credits.**

Focuses on accounting for business combinations and developing consolidated financial statements. Includes accounting for foreign currency transactions, foreign subsidiaries, segment, interim, and SEC reporting. Pre/co-requisites: MAcc standing, BSAD 162.

**BSAD 375. Organization Theory. 3 Credits.**

Organization theories examined for insights into behaviors of organizations and their members. Open systems perspective. Identification of contingencies in organization design based on human, structural, technological, environmental variables. Prerequisite: MBA standing; BSAD 307.

**BSAD 376. Mgmt of Change in Organization. 3 Credits.**

Applied behavioral science perspective adopted to identify conceptual issues, develop diagnostic skills, examine alternative intervention strategies relevant to accomplishment of planned changes in organizational systems. Prerequisite: MBA standing; BSAD 307.

**BSAD 378. International Case Analysis. 3 Credits.**

Analysis of real problems in local and Canadian organizations, pursued in mixed UVM-Concordia teams, with recommendations presented to panel of client and academic judges. Prerequisite: First tier of MBA courses completed.

**BSAD 379. Strategic Management. 3 Credits.**

Case studies of existing organizations are used to illustrate the intellectual, social processes of adaptation to a changing environment; strategy formulation, implementation. Not offered every year. Prerequisite: MBA standing; completion of First-Year courses.

**BSAD 380. Adv Financial Management. 3 Credits.**

Focus on key financial decisions that affect the value of the firms. Topics: capital structure, corporate financial planning, mergers and acquisitions, capital market theories and evidence. Prerequisites: Graduate standing, BSAD 308.

**BSAD 384. Financial Mrkts&Interest Rates. 3 Credits.**

Study of level and structure of interest rates. Topics: flow of funds accounting, market vs. natural rate of interest, interest rate structure, behavior of interest rates over business cycle. Prerequisite: MBA Standing.

**BSAD 394. Independent Readings&Research. 1-3 Credits.**

Allows a student to pursue independent research under the direction of a faculty member. Normally, the course will include a research paper. Prerequisite: MBA standing; permission of the Graduate Studies Committee.

**BSAD 395. Special Topics. 1-3 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: MBA standing; permission of the Graduate Studies Committee.

**BSAD 396. Strategy and Competition. 3 Credits.**

Integrative, capstone course concerned with issues and decisions facing senior executives directing entire enterprises. Students develop analytical skills surrounding industry analysis, strategy formulation, organizational design, and competitive dynamics. Pre/co-requisites: MBA Standing. Taken in last semester of study.

## CELL BIOLOGY (CLBI)

### Courses

**CLBI 295. Special Topics. 1-8 Credits.**

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

**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. Cross-listed with: BIOL 301, PBIO 301.

**CLBI 302. Spec Cells & Cell Processes. 3 Credits.**

Current issues and research in the field of plant, invertebrate, mammalian cell, and molecular biology. Prerequisite: CLBI 301. Cross-listed with: BIOL 302.

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

One hour.

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

Credit as arranged.

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

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

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

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

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

Credit as arranged.

## CHEMISTRY (CHEM)

### Courses

**CHEM 201. Advanced Chemistry Laboratory. 3 Credits.**

Discussion and laboratory experiments using spectroscopy techniques (mass spectrometry, NMR, IR, UV/visible, and atomic spectroscopy) to solve problems in analytical, physical, and inorganic chemistry. Prerequisite: CHEM 121, and CHEM 142 or CHEM 144. CHEM 161 strongly recommended.

**CHEM 202. Advanced Chemistry Laboratory. 2 Credits.**

Laboratory problems requiring modern analytical, physical, and inorganic synthetic techniques. Journal article writing. Prerequisite: CHEM 201.

**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 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: CHEM 205. Cross-listed with: BIOC 206 and MMG 206.

**CHEM 207. Biochemistry Lab. 2 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. Co-requisite: CHEM 205 or CHEM 206. 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 142 or CHEM 144, and CHEM 162.

**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 161 or CHEM 162 strongly recommended.

**CHEM 223. Mass Spectrometry. 3 Credits.**

An in-depth treatment of modern mass spectrometry, instrumentation and techniques with discussion of biological and chemical applications. Prerequisites: CHEM 142 or CHEM 144, and CHEM 221, or Instructor permission.

**CHEM 225. Electroanalytical Chemistry. 3 Credits.**

Principles and techniques of modern electrochemical analysis and applications to redox chemistry. Heterogeneous effects; voltammetry; electron-transfer processes and reactions. Prerequisite: CHEM 221.

**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 227. Spec Topics in Analytical Chem. 1-3 Credits.**

Selected topics of current interest in analytical chemistry. New techniques and methodologies, especially in chemical instrumentation. Credit as arranged.

**CHEM 228. Spec Topics in Analytical Chem. 1-4 Credits.**

Selected topics of current interest in analytical chemistry. New techniques and methodologies, especially in chemical instrumentation. Credit as arranged.

**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. Prerequisites: CHEM 142 or CHEM 144. Credit for or concurrent enrollment in CHEM 161.

**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. Topics include ligand field theory, magnetism, magnetic resonance, Mossbauer spectroscopy, and X-ray crystallography. Prerequisites: CHEM 131 or CHEM 231; CHEM 161.

**CHEM 237. Special Topics: Inorganic. 1-3 Credits.**

Areas of current interest involving inorganic systems.

**CHEM 238. Special Topics: Inorganic. 1-3 Credits.**

Areas of current interest involving inorganic systems.

**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 251. Physical Organic Chemistry. 3 Credits.**

Experimental and computational techniques for determining and interpreting structure, properties and reactivity of organic molecules, with an emphasis on the mechanisms of organic reactions. Prerequisites: CHEM 142 or CHEM 144, CHEM 161, and CHEM 162 strongly recommended.

**CHEM 257. Special Topics in Organic Chem. 1-3 Credits.**

Advanced level discussion of specific topics in organic chemistry of current interest such as photochemistry, carbenes, bioorganic chemistry, magnetic resonance, etc. Credit as arranged.

**CHEM 258. Special Topics in Organic Chem. 1-3 Credits.**

Advanced level discussion of specific topics in organic chemistry of current interest such as photochemistry, carbenes, bioorganic chemistry, magnetic resonance, etc. Credit as arranged.

**CHEM 262. Chemical Thermodynamics. 3 Credits.**

Classical and statistical thermodynamics. Systematic study of applications of thermodynamics to chemical problems. Prerequisite: CHEM 161 and 162.

**CHEM 264. Adv Quantum & Spectroscopy. 3 Credits.**

In-depth theoretical discussion of molecular states, their symmetry, and transition probabilities. Explicit treatment of vibrations, electronic states, and vibronic spectroscopy. Prerequisites: CHEM 161 and MATH 121.

**CHEM 267. Special Topics: Physical. 1-3 Credits.**

Selected topics of current interest in physical chemistry.

**CHEM 268. Special Topics: Physical. 1-3 Credits.**

Selected topics of current interest in physical chemistry.



**CHEM 285. Special Topics. 1-3 Credits.****CHEM 286. Special Topics. 1-3 Credits.****CHEM 318. Current Topics in Chemistry. 0 or 1 Credits.**

Survey of current topics in the chemistry literature. Prerequisite: Graduate standing.

**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. Prerequisite: Permission of the Department.

**CHEM 391. Master's Thesis Research. 1-18 Credits.****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 484. Advanced Topics in Chemistry. 2 Credits.**

Comprehensive independent study in chemistry. Prerequisite: Permission of the Department.

**CHEM 488. Rsch Prob Conception&Solution. 1 Credit.**

Independent origination of research problems and the methods of their solution. Prerequisite: Permission of Department.

**CHEM 491. Doctoral Dissertation Research. 1-18 Credits.****CIVIL & ENVIRONMENTAL ENGR (CE)****Courses****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. Prerequisites: MATH 271, CS 020, MATH 124. Cross-listed with: ME 218.

**CE 220. Intro to Finite Element Anyl. 3 Credits.**

Introduction to finite element analysis: applications in solid mechanics, hydrodynamics, and transport: analysis of model behavior: Fourier analysis. Computer project required. Prerequisites: computer programming, linear algebra, or permission of Instructor.

**CE 226. Civil Engineering Systems Anyl. 3 Credits.**

Linear programming, dynamic programming, network analysis, simulation; applications to scheduling, resource allocation, routing, and a variety of civil engineering problems. Prerequisites: Senior/ Graduate standing in Civil & Environmental Engineering or Instructor permission. Cross-listed with: CSYS 226.

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

Advanced concepts of traffic engineering and capacity analysis; highway and intersection capacity; traffic analysis and simulation software; design and application of controls. Prerequisite: CE 133.

**CE 245. Intelligent Transportation Sys. 3 Credits.**

Introduction to Intelligent Transportation Systems (ITS), ITS user services, ITS applications, the National ITS architecture, ITS evaluation, and ITS standards. Pre/co-requisites: CE 140 or equivalent; Instructor permission. Cross-listed with: CSYS 245.

**CE 248. Hazardous Waste Mgmt Engr. 3 Credits.**

Management of hazardous and industrial waste from generation to disposal; emphasis on pollution prevention within industry; waste minimization, recovery, reuse, treatment technologies; environmental regulations, risk assessment, costs and public policy; group projects. Prerequisite: Senior standing in Engineering or sciences.

**CE 250. Fate/Transport Organic Chem. 3 Credits.**

Chemical transfers between environmental media; molecular structure-reactivity models; chemical, photochemical and biochemical transformation rates; emphasis on predicting environmental concentrations and risk. Graduate student independent modeling project. Prerequisites: CHEM 031, CHEM 032, CE 132.

**CE 251. Envr Facility Dsgn/Wastewater. 3 Credits.**

Design of wastewater conveyance and treatment facilities; sewage treatment plant design; equipment selection. 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. Prerequisite: CE 133.

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

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

**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. Pre/co-requisites: CE 151, CE 154, or permission of Instructor.

**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 259. Msmt of Airborne Contaminants. 3 Credits.**

Quantifying airborne contaminants from processes and ambient levels. Laboratories demonstrate calibration and measurement, stack sampling and ambient air monitoring, and specific contaminant generation and measurement. Prerequisite: CE 252 or CE 253.

**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. Prerequisite: CE 160.

**CE 261. Open Channel Flow. 3 Credits.**

Application of the laws of fluid mechanics to flow in open channels; design of channels and transition structures; modeling; uniform and gradually-varied flows. Prerequisite: CE 160.

**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. Prerequisite: CE 160.

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

Virtual work, energy theorems, analysis of structures by the displacement method, finite element analysis of structural systems, non-linear structural analysis, structural optimization, probabilistic structural analysis. Prerequisite: CE 170.

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

Vibrations, matrices, earthquake engineering, stability and wave propagation. Prerequisites: Senior or Graduate 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. Prerequisite: CE 170.

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

Subsurface explorations; bearing capacity, lateral earth pressures, slope stability; analysis and design of shallow and deep foundations, retaining structures, and slopes. Pre/co-requisite: CE 180.

**CE 283. Designing with Geosynthetics. 3 Credits.**

Geotextiles, geogrids, geonets, geomembranes, geocomposites, geopipes. Design for separation, reinforcement, filtration, drainage, erosion, control, liners. Applications in transportation, drainage, solid waste containment. Material testing, behavior. Prerequisite: CE 180.

**CE 284. Site Characterization. 3 Credits.**

A comprehensive approach to subsurface site characterization for geotechnical and environmental designs and a systems approach for integrating the two. Prerequisites: CE 160, CE 180.

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

An introduction to Geoenergy 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). Prerequisite: CE 180.

**CE 290. Engineering Investigation. 3 Credits.**

Independent investigation of a special topic under the guidance of a staff member. Preparation of an engineering report is required.

**CE 295. Special Topics. 1-18 Credits.**

Content is dictated by expanding professional interest in newly developing, or recently developed, technical areas in which there is particular need or opportunity. Prerequisite: Senior/Graduate standing.

**CE 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. Cross-listed with: ME 304.

**CE 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. Cross-listed with: ME 305.

**CE 312. Sustainability & Transportatn. 3 Credits.**

Introduction to the complex interconnection of engineering, policy, science and social science that characterize transportation systems, mobility problems and solutions. Interdisciplinary teams conduct case studies. Prerequisite: Instructor permission required. Cross-listed with: PA 342, TRC 312.

**CE 314. Risk/Behavior in Transportatn. 3 Credits.**

In-depth examination of human, environmental and vehicle factors in transportation crashes. Students develop safety research proposals and statistical measurements of risk and rates. Prerequisite: Instructor permission.

**CE 321. Engr Computations on Adv Arch. 3 Credits.**

Engineering computations using multiprocessing computers, concurrent processing, algorithms for numerical approximation of differential equations, linear systems. Programming projects required.

**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. Pre/co-requisites: STAT 223, CS 016/CE 011, or Instructor permission. Cross-listed with: CSYS 359.

**CE 360. Advanced Hydrology. 3 Credits.**

Application of statistics to engineering hydrology; concept, use of instantaneous unit hydrograph; study of runoff models; flow through porous media; design techniques for water resources projects. Prerequisite: CE 260, MATH 271 or Instructor permission. Offered as occasion warrants.

**CE 361. Fluvial Forms & Processes. 3 Credits.**

Advanced topics in fluvial forms and processes; focus on river and stream restoration and design; includes journal readings, discussion, field trips and group design project. Pre/co-requisites: CE 160 or Instructor permission.

**CE 365. Contaminant Hydrogeol&Remediat. 3 Credits.**

Practical, theoretical aspects of contaminant hydrogeology, advances in technologies, mass transport and transformation in saturated and vadose zones; movement, distribution, and remediation of nonaqueous-phase liquids. Prerequisite: CE 265 or with Instructor permission.

**CE 366. Numerical Method/Surface Water. 3 Credits.**

Development of the governing equations for geophysical hydrodynamics/transport, shallow water equations, analysis and implementation of finite element/finite difference computational algorithms. Prerequisite: CE 220.

**CE 367. Phys Flow&Trs thru Porous Mdia. 3 Credits.**

The fundamental equations describing fluid flow and mass transport in subsurface systems are developed from first principles. Pre/co-requisite: CE 265 or equivalent.

**CE 368. Groundwater Modeling. 3 Credits.**

The fundamental theory of groundwater hydrology is combined with concepts in numerical methods to provide the technology needed to study a real-world groundwater problem. Pre/co-requisite: CE 265 and CE 220 or equivalent.

**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. Pre/co-requisite: STAT 223 or STAT 225, CS 016/CE 011, or Instructor permission. Cross-listed with: CSYS 369.

**CE 370. Reliability of Eng. Systems. 3 Credits.**

Modeling and simulation of functions of random variables and random processes, propagation of uncertainties in engineering systems, analytical and computational methods for reliability analysis of engineering systems and components, Bayesian methods to update reliability estimates based on operational data. Prerequisite: STAT 151 or equivalent.

**CE 380. Advanced Soil Mechanics. 3 Credits.**

Stress-strain-strength of soils, introduction to constitutive modeling, critical state concepts, applications of limit analysis and limit equilibrium methods in analyzing stability problems in geotechnical engineering, such as foundations, slopes and embankments and retaining structures. Prerequisite: CE 180.

**CE 390. Adv Topics in Civil & Envr Eng. 1-6 Credits.**

Special topics to intensify the programs of graduate students in civil and environmental engineering. Hours and credits to be arranged.

**CE 391. Master Thesis Rsch. 1-12 Credits.****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 CEE Program.

**CE 395. Advanced Special Topics. 1-6 Credits.**

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

**CE 491. Doctoral Dissertation Research. 1-18 Credits.****CLASSICS (CLAS)****Courses****CLAS 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**CLAS 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**CLINICAL&TRANSLATIONAL SCIENCE (CTS)****Courses****CTS 200. Introduction to CTS I. 3 Credits.**

Teaches the principles of human subjects research for those pursuing a path as research assistants or coordinators.

**CTS 201. Introduction to CTS II. 3 Credits.**

Teaches the principles of human subjects research for those pursuing a path as research assistants or coordinators. Prerequisite: CTS 200.

**CTS 271. Intro Biomedical Informatics. 3 Credits.**

This survey course provides an overview of the field of biomedical informatics covering relevant topics in computer science, healthcare, biology, and social science.

**CTS 272. Applied Biomedical Informatics. 3 Credits.**

Pragmatic coverage of topics/resources relevant to biomedical informatics. Computing skills include Unix, programming, and databases; examples will involve clinical, biomedical, and public health data.

**CTS 275. Informatics Practicum. 3-12 Credits.**

Practicum experience with an informatics research or service project. Prerequisites: At least one of CTS 271, CTS 272, MMG 231, MMG 232, CS 231, or CS 232.

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

Seminar emphasizing the skills for designing and executing clinical and translational research. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 302. Quality in Health Care. 3 Credits.**

This interprofessional course provides students with the skills and knowledge needed to apply quality improvement approaches to the design and management of health care services. Cross-listed with: NH 302.

**CTS 305. Cell To Society I. 2 Credits.**

A two-semester seminar that addresses a medical issue from molecule to market. CTS students must take both semesters. Non-CTS students may take either semester independently. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 306. Cell To Society II. 2 Credits.**

A two-semester seminar that addresses a medical issue from molecule to market. CTS students must take both semesters. Non-CTS students may take either semester independently. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 308. Intro to Research Management I. 3 Credits.**

A course for beginning research coordinators, research managers, or research assistants who need to learn how to prepare and manage clinical and translational research protocols.

**CTS 309. Intro to Research Mgmt II. 3 Credits.**

A course for beginning research coordinators, research managers, or research assistants who need to learn how to prepare and manage clinical and translational research protocols.



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

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

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

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

**CTS 326. Underpinnings Surgical Therapy. 3 Credits.**

Didactic lectures about the current scientific basis for surgical practice, including an understanding of conceptual foundations and empirical methods. Pre/co-requisite: MD degree.

**CTS 327. Mortality&Morbidity in Surgery. 3 Credits.**

Examination of the processes of care and the therapeutic outcomes of clinical practices through problem-based learning. Pre/co-requisite: MD degree.

**CTS 330. Intro Secondary Data Analysis. 1 Credit.**

Course that orients students to broad issues of clinical research while providing specific skills in statistical analysis of large data set using specialized programs. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 340. Medical & Exper Human Genetics. 3 Credits.**

Overview of medical genetics, including history, techniques and ethical, legal and social implications of genetic diseases and thier treatments. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 345. Genetic Approaches CV Disease. 2 Credits.**

Application of statistics, molecular biology, and genetics to the analysis of complex diseases such as asthma, hypertension and atherosclerotic heart disease. Pre/co-requisite: Graduate student, or Instruction permission.

**CTS 350. Mouse Genetics in Cancer Res. 3 Credits.**

The mouse as an experimental tool in cancer research. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 355. Complex Trait Analysis. 2 Credits.**

Mathematical approaches to studying complex diseases of humans using the mouse as a paradigm. Pre/co-requisite: Graduate student, or Instructor permission.

**CTS 382. CTS Seminar. 0.5 Credits.**

Presentation and discussion of current research. Mandatory attendance for all CTS Masters and Doctoral students. Prerequisite: Masters and Doctoral CTS students.

**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 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 395. ST in Clin & Translational Res. 1-18 Credits.**

Special topics in Clinical and Translational Research. Pre/co-requisite: Graduate student, or Instructor permission.

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

Doctoral Dissertation Research. Credit as arranged.

## 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. Prerequisites: PSYC 109, PSYC 161 or Instructor permission.

**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. Prerequisite: CSD 101.

**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 biological, social, cultural, political, and economic determinants in the societal construction of disability. Prerequisite: Junior/Senior/Graduate standing. Cross-listed with: EDSP 274.

**CSD 287. D2: Mindfulness&Helping Skills. 3 Credits.**

This course introduces the students to key elements of mindfulness practice, basic listening and counseling skills, and how to apply them in work and life. Prerequisite: Instructor permission.

**CSD 295. Advanced Special Topics. 1-12 Credits.**

Advanced Special Topics Advanced courses of seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

**CSD 296. Advanced Special Topics. 1-6 Credits.**

See Schedule of Courses for specific titles. Undergraduate only.

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

Assessment and intervention considerations in communication, social interaction and play, selection and use of evaluation tools, and implementation of intervention strategies for children with autism. Prerequisites: Graduate standing or Instructor permission.

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

Seminar exploring interdisciplinary process, collaborative teaming, cultural competence and family-centered care as they relate to children and families affected by neurodevelopmental and related disabilities. Pre/co-requisite: Instructor permission. Cross-listed with: EDSP 295, GRNU 296, PSYC 380, MVSR 381, SWSS 380.

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

Seminar exploring interdisciplinary process, collaborative teaching, cultural competence and family-centered care as they relate to children and families affected by neurodevelopmental and related disabilities. Pre/co-requisite: Instructor permission. Cross-listed with: EDSP 295, GRNU 296, PSYC 380, MVSR 381, SWSS 380.

**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. Prerequisites: Graduate standing or Instructor permission.

**CSD 314. Collab Intervntn Schl Settings. 3 Credits.**

Introduction to a transdisciplinary approach to collaborative, curriculum-based assessment and intervention for students with special needs in school settings. Prerequisites: Graduate standing or Instructor permission.

**CSD 315. Early Lang&Communicatn Interv. 3 Credits.**

Research in normal and disordered language, cognition, and social development is applied to interventions for children, birth to age 5, with language and communication problems. Prerequisites: Graduate standing 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. Prerequisites: Graduate standing or Instructor permission.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission. Concurrent enrollment or completion of CSD 320.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission. Completion of CSD 320.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission.

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

Supervised practicum experiences with children and adults presenting disorders of speech, hearing, and language. Pre/co-requisites: Graduate standing or Instructor permission, CSD 320, CSD 321.

**CSD 330. Assessment of Stuttering. 1 Credit.**

Study of adult and child fluency disorders which focuses upon symptomatology, etiology, and diagnosis of people with stuttering disorder. Prerequisites: Graduate standing or Instructor permission.

**CSD 331. Treatment of Stuttering. 2 Credits.**

Study of adult and child fluency disorders which focuses on rehabilitation of people with stuttering disorder. Prerequisites: Graduate standing or Instructor permission.

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

Etiology, diagnosis, pathology, and habilitation and rehabilitation of articulation of speech. Prerequisites: Graduate standing or Instructor permission.

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

Identification, evaluation, and rehabilitation procedures for children with language disabilities. Prerequisites: Graduate standing or Instructor permission.

**CSD 342. Seminar Lang/Lrng Disabilities. 3 Credits.****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. Prerequisites: Graduate standing or Instructor permission.

**CSD 351. Aphasia in Adults. 3 Credits.**

Study of linguistic and cognitive impairments associated with stroke and other types of neuropathologies in the adult patient. Emphasis on rehabilitation strategies, principles, and procedures. Prerequisites: Graduate standing or Instructor permission.

**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. Prerequisites: Graduate standing or Instructor permission.

**CSD 353. Adult Neuropathologies. 3 Credits.**

Etiology, pathology, diagnosis, and principles of rehabilitation of CNS pathologies affecting communication. Emphasis on motor speech disorders and cognitive consequences of traumatic brain injury. Prerequisites: Graduate standing or Instructor permission.

**CSD 360. Rsch Methods Comm Disorders I. 3 Credits.**

Empirical research methodology as applied to the study of normal and deficient speech, language, and hearing processes. Students analyze data statistically and write a research proposal. Prerequisites: Graduate standing or Instructor permission.



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

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

**CSD 381. Advanced Readings. 1-3 Credits.**

Readings, with conferences, intended to contribute to the programs of graduate students in phases of communication sciences and disorders for which formal courses are not available. Credit as arranged, up to three hours each semester. Prerequisites: Graduate standing or Instructor permission.

**CSD 382. Advanced Readings. 1-3 Credits.**

Readings, with conferences, intended to contribute to the programs of graduate students in phases of communication sciences and disorders for which formal courses are not available. Credit as arranged, up to three hours each semester. Prerequisites: Graduate standing or Instructor permission.

## 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. Markets, Food & Consumers. 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 equivalent.

**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 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. Pre/co-requisites: Minimum Junior standing; PSS 137 or one course in ecology plus one course in design or drawing. Cross-listed with: PSS 238, ENVS 238, NR 238.

**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 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 CS 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 required.

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

International trade, finance, investment and development theories and policies for community development. Prerequisites: CDAE 102 or equivalent. Co-requisite: CDAE 273.

**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 287. Spatial Analysis. 3 Credits.****CDAE 295. Special Topics. 1-12 Credits.**

Lectures or readings on contemporary issues in Community Development and Applied Economics. Enrollment may be more than once, up to twelve hours.

**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 351. Research Methods. 0 or 3 Credits.**

Developing research projects with the scientific methods; evaluating alternative literature review, sampling, surveying, and analytic methods; and reporting the results. 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: CDAE 254 or equivalent.

**CDAE 377. Practicum in Extension Educ. 1-12 Credits.****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 395. Special Topics. 1-6 Credits.**

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

## COMPLEX SYSTEMS (CSYS)

### Courses

**CSYS 205. Software Engineering. 3 Credits.**

Treatment of software engineering problems and principles, including documentation, information hiding, and module interface specification syntax and semantics. Requires participation in a team project. Students who receive credit for CSYS 205 may not receive credit for CSYS 208 or CSYS 209. Cross-listed with: CS 205.

**CSYS 221. Deterministic Modls Oper Rsch. 3 Credits.**

The linear programming problem. Simplex algorithm, dual problem, sensitivity analysis, goal programming. Dynamic programming and network problems. Prerequisite: CSYS 124, CSYS 121 desirable. Cross-listed with: MATH 221.

**CSYS 226. Civil Engineering Systems Anyl. 3 Credits.**

Linear programming, dynamic programming, network analysis, simulation; applications to scheduling, resource allocation routing, and a variety of civil engineering problems. Pre/co-requisites: Senior/Graduate standing in CEE or Instructor permission. Cross-listed with: CE 226.

**CSYS 245. Intelligent Transportation Sys. 3 Credits.**

Introduction to Intelligent Transportation Systems (ITS), ITS user services, ITS applications, the National ITS architecture, ITS evaluation, and ITS standards. Pre/co-requisites: CE 140 or equivalent; Instructor permission. Cross-listed with: CE 245.

**CSYS 251. Artificial Intelligence. 3 Credits.**

Introduction to methods for realizing intelligent behavior in computers. Knowledge representation, planning, and learning. Selected applications such as natural language understanding and vision. Prerequisites: CS 103 or CS 123; CS 104 or CS 124; STAT 153 or equivalent. Cross-listed with: CS 251.

**CSYS 253. Appl 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. Prerequisites: CE 211 or CE 225; or CE 141 or CE 143 with Instructor permission. Cross-listed with: STAT 253.

**CSYS 256. Neural Computation. 3 Credits.**

Introduction to artificial neural networks, their computational capabilities and limitations, and the algorithms used to train them. Statistical capacity, convergence theorems, backpropagation, reinforcement learning, generalization. Prerequisites: MATH 124 or MATH 271; STAT 153 or equivalent; computer programming. Cross-listed with: STAT 256, CS 256.

**CSYS 266. 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. Co-requisite: CSYS 271 or CSYS 230 or Instructor permission Cross-listed with: MATH 266.

**CSYS 268. Mathematical Biology&Ecology. 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. Prerequisites: CSYS 124, CSYS 230; or Instructor permission. Cross-listed with: MATH 268.

**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. 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 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. Cross-listed with: ME 312.

**CSYS 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. Cross-listed with: ME 350.

**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: BIOL 352, CS 352.

**CSYS 355. Statistical Pattern Recognitn. 3 Credits.**

Analysis of algorithms used for feature selection, density estimation, and pattern classification, including Bayes classifiers, maximum likelihood, nearest neighbors, kernels, discriminants, neural networks, and clustering. Prerequisite: STAT 241 or STAT 251 or Instructor permission. Cross-listed with: STAT 355, CS 355.

**CSYS 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. Pre/co-requisites: STAT 223, CS 016/CE 011, or Instructor permission. Cross-listed with: CE 359.

**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. Pre/co-requisites: STAT 223 or STAT 225; CS 016/CE 011 or Instructor permission. Cross-listed with: STAT 369.

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

See Schedule of Courses for specific titles.

## COMPUTER SCIENCE (CS)

### Courses

**CS 201. Operating Systems. 0 or 3 Credits.**

Supervisory and control software for multiprogrammed computer systems. Processes synchronization, interprocess communication, scheduling, memory management, resource allocation, performance evaluation, object-oriented systems, case studies. Prerequisites: CS 101 or CS 121; CS 104 or CS 124.

**CS 204. 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 104 or CS 124.

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

Treatment of software engineering problems and principles, including documentation, information hiding, and module interface specification syntax and semantics. Requires participation in a team project. Students who receive credit for CS 205 may not receive credit for CS 208 or CS 209. Prerequisite: CS 104 or CS 124. Cross-listed with: CSYS 205.

**CS 206. 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 222. 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 101 or CS 121.

**CS 224. 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. CS 125 and one course in probability (e.g. STAT 143, STAT 151 or CS 128) are recommended.

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

The design, implementation and evaluation of user interfaces for computers and other complex, electronic equipment. Includes a significant project. Pre/co-requisites: Programming experience and Junior standing or Instructor permission.

**CS 231. Programming for Bioinformatics. 3 Credits.**

Introductory course on computing (including scripting, database, and statistical analysis) for developing bioinformatics applications. Particular emphasis is given to comparative genomics and systems biology scenarios. Prerequisites: STAT 151, STAT 153 or Instructor permission. Cross-listed with: MMG 231.

**CS 232. Methods in Bioinformatics. 3 Credits.**

This course provides a methodological survey of bioinformatics. Particular emphasis is given to algorithms associated with sequence analysis, comparative genomics, structural biology, and systems biology. Prerequisites: STAT 151, STAT 153, or Instructor permission. Cross-listed with: MMG 232.

**CS 243. 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, CS 125.

**CS 251. Artificial Intelligence. 3 Credits.**

Introduction to methods for realizing intelligent behavior in computers. Knowledge representation, planning, and learning. Selected applications such as natural language understanding and vision. Prerequisites: CS 103 or CS 123; CS 104 or CS 124; STAT 153 or equivalent. Cross-listed with: CSYS 251.



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

Introduction to machine learning, including supervised and unsupervised learning algorithms, reinforcement learning, and computational learning theory. Prerequisites: CS 128, STAT 151 or STAT 153 or equivalent, MATH 121, MATH 124.

**CS 256. Neural Computation. 3 Credits.**

Introduction to artificial neural networks, their computational capabilities and limitations, and the algorithms used to train them. Statistical capacity, convergence theorems, backpropagation, reinforcement learning, generalization. Prerequisites: MATH 124 or MATH 271; STAT 153 or equivalent; computer programming. Cross-listed with: STAT 256, CSYS 256.

**CS 260. Parallel Computing. 3 Credits.**

Taxonomy of parallel computers, basic concepts for parallel computing, effectiveness and scalability, parallel algorithms for variety of problems, distributed memory and shared memory paradigms. Prerequisite: CS 104 or CS 124, or Instructor permission.

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

Introduction to the theoretical and pragmatic principles and practices of computer networking. Topics include: local area networks; the Internet; network and world-wide-web application programming. Prerequisites: CS 026 or CS 110, CS 101 or CS 121, and STAT 153 or equivalent.

**CS 266. 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 104 or CS 124.

**CS 274. Computer Graphics. 3 Credits.**

Graphical representation of two- and three-dimensional objects on color raster displays. Line generation, region filling, geometric transformations, hidden line and surface removal, rendering techniques. Prerequisite: CS 104 or CS 124, MATH 124 or MATH 271, recommended.

**CS 275. Mobile Apps & Embedded Devices. 3 Credits.**

A projects-based course focused on applications development on wireless and embedded platforms, including iOS, Arduino, and Linux-based devices. Emphasis on C programming and cyber-physical systems software. Prerequisite: CS 124. Pre/Co-requisites: CS 148 or CS 204 (recommended but not required).

**CS 276. Integrative Computing. 3 Credits.**

Integrative computing principles and practices: Abstraction via APIs, distributed systems orchestration, security, application design and implementation. Team projects for mobile and other networked, embedded devices. Prerequisites: Senior standing in Computer Science or Instructor permission.

**CS 294. Independent Readings&Research. 1-6 Credits.**

Independent readings and investigation under the direction of faculty member. Prerequisite: Department permission.

**CS 295. Special Topic:Computer Science. 1-18 Credits.**

See Schedule of Courses for specific titles. Subject will vary from year to year. May be repeated for credit.

**CS 296. Special Topic:Computer Science. 1-12 Credits.**

See Schedule of Courses for specific titles. Subject will vary from year to year. May be repeated for credit.

**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. Pre/co-requisites: Computer programming in any language, calculus. (Linear algebra recommended). Cross-listed with: CSYS 302.

**CS 303. Adv Top:Prog Environ&Language. 3 Credits.**

Object-oriented, functional, or procedural programming languages, language design, parsing, translation, compilation, interpretation, programming and runtime environments. May be repeated for credit with Instructor permission.

**CS 316. Adv Topi:Computational Science. 3 Credits.**

Topics chosen from engineering and scientific applications, visualization, large-scale data analysis. May be repeated for credit with instructor permission. Prerequisite: Varies by semester. Instructor permission required.

**CS 321. Adv Top:Computer Architecture. 3 Credits.**

Topics from computer architecture, network architecture, array and vector processors, memory hierarchies. May be repeated for credit with Instructor permission. Prerequisite: CS 222.

**CS 331. Adv Tpcs Database&Kwldg Sys. 3 Credits.**

Topics chosen from database design, knowledge based systems, object-oriented and relational systems, data models, knowledge representation. May be repeated for credit with Instructor permission. Prerequisite: CS 204, CS 224.

**CS 332. Data Mining. 3 Credits.**

Analytical and empirical techniques for analysis of large volumes of data. Topics include association analysis, classification, clustering, pattern discovery in sequential data, and Bayesian networks. Prerequisites: STAT 153 or equivalent; CS 251 recommended.

**CS 346. Adv Top:Theory of Computation. 3 Credits.**

Topics from complexity theory, analysis of algorithms, formal languages, combinatorial and geometric algorithms, and theory of databases, networks, distributed algorithms. May be repeated with Instructor permission. Prerequisite: CS 224, CS 243.

**CS 351. Pattern Anyl&Artificial Intell. 3 Credits.**

Topics chosen from pattern analysis, clustering, neural networks, planning, natural language understanding. May be repeated for credit with instructor permission. Prerequisites: CS 224, CS 351.

**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: BIOL 352, CSYS 352.

**CS 355. Statistical Pattern Recognitn. 3 Credits.**

Analysis of algorithms used for feature selection, density estimation, and pattern classification, including Bayes classifiers, maximum likelihood, nearest neighbors, kernels, discriminants, neural networks, and clustering. Prerequisite: STAT 241 or STAT 251 or Instructor permission. Cross-listed with: STAT 355, CSYS 355.

**CS 361. Adv Topics:Systems Software. 3 Credits.**

Topics chosen from operating systems, distributed or parallel software systems, real-time systems, experimental systems, software engineering. May be repeated for credit with Instructor permission. Prerequisite: CS 201, CS 222.

**CS 363. Computer System Performance. 3 Credits.**

Topics chosen from models of computer and operating system performance and queuing systems. May be repeated for credit with Instructor permission. Prerequisite: CS 201, STAT 151.

**CS 365. Adv Top:Network Design&Anyl. 3 Credits.**

Topics chosen from network design, network protocols, network algorithms, and network performance. May be repeated for credit with Instructor permission. Prerequisite: CS 224, CS 265.

**CS 374. Computer Graphic&Visualization. 3 Credits.**

Topics chosen from computer graphics and visualization, such as rendering, hidden surface removal, animation, data visualization. May be repeated for credit with Instructor permission. Prerequisite: CS 224, CS 274.

**CS 381. Seminar. 1 Credit.**

Presentations by students, faculty, and guest speakers on advanced topics in Computer Science. May be repeated up to three times for credit.

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

Prerequisite: Department permission.

**CS 394. Independent Study. 1-6 Credits.**

Independent readings and investigation under the direction of a faculty member. Prerequisite: Instructor permission.

**CS 395. Special Topics. 1-6 Credits.**

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

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

Credit as arranged.

## COUNSELING (EDCO)

### Courses

**EDCO 220. Developmental Persp in Counsel. 3 Credits.**

Survey of major and emerging theories of human development and application of theoretical concepts to self and others from a counseling perspective. Prerequisite: Graduate standing; others by Instructor permission.

**EDCO 291. Special Topics in Counseling. 1-3 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.

**EDCO 310. Counseling Strats for Teachers. 3 Credits.**

Counseling strategies appropriate for use in the classroom for class management assessment and utilization of different learning styles, and promotion of positive behavior change. Prerequisite: permission.

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

An introduction to the role of the school counselor including developmental guidance program planning and implementation, consultation, crisis intervention, parent education and ethical issues. Prerequisite: Counseling majors or Instructor permission.

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

This course outlines the more commonly used psychological diagnostic categories used to describe youth with developmental and psychological challenges.

**EDCO 342. Assessment in School. 1 Credit.**

This course is designed to provide students with information related to the role of assessment in the practice of school counseling.

**EDCO 344. Modalities: Couns Child & Adol. 3 Credits.**

Study of the practice of counseling children and adolescents using behavioral and cog-behavior theory, narrative theory and practice, and play therapies. Prerequisites: Counseling majors and concurrent with internship or Instructor permission.

**EDCO 345. Diagnosis in Counseling. 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. Prerequisite: Counseling majors or Instructor permission.

**EDCO 346. Treatment Modalities. 3 Credits.**

Students will examine specific treatment approaches (e.g., Cognitive Behavioral Therapy, Narrative Therapy, Adlerian, etc.) with an on the application of theories to practice. Prerequisites: Counseling majors with EDCO 220, EDCO 350, EDCO 374, EDCO 375, and EDCO 392 or Instructor permission.

**EDCO 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. Prerequisite: Graduate standing or Instructor permission.

**EDCO 351. Assessment in MH. 2 Credits.**

Students will learn about common assessment tools and processes used in clinical mental health counseling. Prerequisites: Counseling majors and EDCO 220, EDCO 350, EDCO 374, EDCO 375, and EDCO 377 or Instructor permission.

**EDCO 352. Assessment in Mental Health. 3 Credits.**

This course is designed to provide students with knowledge about common assessment tools and processes used in clinical mental health practice. Prerequisites: EDCO 220, EDCO 350, EDCO 374, EDCO 375, and EDCO 377; Counseling majors or Instructor permission.

**EDCO 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. Prerequisite: Graduate standing or Instructor permission.



**EDCO 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: Counseling Majors only and EDCO 220, EDCO 350, EDCO 374, EDCO 375, EDCO 340, and EDCO 361.

**EDCO 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. Prerequisite: Graduate standing or Instructor permission.

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

Students learn and practice basic counseling skills and techniques. Videotaped practice sessions are supervised by course instructor. Prerequisite: EDCO 374. Counseling majors only.

**EDCO 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. Prerequisite: Counseling majors or Instructor permission.

**EDCO 377. Diversity Issues in Counseling. 3 Credits.**

Students examine personal, cultural, political, and social factors affecting a diverse range of people with focus on developing appropriate and effective counseling skills. Prerequisite: Instructor permission.

**EDCO 380. Prof Problems in Counseling. 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.

**EDCO 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. Prerequisite: EDCO 374, EDCO 375; Graduate standing or Instructor permission.

**EDCO 386. Org Dev for Cnsng & Services. 3 Credits.**

The concept and practice of organization development, analysis of and laboratory experience in the utilization of intervention methodologies. Prerequisite: Instructor permission.

**EDCO 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. Prerequisite: EDCO 360 or program permission.

**EDCO 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: EDCO 220, EDCO 374, EDCO 375, EDCO 377, EDCO 392, or Instructor permission.

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

A supervised experience in counseling in a field (school or mental health) setting. Prerequisites: Counseling majors only and EDCO 220, EDCO 350, EDCO 374, EDCO 375, EDCO 392, EDCO 363, EDCO 340, and EDCO 361..

**EDCO 390. Advanced Counseling Seminar. 3 Credits.**

Analysis and practice of advanced counseling skills with focus on new developments. Emphasis on integration of theory and technique into a consistent counseling model. Prerequisites: EDCO 374, EDCO 375, and Instructor permission.

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

Thesis topic must be approved by a faculty committee.

**EDCO 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.

**EDCO 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: EDCO 220, EDCO 374, EDCO 375, EDCO 377, EDCO 392 and permission of the Instructor.

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

Special issues in counseling, administration and planning, social work, higher education not appropriate to content of existing courses. Prerequisite: Instructor permission. Variable credit.

**EDCO 397. Independent Study. 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.

**EDCO 399. Program Completion Seminar. 1 Credit.**

Students are aided in preparation of a scholarly paper to be presented and discussed in seminar and submitted for publication review. Prerequisite: Counseling majors in final or next to final semester; Instructor permission.

## CURRICULUM & INSTRUCTION (EDCI)

### Courses

**EDCI 200. Contemporary Issues. 0-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Pre/co-requisite: twelve hours in Education and related areas.

**EDCI 238. Teach'g w/Global Perspective. 3 Credits.**

Approaches to teaching global and multicultural issues: justice and human rights, peace, and the environment. Development of curriculum materials. Links between local and global concerns. Prerequisite: Twelve hours of Education and related areas.

**EDCI 245. Computer Apps in Elem&Sec Curr. 3 Credits.**

For elementary, secondary educators with experience in simple programming. Design of instructional procedures, integrating computers into school curriculum. Use of computer software to teach basic skills, reasoning, thinking skills. Prerequisites: CS 003 or equivalent; Instructor permission.

**EDCI 261. Current Direction in C&I. 3 Credits.**

Current trends, issues, literature, programs, and organizational activities in fields of curriculum and instruction emphasizing areas of individual concern. Focus on elementary and secondary school levels. Prerequisite: Twelve credits in Education or equivalent.

**EDCI 295. Laboratory Experience in Educ. 1-6 Credits.**

Supervised fieldwork designed to give students experience in specialized areas for their professional development. Prerequisite: Permission of the Coordinator of Professional Laboratory Experiences.

**EDCI 296. Laboratory Experience in Educ. 1-6 Credits.**

Supervised fieldwork designed to give students experience in specialized areas for their professional development. Prerequisite: Permission of the Coordinator of Professional Laboratory Experiences.

**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 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 334. Social Studies in Elem Schools. 3 Credits.**

Study of literature, research, and problems in teaching social studies in the elementary school. Prerequisite: Twelve hours in Education and related areas.

**EDCI 356. Methods & Materials in Math. 3 Credits.**

Evolution of mathematical concepts, notations. Meaning of numbers, number-systems. Theory underlying fundamental operations, metric measurements, analysis of modern approach to mathematics. Manipulative approach to teaching mathematics. Prerequisite: Twelve hours in Education and related areas.

**EDCI 363. Analysis of Curr & Instruc Sem. 3 Credits.**

A case study of the design, implementation, and evaluation of selected curricular and instructional improvements. Prerequisite: Ed.D. students have priority.

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

Thesis topic must be approved by a faculty committee. Credit as arranged.

**EDCI 397. Problems in Education. 1-6 Credits.**

Individual work on a research problem selected by the student in consultation with a staff member. Pre/co-requisites: Twelve hours in Education and related areas; endorsement by a sponsoring faculty member.

**EARLY CHILDHOOD PRE K-3 (EDEC)****Courses**

**EDEC 397. Problems in Education. 1-6 Credits.**

**EARLY CHILDHOOD SPECIAL EDUC (ECSP)****Courses**

**ECSP 200. Contemporary Issues. 1-6 Credits.**

**ECSP 202. D2:Introduction to EI/ECSE. 3 Credits.**

This course serves as an introduction to the profession and the importance of becoming an advocate for children (0 - 6) experiencing diversity of ability, culture and/or language.

**ECSP 210. Curriculum in EI/ECSE. 3-4 Credits.**

Designing and implementing services and supports for young children with diverse abilities. Topics include IEP/IFSP, embedding instruction, family-centered, and inclusion. three credits, four credits with 30-hour field experience. Pre/co-requisites: ECSP 202 and ECSP 211. Cross-listed with: ECSP 310.

**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 with 30-hour field experience. Pre/co-requisite: Completion or co-enrollment in ECSP 202 for undergraduates. Cross-listed with: ECSP 311.

**ECSP 295. Lab Experience in Education. 1-6 Credits.**

Undergraduate only.

**ECSP 310. Curriculum in EI/ECSE. 3 Credits.**

Designing and implementing services and supports for young children with diverse abilities. Topics include IEP/IFSP, embedding instruction, family-centered, and inclusion (30 hour field experience). Pre/co-requisite: ECSP 202 and ECSP 201. Cross-listed with: ECSP 210.

**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 (30-hour practicum). Pre/co-requisite: Completion or co-enrollment in ECSP 202. Cross-listed with: ECSP 211.

**ECSP 319. Intern Specialized Personnel. 1-6 Credits.**

Undergraduate only.

**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. Cross-listed with: ECSP 220. For undergraduates only.

**ECSP 386. Internship: EI/ECSE. 1-12 Credits.**

Semester-long internship in an early intervention and/or early childhood special education setting. Pre/co-requisite: ECSP 310, ECSP 311, EDSP 217, EDSP 301, or Instructor permission.

**ECSP 391. Master's Thesis Research. 1-12 Credits.****ECSP 397. Problems in Education. 1-6 Credits.****EDUCATION (EDSS) (EDSS)****Courses****EDSS 200. Contemporary Issues. 0-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDSS 208. The Mass Media as Educator. 3 Credits.**

Analysis and assessment of the mass media's teachings about reality and worth and how to live our lives individually and collectively. Appropriate for non-education students. Pre/co-requisites: Junior standing for undergraduates; also can be taken for Graduate credit.

**EDSS 248. Educational Media. 3 Credits.**

Modern instructional aids, theory and practice, educational media related to psychology of teaching and learning. Prerequisite: Twelve hours in education and related areas.

**EDSS 295. Laboratory Exp in Education. 1-12 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.

**EDSS 309. Interdisciplinary Seminar. 3 Credits.**

Introduction to interdisciplinary study; the field of policy analysis and social change. Core academic experience for Interdisciplinary Majors. Prerequisite: Interdisciplinary majors; others by Instructor permission.

**EDSS 313. Stat Meth Ed & Social Services. 3 Credits.**

Basic concepts of descriptive and inferential statistics. Topics: frequency distributions; measures of central tendency, dispersion; correlation, hypothesis testing. Application of concepts to educational situations.

**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 321. School Improvement: Thry & Prac. 4-6 Credits.**

Analysis of research and practices pertinent to improvement of American schools. Student assignments include synthesis papers and site-specific research projects derived from course studies. Prerequisite: Twelve hours of Graduate study in education.

**EDSS 336. Professional Writing. 3 Credits.**

Problems in writing faced by professionals in educational and human service settings. Students write reports, critiques, reviews; analyze examples of published work; receive detailed critiques of their work.

**EDSS 343. The Study of Teaching. 3 Credits.**

Study of the art and science with emphasis on students' own teaching. Current research on teaching and self-study are major foci. Prerequisite: Twelve hours of education; teaching experience.

**EDSS 349. Quasi-Experiment in Ed & SS. 3 Credits.**

Quasi-experimental designs are analyzed, compared, and contrasted with "true experiments." Strategies for addressing threats to the validity of quasi-experiments are studied. Design exemplars are evaluated. Prerequisite: EDSS 313, PSYC 340, STAT 211, or equivalent.

**EDSS 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.

**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 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: EDSP 387.

**EDSS 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

**EDSS 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.

**ELECTRICAL ENGINEERING (EE)**



## Courses

### EE 209. Transient Phenomena. 3 Credits.

Study of complex variable basis of Laplace and Fourier Transforms; applications to transient behavior of lumped and distributed parameter systems, root locus. Nyquist criterion and two-dimensional field problems. Prerequisite: MATH 271.

### 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. Prerequisites: EE 171 or ME 111. Cross-listed with: ME 210.

### EE 212. Computer Vision. 3 Credits.

Introduction to computer vision systems for interactive and industrial applications using both hard/software computational approaches. Pre/co-requisites: MATH 124 or MATH 271 and CS 026, or Instructor permission. Cross-listing: CS 212.

### 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 124.

### EE 221. Prin VLSI Digital Circuit Des. 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. Pre/co-requisites: EE 131, EE 163, EE 121.

### EE 222. Prin VLSI Analog Cir 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 163, EE 121, Instructor permission.

### EE 224. Principles VLSI System Design. 3 Credits.

Survey of VLSI design. Architecture and partitioning of functions. Design for testability. Simulation including timing. Synthesis. Design verification; manufacturing interface. Required team project and report. Prerequisites: EE 221 or Instructor permission.

### EE 227. Biomed Measmnts Instrum & Sys. 3 Credits.

Biomedical and clinical engineering in research, industry, and health care institutions. Measurement techniques and instrumentation. Integrated biomedical monitoring, diagnostic, and therapeutic systems. Co-requisites: EE 121, ANPS 020; Instructor permission. Alternate years.

### 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. Prerequisites: Senior standing in Engineering or Physics.

### 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, either EE 134 or CS 101.

### EE 232. Digital Computer Design II. 3 Credits.

Memory designs, error control, high-speed addition, multiplication, and division, floating-point arithmetic, cpu enhancements, testing and design for testability. Prerequisites: EE 231.

### EE 233. Microprocessor Systems & Appl. 0 or 4 Credits.

Basic principles of mini/microcomputers; A/D; D/A; channels, magnetic devices, display devices, mechanical devices; interface designs of analog systems to mini/microcomputers; principles of microprogramming; bit-slice-based microcomputers. Prerequisites: Department permission; CS 101 desirable.

### EE 241. Electromagnetic Wave Theory. 3 Credits.

Electromagnetic radiation and wave propagation in complex media and systems: angular spectrum of plane waves, dispersive pulse propagation, applications to communications, imaging and remote sensing. Prerequisite: EE 141 or equivalent.

### EE 245. Quantum Electronics. 3 Credits.

A theoretical description of light-matter interactions in photon emitting resonant cavities. A practical understanding of laser design and operation. Prerequisite: EE 141.

### EE 247. Physical Optics. 3 Credits.

Fundamental properties of the optical field. Molecular optics and the Ewald-Oseen extinction theorem. Foundations of geometrical optics. Diffraction and aberration theory. Prerequisite: EE 141.

### EE 250. Test Engineering. 3 Credits.

Parametric, structural, functional, characterization and stress testing of components and subsystems. Test methods, strategies, planning, and economics. Test equipment hardware and software. Prerequisites: EE 121, EE 131.

### EE 251. Digital Syst Testing & Design. 3 Credits.

Circuit failures, fault models, testing and test pattern generation, logic and fault simulation, design for testability, scan design, test interfaces, design for built-in self-test. Prerequisite: EE 131.

### EE 261. Solid State Mat & Devices I. 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. Homojunctions, heterojunctions, and Schottky barriers. Prerequisite: EE 163.

### EE 262. Solid State Mats & Devices II. 3 Credits.

Multijunction and interface devices. Heterostructure and optical devices. Dielectric and optical properties solids. High-frequency and high-speed devices. Prerequisite: EE 261.

### EE 266. Science & Tech Integrated Cir. 3 Credits.

Science and technology of integrated circuit fabrication. Interaction of processing with material properties, electrical performance, economy, and manufacturability. Prerequisites: EE 163 or EE 261; concurrent registration in EE 164 or EE 262.

### 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. Prerequisites: STAT 143/STAT 151/STAT 153.

**EE 273. Digital Communications. 3 Credits.**

Digital modulation/demodulation methods and BER performance; source entropy and channel capacity; optimal detection; convolutional codes and decoding algorithms. Pre/co-requisites: EE 174 and STAT 151.

**EE 274. Intro Wavelets & Filter Banks. 3 Credits.**

Continuous and discrete-time signal processing. Continuous wavelet transform. Series expansion of continuous and discrete-time signals. Perfect reconstruction, orthogonal and biorthogonal filter banks. Wavelets from filters. Prerequisites: EE 171, or Instructor permission.

**EE 275. Digital Signal Processing. 3 Credits.**

Sampling and reconstruction of signals. DFT, FFT and the z-transform. FIR and IIR filter design. Speech coding. Accompanying lab: EE 289. Pre/co-requisites: EE 171; Instructor permission.

**EE 276. Image Processing & Coding. 3 Credits.**

Image enhancement techniques by point and spatial operations. Data compression techniques to include scalar quantization, entropy coding, transform and sub-band coding. Labs on PC hardware; PC and Unix-based software. Prerequisite: EE 275.

**EE 277. Image Anyl&Pattern Recognition. 3 Credits.**

Image, shape, and texture analysis. Statistical pattern recognition methods. Pattern recognition and computer vision techniques for machine parts recognition and automatic visual inspection. Prerequisite: EE 276.

**EE 278. Wireless Communication. 3 Credits.**

Modern wireless systems, including cellular design, propagation modeling, multiple access and equalization techniques. Pre/co-requisites: EE 174 and STAT 151.

**EE 281. Materials Science Seminar. 1 Credit.**

Presentation and discussion of advanced electrical engineering problems and current developments. Prerequisite: Senior or Graduate Engineering enrollment.

**EE 295. Special Topics. 1-18 Credits.**

Special topics in developing areas of Electrical Engineering. Prerequisites: Senior standing; or Instructor permission.

**EE 301. System Theory. 4 Credits.**

Basic concepts in system theory; linear vector spaces; state variable representation; phase plane analysis of nonlinear dynamic systems; limit cycles; Lyapunov stability. Applications in engineering. Prerequisites: MATH 230 or MATH 271, MATH 124, EE 171.

**EE 302. Stochastic Processes. 4 Credits.**

Probability theory, random variables and stochastic processes. Response of linear systems to random inputs. Applications in engineering. Prerequisites: EE 171 and STAT 151.

**EE 310. Digital Control Systems. 3 Credits.**

Digital control system analysis and design using transform, algebraic, and state space methods. Sampled data systems, stability, quantization effects, sample rate selection, computer-based realization. Prerequisite: EE 210 or Instructor permission.

**EE 312. Intro Optimum Control Systems. 3 Credits.**

Optimal control problem formulation and solution; including the calculus of variations, Pontryagin's maximum principle, Hamilton-Jacob theory, dynamic programming, and computational methods. Prerequisite: EE 210.

**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: EE 201 or MATH 230.

**EE 338. Semiconductor Dev Model&Simul. 3 Credits.**

Analysis and application of computer models for semiconductor process and device simulation. Strategies for development of device models for circuit simulation. Prerequisite: EE 262; Instructor permission.

**EE 341. ST:Electromagnetic Field Thry. 3 Credits.**

For advanced students in the field of electromagnetism. Topics selected from special interests of staff with lectures and readings from current literature.

**EE 352. Adv Semicond Device Phys & Des. 3 Credits.**

MOSFET, bipolar, and CMOS device parameters, their characterization, and their relation to process technology. Description and use of computer-aided process and device models. Prerequisite: EE 262. Alternate years. Spring semester.

**EE 354. MOS Analog Intergrtd Circ Dsgn. 3 Credits.**

Analysis and design of MOS analog integrated circuits. Each student will design, layout, test, and document an analog integrated circuit using computer-aided-design techniques. Prerequisite: EE 338, EE 339.

**EE 365. Optoelectronic Devices. 3 Credits.**

Optical and electro optical properties of semiconductors. Applications to photodetectors, solar cells, light emitting diodes and lasers. Prerequisites: EE 142, EE 261.

**EE 366. Solid State & Semicond Thry I. 3 Credits.**

Energy band theory for electrons and phonons in crystalline solids. Brillouin zones. Conservation laws. Elements of statistical mechanics. Transport properties. Applications to semiconductor electronics. Prerequisite: EE 261, PHYS 273 or CHEM 263.

**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: EE 302.

**EE 373. Adv Topics in Communications. 3 Credits.**

Advanced topics of current interest in communication systems. Topics may include channel coding/decoding, software radio, ad-hoc networks, wireless systems, etc. Prerequisites: EE 273 or Instructor permission.

**EE 391. Master's Thesis Research. 1-18 Credits.****EE 392. Master's Project. 1-3 Credits.**

Master's Project.



**EE 395. Advanced Special Topics. 1-6 Credits.**

Advanced topics of current interest in electrical engineering.  
Prerequisite: Instructor permission.

**EE 491. Doctoral Dissertation Research. 1-18 Credits.****ELEMENTARY EDUCATION (EDEL)****Courses****EDEL 200. Contemporary Issues. 0-3 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDEL 270. Kindergarten Methods & Org. 3 Credits.**

Objectives, organization, curriculum, methods and materials, and relationships of kindergarten preschool experiences. Prerequisite: Twelve hours in education and related areas.

**EDEL 271. Kindergarten Educ W/Lab. 3 Credits.**

Designed to acquaint the prospective kindergarten teacher with educational research conducted by Piaget, Bruner, Montessori, and others with experiences provided for working with children of kindergarten age. Prerequisite: Twelve hours in education and related areas.

**EDEL 319. Internship Specialzd Personnel. 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.

**EDEL 334. Social Studies in Elem Schools. 3 Credits.**

Study of literature, research, and problems in teaching social studies in the elementary school. Prerequisite: Twelve hours in Education and related areas.

**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 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.

**EMERGENCY MEDICAL TECHNICIAN (SURG)****Courses****SURG 200. Emergency Medicine Research I. 3 Credits.**

Introduction to research in emergency medicine with a laboratory focusing on human subjects research in the emergency department. Prerequisites: Junior status or Instructor permission; completion of mandatory hospital training at least one month before semester.

**SURG 201. Emergency Medicine Research II. 3 Credits.**

Advanced discussion and research training in emergency medicine with continued emergency department-based human subjects laboratory. Prerequisite: SURG 200.

**SURG 220. Adv Topics Emerg Med Research. 3-6 Credits.**

Emergency medicine research under guidance of a faculty member. Prerequisites: SURG 200, SURG 201 and/or faculty permission.

**SURG 301. Immunity and Host Defense. 3 Credits.**

This course will cover aspects of the immune system that are necessary to understand the complex interactions between pathogen and host. Prerequisites: BIOL 001 and BIOL 002 or equivalent.

**ENGINEERING (ENGR)****Courses****ENGR 201. Ethics in CEMS Rsrch/Practice. 1 Credit.**

Professional responsibilities of computer scientists, engineers, mathematicians and statisticians in research and practice. Professional rights and responsibilities, research integrity, fair credit in research and publication. Prerequisite: Senior/Graduate standing.

**ENGLISH (ENGS)****Courses****ENGS 201. Sem Engl Lang or Critical Thry. 3 Credits.**

Recent topics: "Origins and Development of the English Language;" "Re-disciplining the History of Literature and the Literature of History. Prerequisites: ENGS 086, six hours at the intermediate level, and Instructor permission.

**ENGS 202. Sem Engl Lang or Critical Thry. 3 Credits.**

Recent topics: "Origins and Development of the English Language;" "Re-disciplining the History of Literature and the Literature of History;" "Women's Texts. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 211. Sem in Composition & Rhetoric. 3 Credits.**

Recent topics: "Writing the New Yorker;" "Writing Vermont Life;" "Editing and Publishing. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 212. Sem in Composition & Rhetoric. 3 Credits.**

Recent topics: "Writing the New Yorker;" "Writing Vermont Life;" "Editing and Publishing. Prerequisite: ENGS 086; six hours at the intermediate level; and Instructor permission.

**ENGS 221. Seminar in Literature to 1800. 3 Credits.**

Recent topics: "Women in 17th Century English Poetry; Dante and the Experience of Reading;" "Orality and Textuality in Middle English Literature. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 222. Seminar in Literature to 1800. 3 Credits.**

Recent topics: "Women in 17th Century English Poetry; Dante and the Experience of Reading;" "Orality and Textuality in Middle English Literature. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 241. Seminar in 19th Century Lit. 3 Credits.**

Recent topics: "Dickens"; "Reader, I Married Him: The Brontes;" "Love, Marriage, and Literary Criticism: Jane Austen;" "Reading Serially: The Victorian Novel; Invisible Man and 19th Century American Literature, The Gothic." Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 242. Seminar in 19th Century Lit. 3 Credits.**

Recent topics: "Dickens"; "Reader, I Married Him: The Brontes;" "Love, Marriage, and Literary Criticism: Jane Austen;" "Reading Serially: The Victorian Novel; Invisible Man and 19th Century American Literature, The Gothic." Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 251. Seminar in 20th Century Lit. 3 Credits.**

Recent topics: "The Beat Generation;" "Literature and Society in Modern Ireland;" "Dostoevsky's Influence on 20th Century American Literature. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 252. Seminar in 20th Century Lit. 3 Credits.**

Recent topics: "The Beat Generation;" "Literature and Society in Modern Ireland;" "Dostoevsky's Influence on 20th Century American Literature. Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 281. Sem Lit Themes, Genres, Folklore. 3 Credits.**

Recent topics: "Spiritual Journeys;" "Murder, He Said: Detective Fiction;" "Chekhov to Cheever: The Short Story." Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 282. Sem Lit Themes, Genres, Folklore. 3 Credits.**

Recent topics: "Spiritual Journeys;" "Murder, He Said: Detective Fiction;" "Chekhov to Cheever: The Short Story." Prerequisite: ENGS 086; six hours at the intermediate level; Instructor permission.

**ENGS 290. Sem Prospective Tchrs of Engl. 3 Credits.**

Approaches to teaching composition, literature, and the English language in secondary school. Prerequisites: ENGS 086, six hours at the intermediate level, and Instructor permission.

**ENGS 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisites: ENGS 086, six hours at the intermediate level, and Instructor permission.

**ENGS 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisites: ENGS 086, six hours at the intermediate level, and instructor permission.

**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.

**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.

**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.

**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 370. Principles of Literary Rsch. 3 Credits.**

Methods of literary study, research, and scholarship, including bibliographic, manuscript, and archival work.

**ENGS 391. Master's Thesis Research. 1-6 Credits.****ENGS 392. Seminar Paper Review. 0 Credits.****ENGS 397. Special Readings & Research. 1-6 Credits.**

Directed individual study of areas not appropriately covered by existing courses. Permission of Graduate Director.

## ENVIRONMENTAL STUDIES (ENVS)

### Courses

**ENVS 212. 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 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. Pre/co-requisites: Minimum Junior standing, PSS 137 or one course in ecology plus one course in design or drawing. Cross-listed with: CDAE 238, PSS 238, NR 238.

**ENVS 267. Environmental History Seminar. 3 Credits.**

Advanced reading and research on the role and influence of nature on human history and how people and cultures have influenced the natural world. Prerequisites: ENVS 151; six credits in History. Cross-listed with: HST 267.

**ENVS 291. Advanced Env Practicum. 1-12 Credits.**

Individual readings and research, internship, or field-based learning experience at the advanced level, under direction of faculty member or environmental practitioner. Prerequisite: ENVS 001, ENVS 002; Senior/Graduate standing.

**ENVS 292. Env Conflict Resolution. 3 Credits.**

Explores the causes of conflicts involving environmental concerns and the role of environment as a factor in conflict development and mediation. Pre/co-requisites: 100-level course in Environmental Studies or Natural Resources; Junior, Senior, or Graduate standing.

**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. Prerequisite: 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: Six hours of intermediate or advanced courses in Environmental Studies or related areas.

**ENVS 295. Advanced Special Topics. 1-18 Credits.**

Advanced courses of current areas of interest which may vary each semester. Topics have included environmental health, energy, regional planning, international studies, literature, ethics, and natural area management. Prerequisite: One environmental course at 100 level; Junior standing.

**FOOD SYSTEMS (FS)****Courses****FS 335. Qualitative Research Methods. 3 Credits.**

This course provides an overview of qualitative research methods and an opportunity to apply such research methods for topics focusing on food systems and health.

**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, Society & 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 350. Food Systems Immersion. 3 Credits.**

This problem-based course uses current issues in Vermont's food system to explore systems complexity, emergence and interdependence. Pre/co-requisites: FS 340, FS 345.

**FS 391. Master's Thesis Research. 1-18 Credits.****FS 395. Special Topics. 0-18 Credits.**

See Schedule of Courses for specific titles.

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

See Schedule of Courses for specific titles.

**FORESTRY (FOR)****Courses****FOR 222. Advanced Silviculture. 0 or 3 Credits.**

Scientific basis and contemporary status of silviculture practices. Prerequisite: FOR 223; permission. Alternate years, 2000-01.

**FOR 225. Tree Structure & Function. 3 Credits.**

Basic anatomy and physiology of trees and other woody plants, emphasizing their unique structural and physiological adaptations to the environment. Prerequisite: Permission.

**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: CHEM 031, CHEM 032, NR 103, NR 143 or NR 146, or Instructor permission. Cross-listed with: NR 228.

**FOR 235. Forest Ecosystem Health. 4 Credits.**

Forest health is a broadly defined, emerging discipline in forestry and ecology that examines the agents and processes affecting tree and forest decline. Pre/co-requisites: NR 103, BIOL 001 and BIOL 002 or PBIO 004, MATH 009, FOR 021, preferred FOR 121.

**FOR 272. Sustainable 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. Prerequisite: FOR 122, NR 205; concurrent or prior enrollment in FOR 223, or Graduate standing.

**FOR 285. Advanced Special Topics. 0-6 Credits.**

Advanced special topics courses or seminars in forestry beyond the scope of existing formal courses. Prerequisite: Graduate or advanced undergraduate standing; Instructor permission. Credit as arranged.

**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. Prerequisite: Instructor permission.

**FOUNDATIONS (EDFS)****Courses****EDFS 200. Contemporary Issues. 3 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**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 204. Sem in Educational History. 3 Credits.**

Selected topics in history of education. Education in democratic and authoritarian social orders. Topics: education of women, black heritage, American higher education in transition. Prerequisite: Twelve hours in education and related areas or Instructor permission.

**EDFS 205. History of American Education. 3 Credits.**

Educational principals and practices in the U.S. as they relate to the main currents of social history. Key ideas of historic and contemporary significance. Prerequisite: Twelve hours in education and related areas or Instructor permission.

**EDFS 206. D2:Comparative Education. 3 Credits.**

Examines educational challenges confronting countries around the world. Explores issues related to sustainable development, diversity, citizenship, and justice in formal and nonformal educational contexts. Prerequisite: Twelve hours in education and related areas.



**EDFS 207. Traditionalist Education. 3 Credits.**

Perspectives on schooling at all levels directed at preserving and extending a heritage (cultural, racial, ethnic, religious, regional, national), or promoting individual freedom, character, or academic excellence. Selected topics, Instructor choice. Prerequisite: Junior standing. Also for Graduate credit.

**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 255. School as Social Institution. 3 Credits.**

Examination of the school and related social institutions, focus on themes, including: social class, race, ethnicity, socialization, role of the family, social change. Prerequisite: Twelve hours of education and related areas.

**EDFS 295. Lab Experience 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.

**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 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 322. D1:Chall Multicult/Ed&Soc Inst. 3 Credits.**

Critical analysis of social, historical, and philosophical dimensions of multiculturalism. Examination of identity, empowerment, and justice and their relationships to educational/social policies and practices. Prerequisite: Twelve hours in education and related areas.

**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 352. Aesthetic Ed & Social Justice. 3 Credits.**

Exploration of art that deepens understanding of educational and social problems. Focus on artists who challenge dominant powers. Incorporates democratic perspectives on art and aesthetics. Prerequisite: Twelve hours in education and related areas.

**EDFS 353. Program Evaluation&Assessment. 3 Credits.**

Introduction to program evaluation concepts and methods in education; contemporary theory and practice in educational assessment and testing.

**EDFS 354. Anth Persp on Ed & Soc Serv. 3 Credits.**

Examination of formal and non-formal education as means to produce and alleviate cultural conflict. Incorporates an autobiographical approach to studying socio-cultural implications of schooling and social services. Emphasis on Third World situations. Prerequisite: Twelve hours in education and related areas.

**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 369. Ethics in Ed & Soc Serv Admin. 3 Credits.**

Critical examination of theories of ethical decision making. Implications for leadership in educational, social service settings. Ethical investigation utilizing research, scholarship, actual incidents, case studies, role playing. Prerequisite: Ed.D. students have priority.

**EDFS 377. Seminar Educational Psychology. 3 Credits.**

Personal values, attitudes, beliefs related to learning. Psychological research of the teaching-learning process. Research use in analysis of educational processes. Applications for educational settings. Prerequisite: Twelve hours in education and related areas.

**EDFS 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.

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

Thesis topic must be approved by a faculty committee.

**EDFS 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.

**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.

**FRENCH (FREN)****Courses****FREN 235. Medieval/Renaissance Topics. 3 Credits.**

Study of literary and non-literary writings from Medieval and Renaissance France. Texts may deal with questions of otherness, religion, gender, and/or politics. Prerequisites: FREN 141 or FREN 142.

**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 247. Power/Desire in Class Fr Drama. 3 Credits.**

How dramatists like Corneille, Moliere and Racine used history, legend and satire to explore questions of tyranny, freedom, passion, generosity, hypocrisy, truthfulness and more. Prerequisites: FREN 141 or FREN 142.

**FREN 256. EnlightenmentSocietyReimagined. 3 Credits.**

How did 18C writers use the representation of social hierarchy, gender relations, the exotic, etc., to (re-)define French culture on the eve of the Revolution? Prerequisites: FREN 141 or FREN 142.

**FREN 265. Romanticism and Symbolism. 3 Credits.**

Exploration of the idealist tradition in 19th century French poetry and novels. Authors may include Constant, Chateaubriand, Stael, Hugo, Flaubert, Baudelaire, Verlaine, Mallarme. 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 270. Lyric Poetry:Harmony & Crisis. 3 Credits.**

A consideration of the French lyric tradition. Authors may include the troubadours, Ronsard, Dubellay, Hugo, Baudelaire, Mallarme, Rimbaud, Valery, Roubaud. 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 276. Topics in Modern French Lit. 3 Credits.**

Selected topics dealing with poetry and/or narrative related either to an historical period or a literary movement. 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 289. African Lit: French Express. 3 Credits.**

Study of West African poetry, theatre, novel, and civilization as an expression of the Black experience in the language of the French colonizer. Prerequisites: FREN 141 or FREN 142.

**FREN 292. Topics in French Culture. 3 Credits.**

In-depth study of a major aspect of French culture. See Schedule of Courses for specific offering. Prerequisites: FREN 131 or FREN 132 or Instructor permission.

**FREN 293. Quebec Culture. 3 Credits.**

Sociocultural study of the Francophone culture of Canada. Prerequisite: FREN 141 or FREN 142.

**FREN 294. Topics in French Cinema. 3 Credits.**

A topical approach to the study of French cinema and cinematographic aesthetics, from the medium's beginnings through contemporary films. Prerequisites: FREN 141 or FREN 142.

**FREN 295. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

**FREN 296. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

**FREN 297. Advanced Readings & Research. 1-6 Credits.**

Permission of Chair required.

**FREN 298. Advanced Readings & Research. 1-6 Credits.**

Permission of Chair required.

**FREN 391. Master's Thesis Research. 1-18 Credits.****GEOGRAPHY (GEOG)****Courses****GEOG 202. Research Methods. 3 Credits.**

A systematic overview of the art and science of geographical inquiry. Examination of key research and methodological approaches in the discipline. Prerequisite: Junior/Senior standing; nine hours in Geography.



**GEOG 203. Contemp Geog Thought Context. 3 Credits.**

A survey of paradigms and issues in contemporary geography. Attention paid to the social and historical contexts of geographic thought. Prerequisite: Nine hours in Geography or Instructor permission.

**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. Prerequisite: Senior/Graduate standing with nine hours in Geography or Instructor permission.

**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. Pre/co-requisites: GEOG 143 or GEOG 144 and Senior or Graduate standing with nine hours in Geography.

**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. Prerequisite: Senior/Graduate standing with nine hours in Geography or Instructor permission.

**GEOG 273. Adv Top:Political Econ&Ecology. 3 Credits.**

Advanced offerings in political ecology and political economy, particularly at global and regional scales. Possible topics include Third World economic restructuring, globalization, international environmental movements. Prerequisite: Senior/Graduate standing with nine hours in Geography or Instructor permission.

**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. Prerequisite: Senior/Graduate standing with nine hours in Geography, or Instructor permission.

**GEOG 281. Adv Topic:GIS & Remote Sensing. 3 Credits.**

Advanced offerings in GIS or remote sensing focusing on landscape interpretation for decision-making practices. Incorporation of applications from Vermont public and private sectors. Prerequisites: Senior or Graduate standing with nine hours in Geography; or Instructor permission.

**GEOG 287. Spatial Analysis. 3 Credits.**

Analysis of spatial pattern and interaction through quantitative models; introduction to measurement, sampling, and covariation in a spatial framework. Prerequisites: Senior/Graduate standing with at least nine hours in Geography or Instructor permission.

**GEOG 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GEOG 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GEOG 297. Readings & Research. 1-6 Credits.****GEOG 298. Readings & Research. 1-6 Credits.****GEOG 300. Graduate Tutorial. 3 Credits.**

Readings and research on topics arranged individually by students with instructors; attendance in appropriate undergraduate courses may be required. Prerequisite: Instructor permission.

**GEOG 391. Master's Thesis Research. 1-18 Credits.****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 260.

**GEOL 217. Vermont Field Geology. 4 Credits.**

Field observations of rocks and surficial materials across northern Vermont are utilized to decipher the region's geologic history. Readings complement field work. Pre/co-requisite: Graduate student standing.

**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. Pre/co-requisite: GEOL 110.

**GEOL 233. Environmental Isotope Geochem. 3 Credits.**

Course focuses on stable isotope geochemistry of low temperature processes occurring on and near the earth surface through lecture, laboratory, and seminar. Prerequisite: Introductory Chemistry.

**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: Introductory Chemistry.

**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: CHEM 031, 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. Prerequisite: GEOL 101, GEOL 110.

**GEOL 242. Basin Analysis. 3 Credits.**

This course examines the formation and evolution of sedimentary basins, including tectonic setting, sediment supply, and subsidence history. Prerequisite: GEOL 153.

**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 255. Geohydrology. 4 Credits.**

Field-based projects address hydrologic processes in geological context; precipitation, runoff, ground water flow, river behavior, and hillslope stability. Stresses data analysis, writing, and practical approaches to water-related environmental problems. Prerequisite: Major in science or engineering or permission.

**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. Prerequisite: GEOL 101, GEOL 110, PHYS 011, or Instructor permission.

**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 265. Geomicrobiology. 3 Credits.**

An introduction to microbial control of redox chemistry on Earth's surface, including field techniques and a detailed look at how microbes affect element cycling. Prerequisite: GEOL 135.

**GEOL 266. Microstructures. 3 Credits.**

This course will focus on deformation of rocks and minerals at the microscopic scale and the practical use of photographic analyses to unravel tectonic histories. Pre/co-requisite: GEOL 260.

**GEOL 272. Regional Geology. 0 or 4 Credits.**

Discussion of the geology of a selected region of North America; a four-week summer field trip to the area in question. Prerequisite: GEOL 101, GEOL 110, or equivalent.

**GEOL 273. Geology of the Appalachians. 3 Credits.**

Origin of mountain belts; the Appalachian mountain system discussed in terms of tectonics and geologic processes active in modern continental margins. Prerequisite: GEOL 101, GEOL 110, or Instructor permission.

**GEOL 278. Principles of Aquatic Systems. 3 Credits.**

See NR 278.

**GEOL 295. Advanced Special Topics. 1-12 Credits.**

See Schedule of Courses for specific titles.

**GEOL 296. Advanced Special Topics. 1-12 Credits.**

See Schedule of Courses for specific titles.

**GEOL 301. Intro to Graduate Studies. 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 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 335. Aqueous Environmental Geochem. 3 Credits.**

This course focuses on the chemical equilibrium and kinetics principles governing water chemistry, including water interaction with the atmosphere, microbes and minerals. Prerequisite: Graduate standing.

**GEOL 351. Surface Proc & Quaternary Geol. 1-3 Credits.**

Discussion and critique of scientific literature pertaining to Earth surface history and processes. Critical examination of author's methods, data, and assumptions. Student-led discussions. Specific focus changes yearly. Prerequisites: Graduate standing in science, natural resources or engineering, or Instructor permission.

**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. Prerequisites: Graduate standing in science, natural resources, or engineering, or Instructor permission.

**GEOL 360. Structural Anyl Deformed Rocks. 4 Credits.**

Mechanisms of rock deformation; fracture phenomena and analysis; fault zone characteristics; fold generation analysis. Stress and strain interpretation of deformational features in rocks and minerals. Field work. Prerequisite: GEOL 260 or equivalent.

**GEOL 361. Advanced Structural Geology. 3 Credits.**

Selected topics in analytical structural geology. Prerequisite: GEOL 260 or equivalent.

**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. Prerequisite: Graduate standing in Geology.

**GEOL 384. Teaching in the Geosciences. 1 Credit.**

A review of the pedagogical underpinnings of introductory geology and its laboratory activities. Prerequisite: Geology Graduate Teaching Assistantship.

**GEOL 385. Teaching in the Geosciences. 1 Credit.**

A review of the pedagogical underpinnings of introductory geology and its laboratory activities. Prerequisite: Geology Graduate Teaching Assistantship.

**GEOL 391. Master's Thesis Research. 1-9 Credits.****GERMAN (GERM)****Courses****GERM 201. Methods Research&Bibliography. 3 Credits.**

Introduction to tools and methods of research, including major bibliographical sources, reference works, dictionaries, editions, and journals concerned with German literature, language, and folklore. Prerequisite: Two 100-level courses.

**GERM 202. Expository Writing. 3 Credits.**

Improvement of writing skills through work with authentic texts from different content areas (literature, media, science, business). Emphasis on stylistic development and sophisticated vocabulary-building. Prerequisite: Two 100-level courses.

**GERM 213. History of the German Language. 3 Credits.**

Historical and linguistic development of the German language from Indo-European to the present, emphasizing sound shifts, the 16th century, and the modern age. Prerequisite: GERM 155 or GERM 156; one other 100-level course.

**GERM 214. Middle Ages. 3 Credits.**

Analysis and discussion of several "Minnesang" poets (esp. Walther and Neidhart), the Nibelungenlied, the courtly epics Erec, Parzival, and Tristan, and the satirical epic Helmbrecht. Prerequisite: GERM 155 or GERM 156; one other 100-level course.

**GERM 225. Goethe. 3 Credits.**

Study of Goethe's accomplishments in poetry, drama, and the novel during major phases of his literary career: Sturm und Drang, Classicism, and Romanticism. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 226. Schiller. 3 Credits.**

Major attention will be paid to Schiller's development as a dramatist (from Die Rauber to Wilhelm Tell) as well as to his contributions to German Classicism. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 237. 19th-Century Prose. 3 Credits.**

Literary and stylistic analysis of prose works by Tieck, Kleist, Stifter, Gotthelf, Droste-Hulshoff, Storm, Keller, and Hauptmann with emphasis on Romanticism, Poetic Realism, and Naturalism. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 247. German Lit from 1890 to 1945. 3 Credits.**

Naturalism, Symbolism, Expressionism and subsequent trends through readings of authors such as Hauptmann, Rilke, Kaiser, Kafka, Mann, and Brecht. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 248. Contemporary German Literature. 3 Credits.**

Literary movements and their major representatives from 1945 to the present, including relevant sociopolitical, intellectual, and cultural aspects. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 251. German Folklore. 3 Credits.**

Verbal folklore genres (fairy tales, legends, folk songs, and proverbs) treated in their relation to literature, mass media, and popular culture. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 263. German Romanticism. 3 Credits.**

Study of major works by authors such as Friedrich Schlegel, Novalis, Brentano, Hoffmann, and Eichendorff in their literary, artistic, philosophical, and sociopolitical contexts. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 271. Proverbs. 3 Credits.**

Diachronic and synchronic survey of German proverbs, proverbial expressions, and wellerisms, emphasizing their use and function in literature, art, mass media, advertisements and oral communication. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 273. German Intellectual Movements. 3 Credits.**

A survey of developments in art, music, philosophy, and social thought from the Enlightenment to 1945, with particular attention to their impact on German literature. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 275. Fin-de-Siecle. 3 Credits.**

Prevalent literary and intellectual movements at the turn of the 20th century in their historical, sociopolitical, and cultural contexts. Study of Nietzsche, Freud, Rilke, Hofmannsthal, Schnitzler, and Mann. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 276. Brecht & the Modern Drama. 3 Credits.**

Brecht's revolutionary concept of "epic theatre" in theory and practice and its influence on subsequent dramatists, including Durrenmatt, Frisch, Handke, Hochhuth, Muller, and Weiss. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 279. German Short Story after 1945. 3 Credits.**

Aesthetic and thematic evolution of the short story and its relation to historical, political, and cultural developments from 1945 to the present. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 281. Sem in Lit Genre, Period, Theme. 3 Credits.**

Study of a literary genre, period, or theme through close readings of representative texts supplemented by lectures and reports on sociocultural context. May be repeated. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**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. Prerequisite: GERM 155 or GERM 156 and one other 100-level course.

**GERM 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**GERM 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

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

## GLOBAL AND REGIONAL STUDIES (GRS)

### Courses

**GRS 297. Advanced Readings & Research. 1-6 Credits.**

Independent study of a specific region with an approved instructor. Prerequisites: Junior/Senior standing or Graduate student, and permission of Program Director.

**GRS 298. Advanced Readings & Research. 1-6 Credits.**

Independent study of a specific region with an approved instructor. Prerequisites: Junior/Senior standing or Graduate student, and permission of Instructor.

## GRADUATE (GRAD)



## Courses

**GRAD 301. Sem College Tchg. 1-12 Credits.**

**GRAD 395. Special Topics. 0-3 Credits.**

**GRAD 900. Continuous Registration Fee. 0 Credits.**

All Graduate students who have enrolled for all credits required in their degree program, but who have not completed all degree requirements (e.g. APA internship, comprehensive exam, defense of project or thesis) must pay a \$100 fee per Fall and Spring semester.

**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 353. Medical Cell & Molec Biology. 3 Credits.**

Fundamental vocabulary, concepts, and methods of molecular genetics, cell physiology, biochemistry and metabolism including cell-cell and cell-environment communication, cell proliferation and cell death. Pre/co-requisite: Graduate standing; permission of the Instructor; six credits coursework, plus two credits lab in Biology, general chemistry, organic chemistry and Physics.

**GRMD 354. Medical Human Struc & Fncn. 4-8 Credits.**

Combination of gross anatomy, histology, embryology, physiology and medical image to present an integrated overview of the human body. Pre/co-requisites: Graduate standing; Instructor permission; six credits coursework, plus two credits lab in Biology, general chemistry, organic chemistry and Physics; graduate coursework in Cell Biology or Biochemistry.

**GRMD 355. Medical Attacks & Defenses. 4 Credits.**

Principles of hematology, immunology, microbiology, toxicology, pathology, pharmacology, and neoplasia as a foundation to pathophysiology and therapeutics. Pre/co-requisite: Graduate standing; Instructor permission; six credits coursework plus two credits lab in Biology, general chemistry, organic chemistry and Physics; graduate coursework in Cell Biology or Biochemistry and Anatomy & Physiology.

**GRMD 356. Medical Nutr, Metab, & GI Syst. 5 Credits.**

Organizes studies in nutrition, organ systems metabolism and the gastrointestinal and endocrine systems through integrated lessons in cell biology, biochemistry, normal and pathologic anatomy, pharmacology, physiology, pathophysiology and microbiology. Pre/co-requisite: Graduate standing; permission of the Instructor; six credits coursework, plus two credits lab in Biology, Anatomy & Physiology, and an introduction to immunology, microbiology, toxicology, pathology and pharmacology.

**GRMD 357. Medical Neural Science. 6 Credits.**

Organize study of the human nervous and behavioral system through lessons that integrate cell metabolism, endocrinology, normal and pathologic anatomy, pharmacology, physiology, pathophysiology and psychopathology. Pre/co-requisite: Graduate standing; permission of the Instructor; six credits coursework plus two credits lab in Biology, general chemistry, organic chemistry and Physics; Graduate coursework in Cell biology or Biochemistry, human anatomy & physiology, and an introduction to immunology, microbiology, toxicology, pathology and pharmacology.

**GRMD 358. Medical Connections. 1 Credit.**

Introduction to musculoskeletal and integumentary systems that integrates cell metabolism, endocrinology, normal and pathologic anatomy, physiology and pathophysiology, and pharmacology. Pre/co-requisite: Graduate standing; Instructor permission; six credits coursework plus two credits lab in biology, general chemistry, organic chemistry and physics; graduate coursework in cell biology or biochemistry, human anatomy and physiology, and an introduction to immunology, microbiology, toxicology, pathology, and pharmacology.

**GRMD 359. Medical Cardio,Resp,Renal Syst. 6 Credits.**

Organizes studies in the cardiovascular, respiratory and renal system through lessons that integrate cell metabolism, endocrinology, normal and pathologic anatomy, pharmacology, physiology and pathophysiology. Pre/co-requisite: graduate standing; permission of the Instructor; six credits coursework plus two credits lab in biology or biochemistry, human anatomy and physiology, and an introduction to immunology, microbiology, toxicology, pathology and pharmacology.

**GRMD 360. Medical Generations. 5 Credits.**

Organizes studies in reproduction, development and aging through lessons that integrate behavioral development, cell and molecular biology, endocrinology, normal and pathologic anatomy, pharmacology, physiology and pathophysiology. Pre/co-requisite: Graduate standing; permission of the Instructor; six credits coursework plus two credits lab in biology, general chemistry, organic chemistry and physics; graduate coursework in cell biology or biochemistry, human anatomy and physiology, and an introduction to immunology, microbiology, toxicology, pathology and pharmacology.

## 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 301. Drug Therapy: Impl Clin Pract. 3 Credits.**

Pharmacology and pharmacotherapeutics will be applied to nursing practice with a focus on pharmacodynamics, pharmacokinetics, indications, adverse effect, drug interactions, safe administration and patient education. Prerequisite: Admission to DEPN program. Co-requisites: GRNS 300, GRNS 302, GRNS 303. Pre/co-requisite: GRNS 313.

**GRNS 302. Sci of Nsg: Adults & Elders. 4 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, GRNS 301, GRNS 303. Pre/co-requisite: GRNS 313.

**GRNS 303. Practicum: Adults & Elders 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, GRNS 301, GRNS 302. Pre/co-requisites: GRNS 313.

**GRNS 304. Practicum: Adults & Elders II. 1.25 Credit.**

80 hour supervised clinical nursing practicum provides an immersion experience in the medical/surgical acute care setting. Prerequisites: GRNS 300, GRNS 301, GRNS 302, GRNS 303, GRNS 313.

**GRNS 305. Practicum: Cmplx Nsg Care. 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 310, GRNS 312.

**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 310. Science of Nursing: Children. 3 Credits.**

Identification and treatment of human responses to pathophysiological problems in children with acute, chronic, or terminal conditions, with principles of acute nursing care for hospitalized children emphasized. Prerequisites: GRNS 304, GRNS 305. Co-requisites: GRNS 311. Pre/Co-requisites: GRNS 306, GRNS 307, GRNS 308, GRNS 309, GRNS 312.

**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. Pathophysiological Phenom. 1 Credit.**

Exploration of pathophysiological phenomena commonly experienced in an acute care setting. Prerequisite: GRNS 304. Pre/Co-requisites: GRNS 305, GRNS 306, GRNS 308, GRNS 309, GRNS 310.

**GRNS 313. Pathophysiology. 3 Credits.**

This course is designed to provide the student with a comprehensive foundation in pathophysiology. The phenomena that result in dysfunction in human physiologic response will be examined within a holistic context across the lifespan. Prerequisites: ANPS 019, ANPS 020 or equivalent, MMG 065 or BMT 054 or equivalent, NFS 043 or equivalent. Co-requisites: GRNS 300, GRNS 301, GRNS 302, GRNS 303.

**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 323. Methods Evid-Based Practice. 3 Credits.**

This course prepares students for translation of research into clinical practice through the development of advanced foundational competencies of inquiry, critique, and formulation of evidence-based solutions. Prerequisite: Graduate standing.

**GRNS 324. Nsg Science & Prac Epistemolog. 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.

**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. Pre/Co-requisites: GRNS 322, GRNS 400.

**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 336. Adv Pharmacology CNL. 2 Credits.**

This course will provide an in-depth examination of the pharmacotherapeutics and pharmacodynamics of selected drugs used to manage common health conditions across the lifespan. This course is the first of a two-course sequence in pharmacotherapeutics for clinical nurse leaders. Pre/Co-requisite: GRNS 335.

**GRNS 337. Adv Neuropharmacology CNL. 2 Credits.**

An in depth examination of the pharmacokinetics and pharmacodynamics of drugs used to treat individuals with acute and chronic pain, neurologic, and psychiatric disorders across the lifespan. This course is part of a two-course sequence for clinical nurse leaders. Prerequisites: GRNS 335, GRNS 336.

**GRNS 338. Adv Hlth Assessment CNL. 2 Credits.**

History taking and advanced physical examination of children and adults. Symptom analysis will provide direction for focused examinations. Prerequisite: Undergraduate physical assessment course; Pre/Co-requisite: GRNS 335.

**GRNS 339. CNL Project & Seminar I. 1 Credit.**

This seminar provides structure for the development of the Clinical Nurse Leader Project. Prerequisites: GRNS 321, GRNS 322, GRNS 323, GRNS 335, GRNS 336, GRNS 338. Pre/Co-requisites: GRNS 322, GRNS 337.

**GRNS 340. Clinical Practicum for the CNL. 1.5 Credit.**

This seminar provides an overview of the role of the Clinical Nurse Leader as a change agent at the point of care. Prerequisites: GRNS 321, GRNS 323, GRNS 324, GRNS 336, GRNS 337, GRNS 338, GRNS 339. Pre/Co-requisite: GRNS 324.

**GRNS 341. CNL Project & Seminar II. 2 Credits.**

This seminar supports student learning during the clinical immersion practicum. Prerequisites: GRNS 339, GRNS 340. Pre/Co-requisites: GRNS 322, GRNS 323, GRNS 324, GRNS 325, GRNS 326, GRNS 342.

**GRNS 342. Clinical Immersion Practicum. 2.5 Credits.**

This synthesis practice experience is designed to strengthen student's point of care leadership. Prerequisites: GRNS 321, GRNS 322, GRNS 323, GRNS 324, GRNS 326, GRNS 335, GRNS 336, GRNS 337, and GRNS 338. Pre/Co-requisites: GRNS 340, GRNS 341.

**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 391. Master's Thesis Research. 1-6 Credits.**

Prerequisites: GRNS 321, GRNS 322, GRNS 323, GRNS 324; approval of thesis committee. Pre/Co-requisite: Comprehensive Exam (completed prior to thesis defense).

**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. 1-18 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 thesis research. 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. Hlth Care Serv Design Implemen. 3 Credits.**

Planning and implementation of programs, projects or systems of health care delivery. Prerequisite: GRNS 322.

**GRNS 402. Leadership in Adv Nursing. 3 Credits.**

Strategic leadership in organizations and systems to promote ethical transformation of health care systems. Pre/Co-requisites: GRNS 322, GRNS 323, GRNS 400, NH 302.

**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 Neuropharmacology APRN. 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 APRN. 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. Pract: 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 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. Pract:Acute & Common 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. Pract:Prim Cr Acute&Comm Hlth. 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 412, GRNS 417, GRNS 418. Co-requisite: GRNS 414.

**GRNS 417. Prim Care Mgt Hlth Care Women. 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 health. Prerequisites: GRNS 407, GRNS 408. Co-requisite: GRNS 418.

**GRNS 418. Pract: Primary Care Women. 0.75 Credits.**

Practicum experience for assessment, evaluation and management of common episodic conditions of women in primary care for FNP/AGNP. Prerequisites: GRNS 407, GRNS 408. 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. Pract:Chronic&Complx Cond AGNP. 2 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 412, GRNS 414, GRNS 415. Co-requisite: GRNS 419.

**GRNS 421. Pract:Chronic&Complex 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.**

This seminar provides structure for the development of the Doctor of Nursing Practice Project.

**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 322, GRNS 327. Co-requisite: GRNS 422.

**GRNS 424. DNP Project & Seminar II. 1 Credit.**

Students in this semester will prepare and implement the Doctor of Nursing Practice Project. Prerequisites: GRNS 422, GRNS 423. Co-requisite: GRNS 425.

**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 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.

**GRADUATE NURSING (GRNU)**



## GREEK & LATIN (GKLT)

### Courses

#### **GKLT 300. Proseminar. 3 Credits.**

Introduction to philology. Students will normally take this their first semester.

#### **GKLT 381. Seminar. 3 Credits.**

Intensive study at the graduate level of Greek and Latin authors not read in the candidate's undergraduate program.

#### **GKLT 391. Master's Thesis Research. 1-6 Credits.**

## GREEK (GRK)

### Courses

#### **GRK 201. Greek Orators. 3 Credits.**

Selected speeches of Lysias and Demosthenes. B. Saylor Rodgers. Alternate years, as needed.

#### **GRK 202. Greek Comedy. 3 Credits.**

Two plays of Aristophanes. Alternate years, as needed.

#### **GRK 203. Greek Historians. 3 Credits.**

Thucydides, Books I and II; selections from Herodotus and Xenophon's Hellenica. Alternate years, as needed.

#### **GRK 204. Greek Tragedy. 3 Credits.**

Sophocles' Antigone, and Euripides' Medea, or two equivalent plays. Alternate years, as needed.

#### **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.

#### **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.

#### **GRK 211. Greek Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Greek majors.

#### **GRK 212. Greek Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Greek majors.

#### **GRK 227. Greek Lyric Poetry. 3 Credits.**

A study of early Greek personal, elegiac, and choral poetry from Archilochus to Pindar, including Sappho and Alcaeus, Simonides and Bacchylides. Prerequisites: Two years of college Greek or equivalent. Alternate years, as needed.

#### **GRK 295. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

#### **GRK 296. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

## HEALTH (HLTH)

### Courses

#### **HLTH 211. D2: Sustainable Dev Pub Hlth. 3 Credits.**

Introduction to development of sustainable public health interventions through service learning. Faculty-led program abroad. Prerequisite: Junior standing or above.

## HEALTH EDUCATION (EDHE)

### Courses

#### **EDHE 200. Contemporary Issues. 1-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

#### **EDHE 208. School Health Programs. 3 Credits.**

Organization of the total school health program. Problems and administration in the area of school environment, health services, health education, and school-community relationship. Prerequisite: EDHE 046 or equivalent.

#### **EDHE 211. Community Health Ed. 3 Credits.**

Government and voluntary agencies' sociological, historical, educational, environmental, and medical influences. Role of community health educator in these influences and major American health concerns. Prerequisite: EDHE 046 or equivalent.

#### **EDHE 220. Stress Mgmt Hlth Professionals. 3 Credits.**

Physiological, psychological, and sociological aspects of stress. Theory, practices, teaching techniques, and application relevant to teaching students and/or clients. Prerequisite: EDHE 046 or equivalent.

#### **EDHE 295. Lab Experience in Educ. 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.

#### **EDHE 319. Internship Specializd Personnel. 1-12 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.

#### **EDHE 380. Prof Problems in Education. 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.

#### **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 Thesis Rsch. 1-12 Credits.**

Thesis topic must be approved by a faculty committee.

#### **EDHE 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.



## HIGHER EDUCATION (EDHI)

### Courses

#### **EDHI 200. Contemporary Issues. 1-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

#### **EDHI 295. Lab Experience in Education. 1-3 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.

#### **EDHI 297. Special Topics. 1-3 Credits.**

Learning modules may vary each semester as the need to address topics arises. Learning modules are five week classes.

#### **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 332. Adult Development & Education. 3 Credits.**

Critical examination of research on adult learners in higher education, development theory, and reentry issues facing older students. Analysis and application of proposals for new adult-oriented educational programs.

#### **EDHI 360. Higher Education in America. 3 Credits.**

Critical, contemporary overview of the American university. Implications of conflicting value philosophies for theory, practice of higher education.

#### **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. The American College Student. 3 Credits.**

Examination of the diversity of college students today, and the developmental issues arising during the college experience.

#### **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 375. Cultural Pluralism Higher Ed. 3 Credits.**

This course 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 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. Student Affairs Profession. 3 Credits.**

Overview of the work of the student affairs profession, including philosophical base, historical development, current practices, and future trends. Prerequisite: Enrollment open only to Higher Education and Student Affairs students.

#### **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 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

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

## 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. Prerequisite: Open to non-HP majors by permission.

#### **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. Cross-listed with: HST 201.

#### **HP 202. Special Topics. 3 Credits.**

Courses are offered under this number in specialized areas of historic preservation through Continuing Education.

#### **HP 204. Historic Pres: Devlpmnt Econ. 3 Credits.**

Survey of economic, financial aspects of real estate development pertaining to preservation and adaptive use of historic buildings (market studies, pro-formas). Field trips. Actual proposal development for underutilized properties. Prerequisite: HP 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. Prerequisite: HP 201.

**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. Prerequisite: HP majors or by permission.

**HP 302. Community Preservation Project. 3 Credits.**

Third-semester graduate students apply developed professional skills to actual community preservation problems. Projects include strategy development, securing and allocating funds, research, advocacy, and implementation. Prerequisite: HP 301; Historic Preservation majors.

**HP 303. Grad Internship. 3 Credits.**

Participants will devote a semester to preservation within an appropriate institution or agency. Prerequisite: Historic Preservation majors only.

**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. Prerequisites: Historic Preservation Graduate majors only.

**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: Historic Preservation Graduate majors only.

**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. Prerequisites: Historic Preservation majors or by Instructor permission.

**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 391. Master's Thesis Research. 1-6 Credits.**

Total of six hours required.

**HP 395. 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. Cross listed with: HP 201.

**HST 209. Seminar in Global History. 3 Credits.**

Selected topics on the nature and results of interactions among the world's peoples. HST 209: to 1500. HST 210: since 1500. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History including HST 009 or HST 010.

**HST 210. Seminar in Global History. 3 Credits.**

Selected topics on the nature and results of interactions among the world's peoples. HST 209: to 1500. HST 210: since 1500. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History including HST 009 or HST 010.

**HST 221. Seminar in Ancient History. 3 Credits.**

Selected aspects of Near Eastern, Greek, or Roman History (e.g. trade and colonization, imperialism, social and political institutions, cultural and intellectual developments). Prerequisites: Junior/Senior/Graduate standing; twelve hours of History. Cross-listed with: CLAS 221, CLAS 222.

**HST 222. Seminar in Ancient History. 3 Credits.**

Selected aspects of Near Eastern, Greek, or Roman History (e.g. trade and colonization, imperialism, social and political institutions, cultural and intellectual developments). Prerequisites: Junior/Senior/Graduate standing; twelve hours of History. Cross-listed with: CLAS 221, CLAS 222.

**HST 224. Seminar in Medieval Europe. 3 Credits.**

Selected topics on Europe from the Fall of Rome to the Renaissance. Prerequisites: Twelve hours of History including HST 015; Junior/Senior/Graduate standing.

**HST 225. Seminar in Early Modern Europe. 3 Credits.**

Selected topics on European history from the Renaissance to the French Revolution. Prerequisite: Junior/Senior/Graduate standing and twelve hours of History.

**HST 226. Seminar in Modern Europe. 3 Credits.**

Selected topics on European history from 1815 to present. Prerequisites: Twelve hours of History including HST 014 or HST 016; Junior/Senior/Graduate standing. Cross-listed with: HS 226.

**HST 227. Seminar in Modern Europe. 0 or 3 Credits.**

Selected topics on European history from 1815 to present. Prerequisites: Twelve hours of History, including HST 014 or HST 016; Junior/Senior/Graduate standing. Cross-listed with: HS 227.

**HST 228. Seminar in Popular Culture. 3 Credits.**

History of the attitudes of ordinary people towards every day life in European society from the Middle Ages to the present. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History.

**HST 237. Imperial Russian History. 3 Credits.**

Selected topics in Russian intellectual, social, and cultural history from the Petrine era to the end of the Romanov rule. Pre/co-requisites: Junior/Senior/ Graduate Standing; twelve hours of History including HST 137.

**HST 238. Seminar in Soviet History. 3 Credits.**

Selected topics in Soviet social and cultural history from the Bolshevik Revolution to the death of Stalin (1917-53). Prerequisite: Junior/Senior/Graduate standing; twelve hours of History including HST 138.

**HST 240. D2: Compar Slavery:Hist Persp. 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. Prerequisite: Junior/Senior/Graduate standing.

**HST 241. Seminar in African History. 3 Credits.**

Topics in African history. Generally, the seminar will focus on one of three themes: Islam, slavery or urbanism. Prerequisite: Junior/Senior/Graduate standing; twelve hours History.

**HST 250. D2: Seminar in East Asian Hst. 3 Credits.**

Topics in the history of East Asia. Prerequisite: Junior/ Senior/ Graduate standing; twelve hours of History.

**HST 252. D2: Seminar on China. 3 Credits.**

Selected topics on the history of China. Prerequisite: Junior/Senior/ Graduate standing; twelve hours of History, including HST 150 or equivalent.

**HST 265. Seminar in Canadian History. 3 Credits.**

Topics in 19th and 20th century Canadian history; national development, regionalism, multiculturalism, and international relations. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History.

**HST 271. Seminar in US Social History. 3 Credits.**

Topics in U.S. Social History. HST 271: to the Civil War; HST 272: Civil War to the present. Prerequisite: Junior/ Senior/Graduate standing; twelve hours of History.

**HST 272. Seminar in US Social History. 3 Credits.**

Topics in U.S. Social History. HST 271: to the Civil War; HST 272: Civil War to the present. Prerequisite: Junior/Senior/ Graduate standing; twelve hours of History.

**HST 273. Seminar in Modern U.S. History. 3 Credits.**

Selected topics in U.S. history, among them foreign relations, the role of the presidency, World War II, and the Cold War. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History.

**HST 274. Seminar in Modern U.S. History. 3 Credits.**

Selected topics in U.S. history, among them foreign relations, the role of the presidency, World War II, and the Cold War. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History.

**HST 284. Seminar in Vermont History. 3 Credits.**

Topical approach to Vermont history through original research utilizing primary sources available at UVM, the Vermont Historical Society, and the Vermont State Archives. Prerequisite: Junior/ Senior/Graduate standing; twelve hours History, including HST 184 or permission.

**HST 287. Seminar in Historiography. 3 Credits.**

Topics and methods in contemporary historical writing. Prerequisite: Junior/Senior/Graduate standing; twelve hours of History.

**HST 295. Special Topics Seminar. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Junior/ Senior/Graduate standing; twelve hours of History.

**HST 296. Special Topics Seminar. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Junior/ Senior/Graduate standing; twelve hours of History.

**HST 300. Graduate Tutorial. 3-6 Credits.**

Readings and research in a specific area; topics to be individually arranged; attendance in appropriate undergraduate courses may be required (see undergraduate catalogue). Prerequisite: Instructor Permission. Variable credit.

**HST 301. Graduate Historiography. 3 Credits.**

Historical methods, philosophy of history, and the history of history writing.

**HST 351. American Cultural History. 3 Credits.**

Intended primarily for students in Historic Preservation, but open to other Graduate students.

**HST 391. Master's Thesis Research. 1-6 Credits.**

Required of all candidates for the M.A. Normally arranged for two semesters at three hours each. Credits: 1-6.

**HST 395. Special Topics. 1-18 Credits.****HST 397. Special Readings and Research. 1-6 Credits.**

Directed individual study of areas not appropriately covered by existing courses. Variable credit. Credits 1-6.

## HUMAN DEVELOPMENT & FAMILY STUDIES (HDFS)

### Courses

**HDFS 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: HDFS 005, HDFS 060, HDFS 161, HDFS 189; Junior standing.

**HDFS 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: HDFS 005, HDFS 060, HDFS 161, HDFS 189; Junior standing.

**HDFS 264. Contemporary Issues Parenting. 3 Credits.**

Contemporary cultural factors that influence adult lifestyles and their relationship to successful parenting. Prerequisites: HDFS 005, HDFS 060, HDFS 161, HDFS 189; Junior standing. May be repeated up to six credits.

**HDFS 265. Teaching Human Development. 3 Credits.****HDFS 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. Prerequisite: Junior standing; nine hours in Human Development & Family Studies or Instructor permission.



**HDFS 267. D2: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: Junior standing; nine hours in Human Development & Family Studies or Instructor permission.

**HDFS 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: Junior standing; nine hours in Human Development & Family Studies or Instructor permission. Offered in alternate years.

**HDFS 289. Adv Theories of Human Dev. 3 Credits.**

Comparative overview of major theoretical perspectives in the study of human development with particular emphasis on the interplay of method and theory and the applied implications of each theoretical model and theory. Prerequisites: HDFS 161 and HDFS 189; Junior standing.

**HDFS 291. Special Problems. 1-6 Credits.**

Reading, discussion, and special field and/or laboratory investigations. Prerequisite: Department permission. Students may enroll more than once up to twelve hours.

**HDFS 295. Special Topics. 1-12 Credits.**

Lectures, laboratories, readings, or projects relating to contemporary areas of study. Enrollment may be more than once, accumulation up to 12 hours. Prerequisites: HDFS 005, HDFS 060, HDFS 161, HDFS 189, and Junior standing or Instructor permission.

**HDFS 296. Field Experience. 1-15 Credits.**

Professionally-oriented field experience under joint supervision by faculty and community representative, credit arranged up to 15 hours. Prerequisite: Department permission.

**HUMANITIES (HUMN)****Courses****HUMN 300. Modern Literary Theory. 3 Credits.**

A survey of modern literary theory, including Slavic and Anglo-American formalism, marxism, feminism, structuralism, hermeneutics, deconstruction, and new historicism. Prerequisites: Graduate standing at UVM; or an A.B. in some humanities discipline; Instructor permission. Alternate years.

**HUMN 301. Humanities Graduate Seminar. 3 Credits.**

Varying interdisciplinary topics for humanities graduate students. Prerequisites: Graduate standing at UVM; or an A.B. in some humanities discipline; Instructor permission.

**HUMN 395. Special Topics. 3 Credits.****LATIN (LAT)****Courses****LAT 203. Republican Prose. 3 Credits.**

Extensive reading in Caesar and Sallust, and in the speeches of Cicero. Alternate years, as needed.

**LAT 204. Epic Poets. 3 Credits.**

Extensive reading in Lucretius, Vergil, Ovid, and others. Alternate years, as needed.

**LAT 211. Latin Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Latin majors.

**LAT 212. Latin Prose Style. 3 Credits.**

Readings in literary prose analyzed stylistically and imitated in composition. Required of Latin majors.

**LAT 227. Roman Lyric Poets. 3 Credits.**

Selections from the works of Catullus, Horace, Propertius, and Tibullus. Alternate years, as needed.

**LAT 251. Roman Letters. 3 Credits.**

Letters of Cicero, Horace, and Pliny. Alternate years, as needed.

**LAT 252. Comedy. 3 Credits.**

Two plays of Plautus and Terence. Study of the precursors of this literary form. Alternate years, as needed.

**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.

**LAT 255. Historians of the Empire. 3 Credits.**

Historians of the Empire. Augustus, *Res Gestae*; Tacitus, *Annals*, I-IV; selections from Suetonius and Ammianus Marcellinus. Alternate years, as needed.

**LAT 256. Satire. 3 Credits.**

Selections from Horace, Persius, Juvenal, Petronius. Study of the development of this literary form. Alternate years, as needed.

**LAT 271. Silver Latin. 3 Credits.**

Extensive reading of post-Augustan authors not included in other advanced courses. Alternate years, as needed.

**LAT 295. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

**LAT 296. Advanced Special Topics. 1-18 Credits.**

Advanced courses or seminars on topics beyond the scope of existing departmental offerings. See Schedule of Courses for specific titles.

**LEADERSHIP AND POLICY STUDIES (EDLP)****Courses****EDLP 200. Contemporary Issues. 0-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDLP 268. Educational Law. 2-3 Credits.**

Legal basis for education. State and Federal statutes; related court cases; Attorney General opinions; Special Education procedures; Vermont State Board and State Education Department policies; regulations. Prerequisite: Twelve hours in education or Instructor permission.



**EDLP 295. Lab Experience. 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.

**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 338. Sem in Community Education. 3 Credits.**

The seminar participants will analyze the Community Education process, relate the process to community development, and develop strategies for the planning and implementation of Community Education.

**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 370. Incident Analysis. 3 Credits.**

Leadership of high-reliability organizations (NASA), critical incidents (fratricide, crashes, natural disasters), and crisis planning in diverse organizations like schools, hospitals, and law enforcement. Prerequisite: Graduate standing.

**EDLP 371. Schl Business Mgmt. 3 Credits.**

Analysis of basic management concepts applied to schools, leadership/management trends, types of budgets, risk management, planning, and other personnel and business operations issues. Prerequisites: Graduate standing or Instructor permission.

**EDLP 372. Leadership&Creative Imaginatn. 3 Credits.**

Leadership in societal organizations as presented in literature, other media. Students will demonstrate abilities to integrate leadership theory, principles, personal beliefs, practices with literary and other media models. Prerequisite: Ed.D. students have priority.

**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 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 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 432. Adv Sem:Org Chng&Hum Res Dev. 3 Credits.**

Students inquire into new theories, themes, and multicultural dimensions of organizations. Strategies for managing human resources, structural issues, and future trends in organizations are analyzed. 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 491. Doctoral Dissertation Research. 1-12 Credits.****LIBRARY SCIENCE (EDLI)****Courses****EDLI 200. Contemporary Issues. 1-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDLI 272. Manage Schl Library Media Ctrs. 3 Credits.**

Overview of administrative issues, including development of policies and procedures, budget preparation, personnel administration, and public relations. Focus on information technology and literacy. Prerequisites: Twelve hours in education and related areas, or Instructor permission.

**EDLI 273. Organizing Schl Libr Media Ctr. 3 Credits.**

Introduction to cataloging of print and non-print materials, Dewey Decimal Classification, application of microcomputers to catalog and circulation services. Prerequisite: EDLI 272 or equivalent.

**EDLI 274. Design Instr Sch Lbr Media Ctr. 3 Credits.**

Designing library instruction for integration with curricula and collaborating to create effective lessons. Issues surrounding active learning, critical thinking, learning styles, and assessment are examined. Prerequisite: EDLI 272 or equivalent.

**EDLI 275. Dev Sch Libr Media Ctr Collect. 3 Credits.**

Evaluating and selecting books, periodicals, audiovisuals, software, and other materials for full range of student ages and ability levels. Maintaining collection, weeding, using interlibrary loan, and dealing with censorship. Prerequisite: EDLI 272 or equivalent.

**EDLI 276. Information Sources & Services. 3 Credits.**

Helping students and teachers find information using print, online, CD-ROM and other resources. Developing interview skills and selecting materials for elementary and secondary core collections. Prerequisite: EDLI 272 or equivalent.

**EDLI 277. Info Tech Schl Libr Media Ctrs. 3 Credits.**

Selecting, using, and maintaining full range of media equipment, including audiovisual and computer based systems. Designing and improving presentation facilities for media. Prerequisite: EDLI 272 or equivalent.

**EDLI 295. Lab Experience in Educ. 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.

**LITERACY (EDLT)****Courses****EDLT 200. Contemporary Issues. 1-6 Credits.****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 223. Read Pgms in Sec Schl & Col. 3 Credits.**

Relationship of reading to learning study or organization, instructional procedures, and materials for developing reading improvement programs for secondary and college students; reading in content areas. Prerequisite: Twelve hours in Education and/or related areas or Instructor permission.

**EDLT 228. Lit in Jr/Sr High Schl Curr. 3 Credits.**

Literacy Criticism for Teachers.

**EDLT 234. Lit & Lang for Chil & Youth. 3 Credits.**

Characteristics, interests, reading habits of children and youth; selection, evaluation of literature. Organizing book units for teaching literature, for content areas. Emphasis on development of oral, written expression. Prerequisite: Twelve hours in Education and related areas 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 295. Laboratory Experience in Educ. 1-6 Credits.****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 378. Adv Stdy/Rsch in Read/Rel LArt. 3 Credits.**

Survey of research, comparison and evaluation of emerging programs design and development of projects in reading. Prerequisite: Fifteen hours in Education including nine hours in the field of reading and language education; 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 380. Professional Problems in Educ. 3 Credits.**

**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 395. Special Topics. 1-18 Credits.****EDLT 396. Special Topics. 1-18 Credits.****EDLT 397. Problems in Education. 1-6 Credits.****MASTER OF BUSINESS ADMIN (MBA)****Courses****MBA 300. Business Fundamentals. 1 Credit.**

This course will provide an introduction to the basic definitions and business language of all of the functional areas of business administration. Prerequisite: MBA standing.

**MBA 301. Foundations of Management. 9 Credits.**

This module will provide 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. 8 Credits.**

This module will provide 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. 9 Credits.**

This module 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 395. Advanced Special Topics. 1-18 Credits.****MBA 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific title.

**MATERIALS SCIENCE (MATS)****Courses****MATS 391. Master's Thesis Research. 1-18 Credits.****MATS 491. Doctoral Dissertation Research. 1-18 Credits.****MATHEMATICS (MATH)****Courses****MATH 207. 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. Prerequisites: MATH 121; STAT 151 or STAT 153 recommended. Cross-listed with: STAT 251, BIOS 251.

**MATH 221. Deterministic Modls Oper Rsch. 3 Credits.**

The linear programming problem. Simplex algorithm, dual problem, sensitivity analysis, goal programming. Dynamic programming and network problems. Prerequisites: MATH 124; MATH 121 desirable. Cross-listed with: CSYS 221.

**MATH 222. Stochastic Models in Oper Rsch. 3 Credits.**

Development and solution of some typical stochastic models. Markov chains, queueing problems, inventory models, and dynamic programming under uncertainty. Prerequisite: MATH 207, STAT 151.

**MATH 230. Ordinary Differential Equation. 3 Credits.**

Solutions of linear ordinary differential equations, the Laplace transformation, and series solutions of differential equations. Prerequisite: MATH 121. Corequisite: MATH 124. Credit not granted for more than one of the courses MATH 230 or MATH 271.

**MATH 235. Mathematical Models & Analysis. 3 Credits.**

Techniques of Undergraduate 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 and any of MATH 124, MATH 230, or MATH 271.

**MATH 236. Calculus of Variations. 3 Credits.**

Necessary conditions of Euler, Legendre, Weierstrass, and Jacobi for minimizing integrals. Sufficiency proofs. Variation and eigenvalue problems. Hamilton-Jacobi equations. Prerequisite: MATH 230.

**MATH 237. Intro to Numerical Analysis. 3 Credits.**

Error analysis, root-finding, interpolation, least squares, quadrature, linear equations, numerical solution of ordinary differential equations. Prerequisite: MATH 121, MATH 124 or MATH 271; Knowledge of computer programming.

**MATH 238. Applied Computational Methods. 3 Credits.**

Direct and iterative methods for solving linear systems; numerical solution of ordinary and partial differential equations. Focus will be on application of numerical methods. Prerequisites: MATH 121; either MATH 124 or MATH 271.

**MATH 240. Fourier Series&Integral Trans. 3 Credits.**

Fourier series, orthogonal functions, integral transforms and boundary value problems. Prerequisite: MATH 230 or MATH 271.

**MATH 241. 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 052, MATH 121, MATH 124.

**MATH 242. Anyl Several Real Variables 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 251. Abstract Algebra I. 3 Credits.**

Basic theory of groups, rings, fields, homomorphisms, and isomorphisms. Prerequisite: MATH 052, MATH 124.

**MATH 252. 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 255. Elementary Number Theory. 3 Credits.**

Divisibility, prime numbers, Diophantine equations, congruence of numbers, and methods of solving congruences. Prerequisite: MATH 052 or MATH 054.

**MATH 257. Topics in Group Theory. 3 Credits.**

Topics may include abstract group theory, representation theory, classical groups, Lie groups. Prerequisite: MATH 251.

**MATH 260. Foundations of Geometry. 3 Credits.**

Geometry as an axiomatic science; various non-Euclidean geometries; relationships existing between Euclidean plane geometry and other geometries; invariant properties. Prerequisite: MATH 022 and either MATH 052 or MATH 054.

**MATH 264. Vector Analysis. 3 Credits.**

Gradient, curl and divergence, Green, Gauss, and Stokes Theorems, applications to physics, tensor analysis. Prerequisite: MATH 121, MATH 124, or MATH 271.

**MATH 266. 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. Co-requisite: MATH 271 or MATH 230. Cross-listed with: CSYS 266.

**MATH 268. Mathematical Biology & Ecology. 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 124, MATH 230, or Instructor permission. Cross-listed with: CSYS 268.

**MATH 271. Adv Engineering Mathematics. 3 Credits.**

Differential equations and linear algebra, including linear ordinary differential equations, Laplace transforms, matrix theory, and systems of differential equations. Examples from engineering and physical sciences. Prerequisite: MATH 121. Credit not granted for both MATH 230 and MATH 271. No credit for Mathematics majors.

**MATH 272. Applied Analysis. 3 Credits.**

Basics of Fourier series, partial differential equations of mathematical physics, functions of a complex variable, Cauchy's theorem, integral formula. Prerequisites: MATH 230 or MATH 271.

**MATH 273. 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 or MATH 054.

**MATH 274. Numerical Linear Algebra. 3 Credits.**

Direct and iterative methods for solving linear equations, least square factorization methods, eigenvalue computations, ill-conditioning and stability. Prerequisite: MATH 237.

**MATH 295. Special Topics. 1-18 Credits.**

For advanced students in the indicated fields. Lectures, reports, and directed readings on advanced topics. Credit as arranged. Offered as occasion warrants.

**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 301/CSYS 301, 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. 4 Credits.**

Differentiation, integration, Cauchy-Riemann equations, infinite series, properties of analytic continuation, Laurent series, calculus of residues, contour integration, meromorphic functions, conformal mappings, Riemann surfaces. Prerequisite: MATH 242.

**MATH 332. Approximation Theory. 3 Credits.**

Interpolation and approximation by interpolation, uniform approximation in normed linear spaces, spline functions, orthogonal polynomials. Least square, and Chebychev approximations, rational functions. Prerequisite: MATH 124, MATH 237.

**MATH 333. Thry Functions Real Variables. 4 Credits.**

The theory of Lebesgue integration, Lebesgue measure, sequences of functions, absolute continuity, properties of LP-spaces. Prerequisite: MATH 242.

**MATH 335. Advanced Real Analysis. 3 Credits.**

L2-spaces, LP-spaces; Hilbert, Banach spaces; linear functionals, linear operators; completely continuous operators (including symmetric); Fredholm alternative; Hilbert-Schmidt theory; unitary operators; Bochner's Theorem; Fourier-Plancherel, Watson transforms. Prerequisites: MATH 333.



**MATH 336. Advanced Real Analysis. 3 Credits.**

L<sup>2</sup>-spaces, LP-spaces; Hilbert, Banach spaces; linear functionals, linear operators; completely continuous operators (including symmetric); Fredholm alternative; Hilbert-Schmidt theory; unitary operators; Bochner's Theorem; Fourier-Plancherel, Watson transforms. Prerequisite: MATH 333 and MATH 335.

**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 and MATH 124; MATH 230, 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 242.

**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. Prerequisite: MATH 252.

**MATH 353. Point-Set Topology. 3 Credits.**

Topological spaces, closed and open sets, closure operators, separation axioms, continuity, connectedness, compactness, metrization, uniform spaces. Prerequisite: MATH 241.

**MATH 354. Algebraic Topology. 3 Credits.**

Homotopy, Seifert-van Kampen Theorem; simplicial, singular, and Čech homology. Prerequisite: MATH 241 or MATH 353.

**MATH 373. Topics in Combinatorics. 3 Credits.**

Topics will vary each semester and may include combinatorial designs, coding theory, topological graph theory, cryptography. Prerequisite: MATH 251 or MATH 273.

**MATH 382. Seminar. 1 Credit.**

Topical discussions with assigned reading. Required of M.S. degree candidates.

**MATH 391. Master's Thesis Research. 1-18 Credits.****MATH 395. Special Topics. 1-6 Credits.**

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

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

## MATHEMATICS FOR EDUCATORS (MAED)

### Courses

**MAED 205. Math as a Second Language. 3 Credits.**

Deep conceptual understanding of the operations of arithmetic and interrelationships among arithmetic, algebra, and geometry; applications to the K-8 classroom. Pre/co-requisite: Admission to the VMI program.

**MAED 210. Functions/Algebra for Teaching. 3 Credits.**

Functions, graphs, inverse functions, linear functions, straight lines, linear equations and inequalities, and applications; applications to the K-8 classroom. Pre/co-requisites: MAED 205, or Instructor permission.

**MAED 215. Trig/Algebra for Teachers II. 3 Credits.**

Similar triangles, trigonometric functions, applications to measurement, periodic phenomena; quadratic functions; applications to the K-8 classroom. Pre/co-requisites: MAED 205 and MAED 210, or Instructor permission.

**MAED 220. Measure/Probabil for Teachers. 3 Credits.**

Measurement (length, area and volume), probability, application to problem solving, and the ways in which these concepts develop across the K-12 curriculum. Pre/co-requisites: MAED 205, MAED 201, and MAED 215, or Instructor permission.

**MAED 225. Number Theory for Teachers. 3 Credits.**

Division algorithm, prime numbers, fundamental theorem of arithmetic, factors and multiples, number bases, arithmetic progressions; emphasis on how number theory is taught in grades K-8. Pre/co-requisites: MAED 205, MAED 210, and MAED 215.

**MAED 230. Alg/Geom for Teachers III. 3 Credits.**

Exponents, compound interest, exponential functions, logarithms, the base *e*, growth and decay, research in mathematics education and K-8 curriculum projects. Pre/co-requisites: MAED 205, MAED 210 and MAED 215, or Instructor permission.

**MAED 235. Calculus for Teachers I. 3 Credits.**

Limits, instantaneous change, differentiation, optimization, applications to the K-8 classroom, and K-8 curriculum projects. Pre/co-requisites: MAED 205, MAED 210, MAED 215, MAED 220, and MAED 230 or Instructor permission.

**MAED 240. Calculus for Teachers II. 3 Credits.**

Continued study of calculus and its relationship to the K-8 curriculum. Topics include infinite series, calculating area, the definite integral, Fundamental Theorem of Calculus. Pre/co-requisite: MAED 235, or Instructor permission.

**MAED 300. Statistics & Research I. 3 Credits.**

Introduction to statistics with emphasis on research in K-8 education. Representing and summarizing data, measures of relationship between variables, inference from sample data to population. Pre/co-requisites: MAED 205, MAED 210, and MAED 215, or Instructor permission.

**MAED 305. Statistics & Research II. 3 Credits.**

Error bars in graphs, margins of error in surveys, and confidence intervals; interpret and critique educational research studies; analysis of school assessment data activities. Pre/co-requisites: MAED 300, or Instructor permission.

**MAED 310. Statistics & Research III. 3 Credits.**

Regression, chi-square analysis, design of research studies, reading of research on K-8 instructional practice, design action research project. Pre/co-requisites: MAED 305, or Instructor permission.

**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. Pre/co-requisite: Enrollment in VMI program.

## MECHANICAL ENGINEERING (ME)

### Courses

**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 207. Bioengineering. 3 Credits.**

Introduction to bioengineering including biomechanics, rehabilitation, instrumentation, imaging, biomaterials, and transport. Pre/co-requisites: Senior/Graduate standing in Engineering; Instructor permission.

**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. Pre/co-requisites: Senior/Graduate standing in Engineering; Instructor permission.

**ME 209. Biomechanics: Transport Proc. 3 Credits.**

Transport and kinetic processes to vascular biology, respiratory mechanics and medicine. Steady and unsteady laminar flow, pulse wave reflections, curved and collapsible tube flow, turbulence. Pre/co-requisites: Senior/Graduate standing in Engineering; Instructor permission.

**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. 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 124.

**ME 230. Orbital Mechanics. 3 Credits.**

Motion of spacecraft in a central gravitational field. Two and restricted three-body problems; Kepler's equation; orbital maneuvers and rendezvous; interplanetary and lunar trajectories. Prerequisite: ME 012. Co-requisites: ME 111 or Instructor permission.

**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 235. Turbomach Vibration Anyl/Tstng. 2 Credits.**

Vibration in rotating machines; vibration measurement techniques; machinery condition and degradation; condition monitoring and predictive maintenance; industrial vibration techniques including proximity probes, accelerometers, FFT analyzer. Prerequisite: ME 244.

**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 241. Combustion Processes. 3 Credits.**

Combustion thermodynamics; chemical kinetics; laminar flames, premixed and diffusion; turbulent flames; ignition, explosion, and detonation; droplet combustion; flame spread; large scale fires; rocket combustion. Prerequisite: Senior/Graduate standing.

**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 244. Intro to Turbomachinery Anyl. 2 Credits.**

Fundamental turbomachinery principles of fluid mechanics, thermodynamics, and structural analysis; basic equations and computational techniques for analysis and design to model and evaluate turbomachinery. Prerequisite: ME 243, MATH 271.

**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 246. Centrifugal Compressors. 2 Credits.**

Fluid dynamic and thermodynamic principles of centrifugal compressor design and design practice; limits of stable operation and instability prediction and control. Prerequisite: ME 244.

**ME 247. Centrifugal Pumps. 2 Credits.**

Centrifugal pump design principles and practice; performance limits; cavitation; design tools and pump design optimization. Prerequisite: ME 244.

**ME 248. Turbomachinery Special Topics. 1 or 2 Credit.**

Content in axial fans/compressors; axial, radial, or steam turbines; CFD, dynamics/rotordynamics, or materials for turbo-machinery; power plant or refrigeration cycle developments; turbocharged and compound IC-engines. Prerequisite: ME 244.

**ME 249. Computational Fluids Engr. 0 or 3 Credits.**

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 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 253. Corrosion of Materials. 3 Credits.**

Corrosion principles: electrochemical, environmental, and metallurgical aspects. Corrosion testing. Corrosion prevention. Seawater corrosion. Biological corrosion. Material selection. Prerequisite: ME 101.

**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.**

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. Integrated Product Development. 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 283. Lab Techniques Turbomach Dev. 2 Credits.**

Instruments and transducers for performance, flow, and structural measurements in turbo-machinery; the role of test data in design and development; experimental data acquisition and processing. Prerequisite: ME 244.

**ME 285. Biomedical Engineering Seminar. 1 Credit.**

Presentation and discussion of advanced biomedical engineering problems and current research developments. Prerequisite: Senior/Graduate engineering enrollment.

**ME 295. Advanced Special Topics. 1-18 Credits.**

Content is dictated by expanding professional interest in newly developing, or recently developed, technical areas in which there is particular need or opportunity. Prerequisite: Senior/Graduate standing.

**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. Cross-listed with: CE 304.

**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. Cross-listed with: CE 305.

**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. Cross-listed with: CSYS 312.

**ME 320. Special Problems in Elasticity. 3 Credits.**

Advanced topics in the theory of elasticity in which there is a particular student and staff interest.

**ME 321. Special Problems in Fluid Mech. 3 Credits.**

Advanced topics in fluid mechanics in which there is a particular student and staff interest.

**ME 322. Special Problems in Dynamics. 3 Credits.**

Advanced topics in dynamics in which there is a particular student and staff interest.

**ME 323. Special Prob in Thermodynamics. 3 Credits.**

Advanced topics in thermodynamics in which there is a particular student and staff interest.

**ME 324. Spec Problems in Heat Transfer. 3 Credits.**

Advanced topics in heat transfer in which there is a particular student and staff interest.

**ME 325. Special Problems in Materials. 3 Credits.**

Advanced topics in behavior of materials in which there is a particular student and staff interest.

**ME 330. Matrix Meth in Struct Dynamics. 3 Credits.**

Matrices, eigenvalue problems, forced vibration, wave propagation.

**ME 332. Engineering Elasticity. 3 Credits.**

Tensors, complex variables, variational methods.

**ME 333. Stress Analysis. 3 Credits.**

Theory and experimental method of measuring static and dynamic stress and strain.

**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 342. Advanced Combustion. 3 Credits.**

Equations of reacting mixtures; modeling of steady and unsteady combustion, homogeneous/heterogeneous systems; ignition, explosions, detonations; combustion aerodynamics: turbulence, swirl, and sprays. Prerequisite: ME 241 or equivalent.

**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 344. Adv Eng Thermodynamics II. 3 Credits.**

Microscopic thermodynamics; Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac statistics; kinetic theory of gases; transport properties, compressed gases, liquids, solid states; chemical systems; irreversible processes; fluctuations.

**ME 345. Advanced Heat Transfer II. 3 Credits.**

Advanced treatment of forced and free convection; thermal boundary layers; analytical and approximate solution methods. Phase change heat transfer. Micro/nano-scale heat transfer. Prerequisite: ME 245 or equivalent.

**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. Cross-listed with: CSYS 350.

**ME 371. Adv Engr Des Anyl&Synthesis I. 4 Credits.**

Application of fundamental concepts, principles of advanced mathematics, physics, mechanics, electricity, thermodynamics, fluid dynamics, heat transfer, and decision-making processes to design, analysis, synthesis of complex engineering systems.

**ME 372. Systems Engineering. 3 Credits.**

Advanced course in systems engineering, reliability, maintainability, safety, and human factors engineering. Case studies. Prerequisites: ME 371 or Instructor permission.

**ME 373. Integr Mechanism Design Anyl. 3 Credits.**

Application of system analysis, rigid body dynamics, finite elements, fatigue analysis and structural dynamics to an integrated approach to mechanisms design. Prerequisites: ME 371 or Instructor permission.

**ME 391. Master's Thesis Research. 1-18 Credits.****ME 395. Advanced Special Topics. 1-3 Credits.**

Advanced topics in recently developed technical areas. Prerequisites: three hours with Instructor permission.

**ME 491. Doctoral Dissertation Research. 0-18 Credits.**

## MEDICAL LAB & RADIATION SCI (MLRS)

### Courses

**MLRS 381. Special Topics Seminar. 1 Credit.**

Pre/co-requisite: Instructor Permission.

**MLRS 391. Masters Thesis Research. 1-6 Credits.**

Pre/co-requisite: Instructor Permission.

**MLRS 395. Advanced Topics. 1-3 Credits.**

Pre/co-requisite: Instructor Permission.

## 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. 3 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 203. Mamm Cell Cult:Molecular Biol. 0 or 4 Credits.**

The basic principles and techniques of mammalian cell culture, as well as cell and mammalian molecular genetics. Prerequisite: BCOR 103 or MMG 104, Permission of Coordinator. Alternate years. Spring.

### **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 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. 2 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. Co-requisites: MMG 205 or MMG 206. Cross-listed with: BIOC 207 and 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. Clinical Microbiology I. 0 or 4 Credits.**

Comprehensive study of human pathogenic microorganisms and their disease states in humans, which includes pathogenic bacteriology and medical mycology. Laboratory sessions provide practical experience in handling and identifying these pathogens. Prerequisites: MMG 065 or MMG 101 or equivalent or Instructor permission. Alternate years. Spring.

### **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. Programming for Bioinformatics. 3 Credits.**

Introductory course on computing (including scripting, database, and statistical analysis) for developing bioinformatics applications. Particular emphasis is given to comparative genomics and systems biology scenarios. Prerequisites: STAT 151, STAT 153, or Instructor permission. Cross-listed with: CS 231. Alternate Years. Spring.

### **MMG 232. Methods in Bioinformatics. 3 Credits.**

This course provides a methodological survey of bioinformatics. Particular emphasis is given to algorithms associated with sequential analysis, comparative genomics, structural biology, and systems biology. Prerequisites: STAT 151, STAT 153, or Instructor permission. Cross-listed with: CS 232. Alternate Years. Spring.

### **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. Prerequisite: Junior/Senior/Graduate standing in biological or computational sciences.

### **MMG 295. Advanced Special Topics. 1-6 Credits.**

Supervised investigations in microbiology or molecular genetics. Prerequisite: Instructor permission. Credit as arranged.

### **MMG 296. Advanced Special Topics. 1-6 Credits.**

Supervised investigations in microbiology or molecular genetics. Prerequisite: Instructor permission. Credit as arranged.

### **MMG 310. Current Topics in MMG. 2 Credits.**

Seminar to focus on specific issues at the forefront of current research in molecular genetics. Meetings will involve student presentation and discussion of research articles. Prerequisite: Permission of Coordinator.

### **MMG 312. Eukaryotic Molecular Genetics. 3 Credits.**

The use of lower eukaryotes, such as the yeasts *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*, as model genetic systems to answer questions of basic biological importance. Prerequisites: Instructor permission; MMG 233 and CLBI 301, or equivalent.

### **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 332. Critical Reading. 1 Credit.**

Students will participate in group discussions to critically evaluate and interpret the experimental data from one assigned paper from the scientific literature per week. Prerequisite: Permission of Coordinator. Fall.

**MMG 352. Protein:Nucleic Acid Interact. 3 Credits.**

Structure of DNA and RNA, and the structure and assembly of nucleoprotein complexes will be described using examples from prokaryotes, yeast, viruses, and mammalian cells in culture. Prerequisite: MMG 211 or equivalent; AGBI 201 or BIOC 301; BIOC 302 or equivalent. Cross-listed with: BIOC 352. Alternate years. Spring.

**MMG 391. Master's Thesis Research. 1-18 Credits.****MMG 491. Doctoral Dissertation Research. 1-18 Credits.**

## 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. Pre/co-requisites: Acceptance to licensing program. Cross-listed with: EDSC 207.

**EDML 260. Teaching Young Adolescents. 3-6 Credits.**

Focus on understanding and reflecting on an integrative developmental approach to the design of middle level curriculum, with an emphasis on literacy and numeracy.

**EDML 261. Middle Level Teaching Pract. 3 Credits.**

Teaching practicum on middle level team in 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 260, EDML 261.

**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. Literacy & Mathematics. 3 Credits.**

All middle level teachers are expected to teach reading, writing, literature and mathematics. This course is the capstone for work previously done in these pedagogies. Pre/co-requisite: Successful completion of EDML 260, EDML 261, and EDML 270.

## 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 302. Human Physiology & Pharm II. 4 Credits.**

An integrated examination of the physiology and pharmacology of the endocrine, digestive, renal and respiratory systems in the human body. Pre/co-requisites: CHEM 032 and CHEM 042 or equivalent; two semesters general physics, two semesters calculus, MPBP 301 or Instructor permission. 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 306. Medical Physiology. 8 Credits.**

Function in the whole human organism, and at the cellular, tissue, and organ levels, considered biologically and physically. Pre/co-requisite: Permission of Department Chair. May not be taken for credit with MPBP 301 or MPBP 302.

**MPBP 308. Biometrics & Applied Statistic. 3 Credits.**

The rationale and application of biostatistical methods in the biological, health and life sciences with emphasis on interpreting and reporting results. Prerequisite: STAT 141 or equivalent. Cross-listed with: BIOS 308, STAT 308.

**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 323. Biophysical Techniques. 4 Credits.**

In depth analysis of biophysical techniques. Topics: Introductory statistics, optics, microscopy, motility, optical tweezers, FRET, light-scattering, SAXS and electron microscopy (single-particles, 2 D-crystals, helices). Alternate years. Pre/co-requisite: Basic mathematics including matrices, differentiation and integration.

**MPBP 333. 3D Electron Microscopy&Img Prc. 1 Credit.**

In depth study of the theory of 3D electron microscopy and image processing of single particles. Topics: Fourier transforms. Convolution. Correlation. 2D alignment. Radon transforms. 3D reconstruction techniques. The electron microscope. Specimen preparation and data collection. Alternate years. Pre/co-requisites: Basic mathematics including matrices, differentiation and integration.

**MPBP 381. Seminar. 1 Credit.**

Presentation and discussion by advanced students, staff, and invited speakers, of current topics in physiology. Prerequisite: Department permission.

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

**MPBP 395. Special Topics in MPBP. 1-4 Credits.**

Topics of interest to Graduate students beyond the scope of existing courses.

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

## MUSIC (MU)

### Courses

**MU 211. Senior Music History Project. 1 Credit.**

Directed readings and research. Research project. Prerequisites: Senior standing as a Music History major; permission of the Instructor.

**MU 231. A & B Jazz Combos. 1-6 Credits.**

Small groups (a rhythm section and three to five solo instruments) in which students improve their improvisational skills while learning jazz repertory.

**MU 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MU 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

## 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: CHEM 031, CHEM 032, NR 103, NR 143, NR 146, or Instructor permission. Cross-listed with: FOR 228.

**NR 235. Legal Aspects Envir Planning. 3 Credits.**

Comparison of environmental planning law at local, state, and national levels. Case studies in environmental and natural resource planning and land use controls. Pre/co-requisite: Senior Standing.

**NR 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. Pre/co-requisites: minimum Junior standing, PSS 137 or one course in ecology plus one course in design or drawing. Cross-listed with: CDAE 238, ENVS 238, PSS 238.

**NR 240. Park and Wilderness Mgmt. 3 Credits.**

Cross-listed with PRT 240. History, philosophy, and management of wilderness, national parks, and related areas. Prerequisites: Junior/Senior standing in Parks, Recreation and Tourism.

**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. Prerequisites: Introductory GIS (NR 143 or GEOG 184 or NR 343) or remote sensing (NR 146, NR 346, GEOG 185) course as determined by Instructor.

**NR 243. GIS Practicum. 3 Credits.**

An applied course in geospatial technology with a focus on ESRI's ArcGIS software suite. Prerequisite: NR 143/NR 343.

**NR 245. Integrating GIS & Statistics. 3 Credits.**

Advanced approaches in integrating Geographic Information Systems (GIS) and statistical methods to analyze quantitatively spatial patterns and relationships. Prerequisites: Senior/Graduate standing, one introductory GIS course, one introductory Statistics course.

**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: One year Biology; one year Chemistry; ecology course.

**NR 254. Adv Natural Resource Policy. 3 Credits.**

Advanced seminar in natural resource policy, emphasizing current issues in forest policy. Prerequisite: Graduate or advanced undergraduate standing; Instructor permission.

**NR 255. Field Mthds in Water Resources. 3 Credits.**

Techniques used in field assessment of water quality in rivers and lakes. Case studies on the LaPlatte River and Lake Champlain. Sampling strategies, field measurements, and data evaluation. Extensive field work. Prerequisite: NR 102 or equivalent basic course in water.

**NR 260. Wetlands Ecology & Mgmt. 3 Credits.**

Structure, dynamics and values of natural and artificial wetlands; wetlands management and issues. Prerequisite: BIOL 001 and BIOL 002; an upper-level ecology course.

**NR 262. Int'l Problems in NR Mgmt. 3 Credits.**

Discussion of problems associated with the management of natural resources which have international implications. Topics may include deforestation, desertification, fisheries, wildlife, refuges, fuelwood, pollution. Prerequisite: Senior standing; permission.

**NR 265. Environment & Human Behavior. 3 Credits.**

Applies social psychological frameworks--attitudes, exchange theory, symbolic interaction, group processes, social cognition, discourse theory--to help understand environmentally related behaviors, conflict, and management. Prerequisite: Junior standing.

**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, PSS 161. Cross-listed with: PSS 268.



**NR 270. Toxic&Hrds Subst in Srf Water. 3 Credits.**

The fate of toxic and hazardous pollutants, including trace elements and organics, in surface waters; effects on human health and aquatic biota. Prerequisite: BIOL 001, CHEM 023, CHEM 042; CHEM 102 or equivalent; Senior standing.

**NR 275. NR Planning: Theory & Methods. 3 Credits.**

Investigates theoretical development of natural resource planning. Studies planning methods appropriate to protection and use of scenic, recreational, forest, agriculture, and historic resources and ecologically sensitive areas. Prerequisite: Senior standing.

**NR 276. Water Quality Anlys & Interp. 0 or 3 Credits.**

Selected aspects of water chemistry and bioassay as related to surface and ground waters. Laboratory analysis of water quality parameters and data interpretation. Prerequisite: One course in Chemistry, calculus, and Statistics; Senior standing.

**NR 279. Watershed Management Hydrology. 0 or 3 Credits.**

Fundamental elements of hydrology and contaminant transport in watersheds. Application of dynamic simulation techniques. Discussion of new technologies for watershed management. Prerequisite: NR 170 or equivalent or as a co-requisite; NR 020, PHYS 011, CHEM 023, CHEM 026 or equivalent; Senior standing.

**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: One year Biology; one year Chemistry; ecology course.

**NR 285. Advanced Special Topics. 1-6 Credits.**

Advanced special topics in natural resource planning beyond the scope of existing formal courses. Prerequisite: Graduate/Senior standing; Instructor permission.

**NR 288. Ecol Design & Living Technol. 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. Pre/co-requisites: Junior/Senior standing, background in ecology/systems theory.

**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.

**NR 306. Envisioning a Sust Future. 2 Credits.**

Seminar orienting graduate students to RSEN and providing frameworks for collaborative leadership, whole systems thinking, and intercultural competency.

**NR 333. Professional Writing. 0.5-1 Credits.**

Writing workshop that explores essay and report writing, as published in both popular and professional journals that examine the natural world and its resources. Prerequisites: None, but preference is given to Field Naturalist and Ecological Planning Graduate students; other students may enroll with instructor permission. Cross-listed with: PBIO 333.

**NR 334. Professional Writing. 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. Prerequisites: None, but preference is given to Field Naturalist and Ecological Planning Graduate students; other students may enroll with Instructor permission. 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 student standing.

**NR 343. Fndmntls of Geog Info Systems. 3 Credits.**

Concepts and methods in Geographic Information Systems (GIS) presented at an accelerated pace for Graduate students using ArcGIS software. Pre/co-requisites: Graduate standing.

**NR 346. Digital Image Processing. 2 Credits.**

Principles and applications of digital image processing of remotely sensed imagery. Hands-on analyses of satellite imagery will address environmental issues using ERDAS Imagine software.

**NR 354. Seminar:Envrmntl Policy & Mgmt. 3 Credits.**

Seminar examining contemporary environmental policy at local, state, national, and international levels; policy formulation, implementation and design relative to current environmental problems. Prerequisites: Graduate standing.

**NR 356. Conservation, Systems&Sustain. 3 Credits.**

Conservation concepts and practice, viewed through the lens of history, systems, and sustainability. From site to landscape scale, with case studies and practioner interviews. Prerequisites: An upper-level ecology or field science course. Cross-listed with: PBIO 356.

**NR 360. Environmental Sociology. 3 Credits.**

An in-depth exploration of how sociologists understand the relationship between a) the physical environment's effects on society, and b) society's effects on the natural environment. Prerequisite: Graduate standing; or Insturctor permission. Fall. Alternate years.

**NR 361. Politic:Landscape,Place,Nature. 2 Credits.**

Seminar exploring the social and political construction of nature, emphasizing how natural resources and environment are defined through social relationships in particular landscapes and places.

**NR 362. Leadership Relevancy 21st Cent. 3 Credits.**

Perspectives and tools for working on 21st challenges and opportunities. Targets public land managers. Week-long course in Vermont followed by online presentations, readings, online discussions. Part of NPS Graduate Certificate. Prerequisite: Graduate standing.

**NR 375. NR Planning: Laboratory. 1 Credit.**

Experiential laboratory applying natural resource planning theory and methods to local or regional issues. Students conduct a planning exercise for a town or region. Co-requisite: Concurrent enrollment in NR 275.



**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 377. Land Use Policy & Economics. 3 Credits.**

Economic and social forces that drive urban and suburban land use patterns, such as urban sprawl, and the policy mechanisms designed to intervene in those processes. Pre/co-requisites: Graduate standing or Instructor permission. Cross-listed with: TRC 316.

**NR 378. Integrating Analyses NR Issues. 3 Credits.**

Comparison of epistemologies and ontologies of natural resource disciplines. Applications from fields such as ecology, policy, sociology, economics, engineering, and ethics. Prerequisite: Graduate standing.

**NR 380. Seminar in Natural Resources. 0.5-2 Credits.**

Presentation and discussion of advanced problems, research, and current topics in natural resources by faculty, graduate students, and outside guest speakers.

**NR 382. Seminar in Research Planning. 1 Credit.**

Discussions of the planning and activities associated with Graduate student projects and research. Prerequisite: Instructor permission. Cross-listed with: FOR 382.

**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 385. Special Topics in NR. 0-3 Credits.**

Graduate topics and material that may eventually develop into a regular course offering; in addition, it may include topics and material presented only once.

**NR 391. Master's Thesis Research. 1-18 Credits.****NR 392. Master's Project Research. 1-12 Credits.****NR 491. Doctoral Dissertation Rsch. 1-18 Credits.****NEUROLOGY (NEUR)****NEUROSCIENCE (NSCI)****Courses****NSCI 225. Human Neuroanatomy. 0-3 Credits.**

Functional anatomy of the human nervous system and its cells. Focus on both peripheral and central nervous system. Lectures and laboratory (gross and microscopic anatomy). Prerequisite: Instructor permission.

**NSCI 302. Neuroscience. 4 Credits.**

This course examines the structure and functions of the human nervous system, provides laboratory experience with dissected specimens and incorporates clinical information. Prerequisites: Open to graduate students in Physical Therapy and others with Instructor permission.

**NSCI 306. Techniques in Neurobiology. 3 Credits.**

Discussion of techniques used to study the nervous system. Experience with light, fluorescence, electron microscopy; microsurgical procedures; electrophysiological stimulating, recording techniques; neuronal tracing techniques. Prerequisite: Permission of the Instructor.

**NSCI 320. Developmental Neurobiology. 3 Credits.**

Provides fundamental knowledge of cell-to-cell interactions necessary for proper development and organization of the nervous system. Topics include pattern formation, neuronal differentiation, axon guidance, and target interactions. Prerequisite: Permission of the Instructor. Alternate years.

**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 326. Basic Sci-Neurologic Disease. 1 Credit.**

In-depth examination of basic mechanisms and clinical aspects of one neurological disease per year. Disease examined changes every year. Prerequisite: Advanced Graduate Students, Neuroscience Faculty and Residents in Neurology, Neurosurgery and Psychology.

**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 328. Techniques in Microscopy. 3 Credits.**

Topics shall include practical background in microscopy, including brightfield, epifluorescence, confocal, multi-photon, deconvolution, atomic force and electron microscopy. Prerequisite: Instructor permission.

**NSCI 329. Topics in Excitable Membranes. 2 Credits.**

This course is a graduate course designed to introduce the fundamentals of cellular electrophysiology through independent student reading and faculty-led group discussions of journal articles. Prerequisite: Instructor permission.

**NSCI 330. Comparative Neurobiology. 2 Credits.**

This course is designed to introduce students to the cellular mechanisms that underlie selective motor and sensory abilities that have evolved in various species. Pre/co-requisite: Instructor permission.

**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 391. Master's Thesis Research. 1-18 Credits.****NSCI 395. Special Topics in Neuroscience. 1-3 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Instructor permission.

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

## **NURSING & HEALTH SCIENCES (NH)**

### **Courses**

**NH 301. Clin Ethics for Hlthcare Prof.. 3 Credits.**

Students will analyze clinical and organizational healthcare issues from an interdisciplinary perspective. Ethical decision-making and inter-disciplinary team skills will be developed. Pre/co-requisite: Graduate standing.

**NH 302. Quality in Health Care. 3 Credits.**

This interprofessional course provides students with the skills and knowledge needed to apply quality improvement approaches to the design and management of health care services. Cross-listed with: CTS 302.

**NH 303. Hlth Promotion & Disease Prvnt. 3 Credits.**

Students learn the value of and barriers to health promotion, health protection, and disease prevention, factors that influence personal health decisions, and preventive interventions.

## **NUTRITION AND FOOD SCIENCES (NFS)**

### **Courses**

**NFS 203. Food Microbiology. 0 or 4 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: A course in Biochemistry. Fall.

**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. Pre/co-requisites: NFS 153, NFS 154, or Instructor permission.

**NFS 208. Sensory Evaluation of Foods. 3 Credits.**

Practical study of the methods and protocols used to evaluate the sensory quality of food in the industry and research world. Prerequisite: NFS 053.

**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 043, NFS 053, NFS 054, 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; PBIO 201 or equivalent; ANPS 019 or equivalent; 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: CHEM 042, ANPS 020, NFS 053, NFS 054, NFS 143.

**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 065 and BSAD 120.

**NFS 260. Diet and Disease. 3 Credits.**

Examination of the physiologic, biochemical, and psychosocial basis of several disease states and the application of medical nutrition therapy in treatment. Prerequisite: NFS 053, NFS 143, NFS 243, NFS 244.

**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:NFS 260; Senior standing. Spring.

**NFS 263. Nutritional Biochemistry. 3 Credits.**

Comprehensive study of metabolism of carbohydrates, lipids, and protein emphasizing diet induced, hormone mediated alterations in metabolism (e.g. starvation and obesity). Prerequisite: NFS 243 or Instructor permission. Spring.

**NFS 295. Advanced Special Topics. 1-15 Credits.**

Lectures, laboratories, readings, or projects relating to contemporary areas of study. Credits negotiable. Enrollment may be more than once, maximum of twelve hours in NFS 195 and NFS 295 combined. Prerequisite: Department permission.

**NFS 296. Field Experience. 1-15 Credits.**

Professionally-oriented field experience under joint supervision of faculty and business or community representative. Prerequisite: Departmental permission. Credit negotiable. Maximum of fifteen hours in NFS 196 and NFS 296 combined.

**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: Acceptance into MS D program.

**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: Acceptance into MS D program.

**NFS 350. Nutrition&Food Science Seminar. 1 Credit.**

**NFS 360. Rsch Meth Nutr & Food Sciences. 3 Credits.**

Advanced research methods, including grant preparation, IRB requirements, data analysis and presentation, and selected topics in advanced nutritional and food sciences. Pre/Co-requisites: Permission of the Instructor.

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

**NFS 392. Evidence-based Practice Prjct. 1-2 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: NFS 360, MS in Dietetics.

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

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

## ORTHOPEDIC SURGERY (ORTH)

### Courses

**ORTH 381. Rdgs & Rsch:Musc Biomechanics. 1 Credit.**

Intended for Graduate Students doing thesis or dissertation work in Biomechanics. Class will meet to discuss current journal articles and literature reviews prepared by students. Prerequisite: Instructor Permission.

**ORTH 382. Rdgs & Rsch:Musc Biomechanics. 1 Credit.**

Intended for Graduate Students doing thesis or dissertation work in biomechanics. Class will meet to discuss current journal articles and literature reviews prepared by students. Prerequisite: Instructor Permission.

**ORTH 383. Rdgs & Rsch:Musc Biomechanics. 1 Credit.**

Intended for Graduate Students doing thesis or dissertation work in biomechanics. Class will meet to discuss current journal articles and literature reviews prepared by students. Prerequisite: Instructor Permission.

**ORTH 384. Rdgs & Rsch:Musc Biomechanics. 1 Credit.**

Intended for Graduate Students doing thesis or dissertation work in biomechanics. Class will meet to discuss current journal articles and literature reviews prepared by students. Prerequisite: Instructor Permission.

## 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. Prerequisite: Advanced standing in Parks, Recreation and Tourism or Instructor permission.

**PRT 240. Park and Wilderness Management. 3 Credits.**

History, philosophy, and management of wilderness, national parks, and related areas. Prerequisite: Junior/Senior standing in Parks, Recreation and Tourism.

**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: Advanced standing in Parks, Recreation and Tourism or Instructor permission.

## PATHOLOGY (PATH)

### Courses

**PATH 295. Advanced Special Topics. 1-3 Credits.**

See Schedule of Courses for specific titles.

**PATH 303. Translational Pathology. 3 Credits.**

A course providing an introduction to anatomic and clinical pathology, classes and hands-on training in essential pathology translational research techniques and exposure to their clinical laboratory applications. Prerequisites: Instructor approval.

**PATH 305. Molecular Mech Environ Disease. 3 Credits.**

Introductory course on molecular and cellular pathways of disease induction and development. Emphasis on environmental diseases. For graduate students and postdoctoral fellows and undergraduates with permission of course director. Alternate years.

**PATH 306. Pathobiology of Disease. 1 Credit.**

Computer-assisted basic pathology series with emphasis on skin, lung, brain, and digestive tract. Alternate years with PATH 305.

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

**PATH 395. Special Topics. 1-12 Credits.**

Special Topics in Pathology. Prerequisites: Graduate Students, Department Permission Immunology (MMG 223) desirable. Alternate year course with PATH 305.

## PHARMACOLOGY (PHRM)

### Courses

**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. 2 Credits.**

Experiments conducted under supervision in the areas of drug metabolism, modes of drug action, physicochemical properties of drugs, bioassay, and toxicology.

**PHRM 303. Pharmacological Techniques. 2 Credits.**

Experiments conducted under supervision in the areas of drug metabolism, modes of drug action, physicochemical properties of drugs, bioassay, and toxicology.

**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 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 391. Master's Thesis Research. 1-12 Credits.****PHRM 491. Doctoral Dissertation Research. 1-12 Credits.****PHILOSOPHY (PHIL)****Courses****PHIL 217. Philosophy of Language. 3 Credits.**

Philosophical study of the nature of language. Prerequisite: One Philosophy course at 100-level. Recommended: PHIL 013.

**PHIL 221. D2: Topics in Chinese Phil. 3 Credits.**

Detailed examination of a classical Chinese philosophical text or school. Prerequisite: PHIL 121.

**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 when topic is significantly different and with departmental approval.) Prerequisite: PHIL 101, PHIL 102 or PHIL 135.

**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. Prerequisite: One Philosophy course at the 100-level.

**PHIL 241. Contemp Social&Political Phil. 3 Credits.**

The ideas of leading contemporary philosophers concerning freedom, tolerance, economic justice, international relations, and the relationship between the individual, the community and the state. Prerequisite: PHIL 140, PHIL 142, PHIL 143, or PHIL 144.

**PHIL 242. Justice & Equality. 3 Credits.**

An examination of contemporary normative theories of distributive justice and equality. Prerequisites: POLS 041 and either a 100-level POLS course, or PHIL 140, PHIL 142, PHIL 143, or PHIL 144. Cross-listed with: POLS 241.

**PHIL 265. American Philosophy. 3 Credits.**

The thought of such leading American philosophers as Peirce, James, Royce, Santayana, Dewey, and Whitehead. Prerequisites: PHIL 101, PHIL 102.

**PHIL 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PHIL 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PHIL 297. Adv Readings & Research. 1-6 Credits.**

Independent study with an instructor on a specific philosopher or philosophical problem. Prerequisites: Instructor permission; an appropriate 200-level course in Philosophy.

**PHIL 298. Adv Readings & Research. 1-6 Credits.**

Independent study with an instructor on a specific philosopher or philosophical problem. Prerequisites: Instructor permission; an appropriate 200-level course in Philosophy.

**PHYSICAL EDUCATION-PROF (EDPE)****Courses****EDPE 200. Contemporary Issues. 1-6 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**EDPE 201. Admin of Athletic Programs. 3 Credits.**

Background for effective administration of the athletic program of schools. Include scheduling, budgeting, management, equipment, policy, public relations, and education justification. Prerequisite: Twelve hours of education and Psychology.

**EDPE 203. Principles of Physical Ed. 3 Credits.**

Principles basic to sound philosophy of physical education for appraisal of historical development; relationship to health education, recreation, and other areas; foundation and functions of physical education. Prerequisite: Admission to the program and Instructor permission.

**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. Prerequisite: SOC 001, SOC 019, or equivalent.

**EDPE 241. Sem in Phys Educ & Athletics. 2-4 Credits.**

Examination and analysis of contemporary issues and trends in physical education and athletics not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in physical education and related areas.



**EDPE 266. Ex Prescrip:Sprt,Hlth,Fit,Perf. 3 Credits.**

Course covers basic concepts of exercise prescription and exercise program design. Particular attention is paid to individualization of exercise program to meet participant needs. Cross-listed with: EXMS 266.

**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 295. Lab Experience in Education. 1-12 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.

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

Thesis topic must be approved by a faculty committee.

**EDPE 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.

## PHYSICAL THERAPY (PT)

### Courses

**PT 203. Professional Seminar 1. 2 Credits.**

Framework for students' becoming excellent practitioners, focusing on values, principles and core documents of the physical therapy profession, and contemporary issues related to the profession. Pre/co-requisite: DPT majors only.

**PT 204. Professional Seminar 2. 0 Credits.**

Students discuss professional issues and practices encountered in the clinical environment, allowing them to build a framework of knowledge and skills that supports excellent practice. S/U grading only. Pre/co-requisites: PT 203; Enrollment in DPT program.

**PT 205. Professional Seminar 3. 0 Credits.**

Students discuss professional issues and practices encountered in the clinical environment, allowing them to build a framework of knowledge and skills that supports excellent practice. S/U grading only. Pre/co-requisites: Enrollment in DPT program.

**PT 206. Professional Seminar 4. 0 Credits.**

Students discuss professional issues and practices encountered in the clinical environment, allowing them to build a framework of knowledge and skills that supports excellent practice. S/U grading only. Pre/co-requisite: Enrollment in DPT program.

**PT 207. Professional Seminar 5. 0 Credits.**

Students discuss professional issues and practices encountered in the clinical environment, allowing them to build a framework of knowledge and skills that supports excellent practice. S/U grading only. Pre/co-requisite: Enrollment in DPT program.

**PT 213. Movement Science I. 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. Pre/co-requisites: ANNB 201; enrollment in DPT program.

**PT 241. Patient Mngmt Fndmntl Skills. 6 Credits.**

Introduction to principles and practices of patient/client management including fundamental patient handling skills, physical examination techniques, history taking and interviewing skills, and clinical documentation. Prerequisites: ANNB 201; Enrolled as DPT student. Co-requisite: Pharmacology and Pathophysiology.

**PT 242. Patient Mgmt Musculoskeletal 1. 8 Credits.**

Lecture/Lab experiences in which students will apply fundamental biomechanical and kinesiology principles of the trunk, spine, and extremities. Prerequisites: PT 241, RMS 213, Pathophysiology, Pharmacology; Enrolled as DPT student. Co-requisite: RMS 244, RMS 251.

**PT 301. Clin Ethics for Hlthcare Prof. 3 Credits.**

Students will analyze clinical and organizational healthcare issues from an interdisciplinary perspective. Ethical decision-making skills will be developed. Pre/co-requisite: Graduate Standing.

**PT 302. Quality in Health Care. 3 Credits.**

This course provides students with the skills and knowledge needed to apply quality improvement approaches to the design and management of health care services. Pre/co-requisite: Graduate Standing. Cross-listed with: CTS 302, NH 302.

**PT 303. Hlth Promotion & Disease Prvnt. 2 Credits.**

Students learn the value of and barriers to health promotion, health protection, and disease prevention, factors that influence personal health decisions, and preventive interventions.

**PT 305. Pathophysiology/Pharmacology. 6 Credits.**

Study of diseases of the human body and their pharmacological treatments. Emphasis on common diseases in USA populations and most germane to physical therapy practice. Pre/co-requisite: Enrolled as DPT student.

**PT 320. Undrstdng Evidence in PT Pract. 3 Credits.**

Students critically analyze and interpret research in terms of applicability to practice, examine methods for measuring practice outcomes and apply data to answer clinical questions. Pre/co-requisites: Statistics course; enrollment as DPT student.

**PT 322. Adv Evidence Based Pract Skills. 3 Credits.**

Students gain advanced skills in critically analyzing research literature, including systematic reviews and clinical practice guidelines. Students analyze clinical data and apply results to decision-making. Pre/co-requisite: PT 320.

**PT 328. Independent Study. 1-4 Credits.**

Students work with faculty member to assist in research, applying previously learned skills in critical appraisal, library searches, research methods and writing. Pre/co-requisites: RMS 220 or PT 320 or equivalents; enrollment in DPT program.

**PT 330. Psychosocial Issues in Health. 3 Credits.**

Psychosocial dimensions of health, illness and disability will be examined from lifespan and multicultural perspectives. Pre/co-requisites: Psychology course; enrolled as DPT student.

**PT 331. Practice Management in PT. 3 Credits.**

This course introduces students to the fundamental nature and functions of general business organizations, particularly physical therapy practices. Pre/co-requisite: Enrollment in DPT program.

**PT 345. Patient Mgt-Neuromuscular 1. 0 or 6 Credits.**

Lecture and laboratory experiences re evidence-based medical and physical therapy management of adults with neuromuscular conditions including stroke, multiple sclerosis, and spinal cord injury. Pre/co-requisites: PT 215, Pathophysiology, Pharmacology; Enrolled as DPT student.

**PT 346. Patient Mgt-Neuromuscular 2. 0 or 5 Credits.**

Lecture and laboratory experiences re evidence-based medical and physical therapy management of children with neuromuscular conditions such as cerebral palsy and adults with developmental disabilities. Pre/co-requisites: PT 345, Pathophysiology, Pharmacology; Enrolled as DPT student.

**PT 347. Patient Mgt:Cardiopulmonary. 4 Credits.**

Students explore disease risk and prevention, as well as medical, surgical, pharmacological, psychological, and physical therapies in the management of individuals with cardiopulmonary related diseases. Pre/co-requisites: ANNB 201, PT 241, GRNU 303, RMS 251, pathophysiology; enrollment in DPT program.

**PT 348. Patient Mgt:Medical/Surgical. 2 Credits.**

Students explore medical, surgical, pharmacological, psychological, and physical therapies in the management of individuals with vascular, integumentary, lymphatic disorders and cancer. Pre/co-requisites: PT 241, PT 347, Pathophysiology, Pharmacology; Enrolled as DPT student.

**PT 349. Patient Mgt:Musculoskeletal 2. 0 or 4 Credits.**

Lecture/lab applying foundational and advanced biomechanical, neurophysiological, kinesiological, and anatomical principles of the trunk, TMJ, spine, and extremities. Pre/co-requisites: PT 242; Enrolled as DPT student.

**PT 351. Community Health in PT. 1-3 Credits.**

DPT students travel internationally to experience and reflect on structures, processes and outcomes of healthcare for patients receiving rehabilitation services in another country. Pre/co-requisite: second year DPT student.

**PT 352. Intl Collaborative in PT. 3 Credits.**

This Faculty Lead Program Abroad is an elective for PT students and licensed PT's interested in learning advanced manual physical therapy skills while studying abroad. Pre/co-requisites: PT 349 or PT license.

**PT 360. Integrated Patient Mgmt Sem. 2 Credits.**

Students integrate information learned in prior clinical and foundational science courses, as well as contemporary research findings, into a comprehensive patient management model. Pre/co-requisites: DPT student standing; successful completion of all previous DPT courses.

**PT 370. Clinical Internship 1. 3 Credits.**

Full-time (six weeks) Clinical Education Internship in an out-patient Orthopedic clinical setting. Pre/co-requisite: Completion of year one DPT curriculum.

**PT 371. Clinical Internship 2. 5 Credits.**

Full-time (ten weeks) Clinical Education Internship in various practice settings including out-patient, acute care, rehabilitation, home health, pediatric, long term care and specialty practices. Pre/co-requisite: Completion of all academic courses in DPT curriculum.

**PT 372. Clinical Internship 3A. 2 Credits.**

Full-time (four weeks) Clinical Education Internship in various practice settings including out-patient, acute care, rehabilitation, home health, pediatric, long term care and specialty practices. Pre/co-requisite: Completion of all academic courses in DPT curriculum.

**PT 373. Clinical Internship 3B. 1 Credit.**

Full-time (two weeks) Clinical Education Internship in various practice settings including out-patient, acute care, rehabilitation, home health, pediatric, long term care and specialty practices. Pre/co-requisite: Completion of all academic courses in DPT curriculum.

**PT 374. Clinical Internship 3C. 2 Credits.**

Full-time (four weeks) Clinical Education Internship in various practice settings including out-patient, acute care, rehabilitation, home health, pediatric, long term care and specialty practices. Pre/co-requisite: Completion of all academic courses in DPT curriculum.

**PT 375. Clinical Internship 4. 5 Credits.**

Full-time (ten weeks) Clinical Education Internship in various practice settings including out-patient, acute care, rehabilitation, home health, pediatric, long term care and specialty practices. Pre/co-requisite: Completion of all academic courses in DPT curriculum.

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

## PHYSICS (PHYS)

### Courses

**PHYS 201. Experimental Physics I. 3 Credits.**

Experiments in classical and modern physics. Prerequisites: PHYS 128; MATH 121; Junior standing.

**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. Biological Physics. 3 Credits.**

Physical laws, processes, and interactions pertaining to biological systems. 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 257. Modern Astrophysics. 3 Credits.**

Stellar structure and evolution, compact objects, the interstellar medium, galactic structure, gravitational theory, and cosmology, the formation of our solar system and terrestrial life. Prerequisite: One 100-level course in physical science or engineering. Cross-listed with: ASTR 257.

**PHYS 258. Relativity. 3 Credits.**

Development of Einstein's theory of special relativity. Lorentz transformation, time dilation, length contraction, mass variation, relative velocities. Introduction to four-dimensional space. Concepts of general relativity. Applications selected from astrophysics, elementary particles, etc. 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. Applictns 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 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PHYS 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**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 321. Theoretical Physics. 1-6 Credits.**

For research students interested in pursuing topics of general and departmental research interest in theoretical physics. Prerequisite: Instructor permission. Offered as occasion warrants.

**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. Prerequisite: Instructor permission.

**PHYS 331. Biological Physics. 1-3 Credits.**

For research students in the field of biological physics. Lectures, reports, and directed readings related to the research of the Department and the field generally. May be repeated for credit with departmental approval. Prerequisite: Instructor permission. Offered as occasion warrants.

**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 351. Seminar:Physics of Materials. 1-3 Credits.**

For research students in the field of the physics of materials. Lectures, reports, and directed readings related to the research for the department and the field generally. May be repeated for credit with departmental approval. Prerequisite: Instructor permission. Offered as occasion warrants.

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

## PLANT & SOIL SCIENCE (PSS)



## Courses

### **PSS 212. Advanced Agroecology. 0 or 4 Credits.**

This course presents 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. Pre/co-requisites: PSS 021 and one semester ecology at the 100-level or above or Instructor permission. Cross-listed with: ENVS 212.

### **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. Prerequisites: 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. Pre/co-requisites: minimum Junior standing, PSS 137 or one course in ecology plus one course in design or drawing. Cross-listed with: CDAE 238, ENVS 238, NR 238.

### **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. Alternate years.

### **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. Alternate years.

### **PSS 266. Soil Water Movement. 3 Credits.**

Mathematical modeling and physical principles of the soil-water-plant interaction and its relationship to environmental and agricultural issues. Prerequisites: PSS 161, one semester of Physics or Instructor permission. Alternate years.

### **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. Pre/co-requisites: BCOR 102 or NR 103; 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. Alternate years.

### **PSS 295. Advanced Special Topics. 1-12 Credits.**

Lectures, laboratories, readings, field projects, surveys, or research designed to provide specialized experience in horticulture, agronomy, soils, entomology, and integrated pest management. Prerequisite: Instructor permission.

### **PSS 296. Advanced Special Topics. 1-12 Credits.**

Lectures, laboratories, readings, field projects, surveys, or research designed to provide specialized experience in horticulture, agronomy, soils, entomology, and integrated pest management. Prerequisite: Instructor permission.

### **PSS 297. Advanced Independent Study. 1-6 Credits.**

Individual projects under direction of a faculty member. Project may involve original research, readings, internship, or assisting in teaching. Prerequisite: Instructor permission; More than a total of six credits per semester requires Chair permission.

### **PSS 298. Advanced Independent Study. 1-6 Credits.**

Individual projects under direction of a faculty member. Project may involve original research, readings, internship, or assisting in teaching. Prerequisite: Instructor permission; more than a total of six credits per semester requires Chair 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 302. Soil Science Colloquium. 1 Credit.**

Graduate student and faculty discussion of current research topics in soil science.

### **PSS 381. Graduate Special Topics. 1-3 Credits.**

Advanced readings and discussion of horticulture, crops, or soils research literature.

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

### **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. Special Topics. 1-18 Credits.**

### **PSS 491. Doctoral Dissertation Research. 1-18 Credits.**

## PLANT BIOLOGY (PBIO)

### Courses

### **PBIO 205. Mineral Nutrition of Plants. 3 Credits.**

Role of essential elements for plant growth including classical and modern approaches to the study of ion availability and transport. Prerequisite: PBIO 104.

### **PBIO 209. Biology of Ferns. 3 Credits.**

Evolutionary biology; a survey of New England ferns and discussion of their phylogenetic relationships; current research emphasizing morphological, biogeographical, genetic, and phytochemical aspects of speciation. Prerequisite: PBIO 108 (BCOR 101 recommended). Alternate years.



**PBIO 213. Plant Communities. 0-3 Credits.**

Plant sociology; structure and organization of the plant community; sampling methods and analysis of data; climatic and edaphic factors; field work. Prerequisite: PBIO 109 or Department permission.

**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 226. Environmental Problem Solving. 1-3 Credits.**

Students negotiate a contract, work as a team, and map and inventory forested natural areas as they apply problem solving skills to Vermont environmental project. Prerequisite: Instructor permission. One to three hours.

**PBIO 229. Water Relations of Plants. 3 Credits.**

Cross-listed with: FOR 299.

**PBIO 232. Botany Field Trip. 1 Credit.**

Trips to selected environments outside Vermont, led by faculty members representing different fields of botany. Overall, integrated approach to ecology, structure, and function.

**PBIO 234. Ecology of Freshwater Algae. 0 or 3 Credits.**

Community, population and physiological ecology of algae. Topics include taxonomy; diversity; distribution and seasonal succession; productivity and grazing; growth kinetics; and competitive and synergistic reactions. Prerequisite: NR 103 or BCOR 102. Alternate years.

**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. Alternate years.

**PBIO 251. Principles of Light Microscopy. 1 Credit.**

Introduction to the optics, construction, and care of the light microscope. Theory of phase and interference contrast, fluorescence, and video methods. Prerequisites: One year of Physics or Instructor permission.

**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 equivalent.

**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 295. Advanced Special Topics. 1-18 Credits.**

For advanced students within areas of expertise of faculty. Aspects of ecology, physiology, genetics, cytology, bryology, pteridology, paleobotany, photobiology, membrane physiology, and cell biology. Prerequisite: Department permission.

**PBIO 301. Cell & Molecular 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. Prerequisites: CHEM 142, Graduate standing in Biology or Instructor permission. Cross-listed with: BIOL 301, CLBI 301.

**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. 0.5-1 Credits.**

Writing workshop that explores essay and report writing, as published in both popular and professional journals that examine the natural world and its resources. Prerequisites: None, but preference is given to FN and EP Graduate students; other students may enroll with Instructor permission. Cross-listed with: NR 333.

**PBIO 334. Professional Writing. 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: None, but preference is given to FN and EP graduate students; other students may enroll with Instructor permission. Cross-listed with: NR 334.

**PBIO 369. Field Botany for NR Profession. 2 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 381. Adv Topics in Plant Biology. 1-4 Credits.**

Subject matter varies. Topics will stress current graduate student and faculty research interests in a journal review or presentation-discussion format. Prerequisite: Instructor permission.

**PBIO 382. Adv Topics in Plant Biology. 1-4 Credits.**

Subject matter varies. Topics will stress current graduate student and faculty research interests in a journal review or presentation-discussion format. Prerequisite: Instructor permission.

**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 491. Doctoral Dissertation Research. 1-15 Credits.**

Credit as arranged.

## PSYCHOLOGY (PSYC)

### Courses

**PSYC 205. Learning. 3 Credits.**

Analysis of theory and research on the basic learning process and behavior. Prerequisite: PSYC 109.

**PSYC 206. 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. Prerequisite: PSYC 109.

**PSYC 207. 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. Prerequisite: PSYC 109.

**PSYC 215. Cognition & Aging. 3 Credits.**

Changes in both sensory and cognitive aspects of aging, including changes in vision, hearing, perception, learning, and memory. Prerequisite: Permission of the Instructor.

**PSYC 220. Animal Behavior. 3 Credits.**

Behavior of animals under controlled experimental conditions and in their natural environments. Consideration of evolution, development, function, and control of behavior. Prerequisite: PSYC 109 or BCOR 102.

**PSYC 221. Physiological Psychology I. 0 or 4 Credits.**

Structure and function of mammalian nervous system, emphasizing neurological correlates of sensory experience and perception. Individual laboratory experience. Prerequisites: PSYC 109; PSYC 121 or NSCI 110.

**PSYC 222. Sel Topics Behavioral Neurosci. 3 Credits.**

Selected topics examining the role of the central nervous system in determining behavior, including innate behaviors, arousal, motivation, learning, and memory. Prerequisite: PSYC 121 or PSYC 221.

**PSYC 223. Psychopharmacology. 3 Credits.**

Effects of drugs (both medical and recreation) on behavior. Topics such as drug effects on learning, memory, motivation, perception, emotions, and aggression. Prerequisites: PSYC 109; PSYC 121 or PSYC 222.

**PSYC 224. 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. Pre/co-requisites: PSYC 121 and PSYC 109, or permission from the Instructor.

**PSYC 230. Advanced Social Psychology. 3 Credits.**

Advanced survey of current research on the behavior of individuals in social situations. Prerequisite: PSYC 109 or PSYC 130.

**PSYC 233. Experience & Creativity. 3 Credits.**

Explores psychological processes for developing creative thinking and for enhancing the quality of conscious experience. Emphasizes personal growth as well as theoretical understanding. Prerequisite: Advanced background in at least one relevant field, such as Psychology, Environmental Studies, Studio Art, or education.

**PSYC 236. Theories of Human Comm. 3 Credits.**

Study of the role of perception, human information processing, language, nonverbal codes, meaning, cognition, and interpersonal and sociocultural context in human communication process. Prerequisite: PSYC 109 or PSYC 130.

**PSYC 237. Cross-Cultural Communication. 3 Credits.**

Study of cultural factors, cognitive processes, communication patterns, and problems in cross-cultural communication; role of communication in development and social change in third world countries. Prerequisite: PSYC 109 or PSYC 130 or PSYC 230; other advanced background in education or a social science.

**PSYC 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: PSYC 109, or Instructor permission.

**PSYC 241. Org Psyc:Glob/Cultrl/Loc Force. 3 Credits.**

Study of global, cultural, and local dynamics upon organizational culture, leadership, workforce diversity, ethics and justice at work, and conflict resolution. Conduct applied organizational cultural analysis. Prerequisite: PSYC 109 or Instructor permission.

**PSYC 250. 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. Prerequisite: PSYC 109, PSYC 152.

**PSYC 251. 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. Prerequisite: PSYC 109 or PSYC 161. PSYC 109 may be taken concurrently.

**PSYC 253. Advanced Behavior Modification. 3 Credits.**

Application of techniques for the modification of human behavior in a variety of educational and social situations involving the collection and analysis of behavioral data. Prerequisites: PSYC 109, PSYC 152.

**PSYC 260. Self and Social Cognition. 3 Credits.**

An advanced course in social psychology that covers theory and research on the self and social cognition. Pre/co-requisites: PSYC 109 and PSYC 130.

**PSYC 261. Cognitive Development. 3 Credits.**

Examination of research and theory concerning developmental changes in the human processing of information from infancy to adulthood centered around the work of Piaget. Prerequisite: PSYC 109 or PSYC 161. PSYC 109 may be taken concurrently.

**PSYC 262. Social Development. 3 Credits.**

Examination of theory and research concerning interpersonal development in humans from infancy through adulthood. Relationships between language, cognition, and social development emphasized. Prerequisite: PSYC 109 or PSYC 161. 109 may be taken concurrently.

**PSYC 265. Infant Development. 3 Credits.**

Biological, cognitive, and social aspects of infant development in context; opportunities to evaluate and design research and apply knowledge to parenting, prevention, and social policy. Prerequisite: PSYC 109, PSYC 161 which may be taken concurrently or comparable.

**PSYC 266. Communication & Children. 3 Credits.**

Study of the role of communication, especially television, in cognitive and social development from preschool to adolescence. Relationship between television violence and abnormal behavior examined. Prerequisite: PSYC 109 or PSYC 161 or PSYC 163.

**PSYC 267. 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. Pre/co-requisites: PSYC 109 and PSYC 161.

**PSYC 268. Psychology Adult Dev & Aging. 3 Credits.**

Psychological development in the final third of the life span emphasizing theory and research concerning social, cognitive, perceptual, and mental health transitions and support interventions. Prerequisites: PSYC 001, and HDFS 020 or HDFS 195/HDFS 295 or Instructor permission.

**PSYC 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PSYC 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**PSYC 301. Faculty Seminar. 0 Credits.**

Introduction to specialized areas of psychology.

**PSYC 302. Faculty Seminar. 0 Credits.**

Introduction to specialized areas of psychology.

**PSYC 303. Biobehavioral Proseminar. 3 Credits.**

Advanced survey and analysis of behavioral and biological psychology, with special emphasis on learning theory and behavioral neuroscience.

**PSYC 305. Seminar in Learning Theory. 3 Credits.****PSYC 306. Emotion. 3 Credits.**

Analysis of research and theory on emotion from biological, psychological, cognitive and psychosocial perspectives. Research literature considering clinical disorders of emotion will also be considered. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 307. Cognitive Neuroscience. 3 Credits.**

Exploration of the neural bases of complex cognitive functions in humans, including memory, attention, executive functions, and consciousness, through a survey of recent journal articles. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 320. Animal Minds. 3 Credits.**

Examination of historical and modern scientific research literature on cognition as it is represented in the behavior of animals. Considers evolutionary, behavioristic, and cognitive perspectives. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 322. 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. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 323. 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. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 330. Proseminar in Exp Social Psych. 3 Credits.**

Advanced survey and analysis of experimental social psychology, including examination of social psychological theories, methods, and key research findings. Prerequisites: PSYC 303 or Instructor permission.

**PSYC 332. Cognition in Social Behavior. 3 Credits.**

Examination of social attribution, interpersonal set, perspectives in social encounter, and the formulation of interpersonal strategies. Prerequisite: Instructor Permission.

**PSYC 334. Organizational Behav&Cultures. 3 Credits.**

Examination of the impact of various organizational cultures upon leadership, personnel selection, group processes, motivation, entrepreneurship, decision making, conflict, negotiation strategies, and organizational development. Prerequisite: Instructor Permission.

**PSYC 340. 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.

**PSYC 341. Adv Statistical Methods II. 3 Credits.**

Continuation of PSYC 340. In-depth study of the analysis of variance and multiple regression. Further study of analysis and interpretation of data from the behavioral sciences. Prerequisite: PSYC 340.

**PSYC 344. Experimental Design. 3 Credits.****PSYC 346. 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: PSYC 340 and PSYC 341 or equivalent.

**PSYC 347. Measurement & Scaling. 3 Credits.**

Traditional psychophysical methods, Thurstonian judgmental methods, recent topics in unidimensional scaling. Techniques, applications in multidimensional scaling. Relation of these to mental test theory, factor analysis, cluster analysis. Prerequisites: PSYC 340, PSYC 341.

**PSYC 348. Structural Equation Modeling. 3 Credits.**

Introduction to confirmatory factor analysis, path analysis, and structural equation methods, with an emphasis on applied psychological research. Prerequisites: PSYC 340 and PSYC 341 or equivalent.



**PSYC 349. Seminar in Psyc Research Meth. 3 Credits.**

For advanced psychology Graduate students. Topics may include but are not limited to: factor analysis, discriminant function analysis, multivariate analysis of variance, advanced experimental design, computer application in data collection and analysis. Prerequisite: PSYC 341; or Instructor permission.

**PSYC 350. Family Therapy. 3 Credits.**

An exploration of current theories and techniques in family therapy, through readings and discussion, as well as observation of taped and live family therapy sessions. Prerequisite: Graduate standing in Clinical Psychology; or Instructor Permission.

**PSYC 351. Behavior Therapy: Adults. 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: Instructor Permission.

**PSYC 352. 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: Instructor Permission.

**PSYC 353. Clinical Human Neuropsychology. 3 Credits.**

Clinical seminar on effects on human behavior of neocortical dysfunction. Review of theoretical, clinical approaches to brain function, emphasis on recent developments in diagnostic techniques, ensuing theoretical developments. Prerequisite: PSYC 221, PSYC 222, or equivalent.

**PSYC 354. Psychopathology I. 3 Credits.**

An advanced course dealing with models of classification, diagnosis, epidemiology of behavior disorders in children. Prerequisite: Instructor Permission.

**PSYC 355. Psychopathology II. 3 Credits.**

An advanced course dealing with models of classification, diagnosis, epidemiology of behavior disorders in adults. Prerequisite: Instructor Permission.

**PSYC 357. Cross Culture Clin Interv&Rsch. 3 Credits.**

Issues for psychologists regarding clinical intervention and research with Black, Latino/a, Native and Asian Americans and international populations of color with an eye towards cultural competence. Prerequisites: Graduate standing.

**PSYC 359. Interpersonal Psychotherapy. 3 Credits.**

An examination of psychotherapy as an interpersonal process. Resistance, transference, and counter-transference examined as interpersonal interactions and related to interpersonal personality theory. Prerequisites: Advanced Graduate standing; Instructor permission.

**PSYC 361. Developmental Psychopathology. 3 Credits.**

Provides an overview of theoretical, methodological, and analytic approaches in developmental psychopathology. Seminar format. Prerequisite: Graduate student in Psychology.

**PSYC 362. Community Clinical Psychology. 3 Credits.**

Seminar examining community intervention strategies for psychological problems and health risk behaviors. Topics: history of community psychology, discussion of intervention programs, consultation issues, research. Prerequisite: Instructor Permission.

**PSYC 363. Advanced Primary Prevention. 3 Credits.**

Review of research literature on prevention of psychopathology and promotion of competence; development of model prevention programs; evaluation, ethical issues, and political issues. Prerequisite: Instructor Permission.

**PSYC 364. 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: Instructor Permission.

**PSYC 365. 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: Graduate student in Psychology.

**PSYC 366. Advanced Developmental Psyc. 3 Credits.**

Critical Analysis of selected topics in developmental psychology. Research, theory, applied, professional issues including, for example, moral development, infancy, early conceptual development, professional writing. Prerequisite: Graduate standing in Psychology. Repeatable course.

**PSYC 367. Social Development. 3 Credits.**

This course will include an examination and critique of psychological theories, methods, and research about social development from infancy through young adulthood. Prerequisite: Graduate student in Psychology.

**PSYC 369. Health Psychology. 3 Credits.**

Psychological aspects of the etiology, treatment, prevention of physical illness. Topics include: stress and disease, compliance, health care systems, coping with illness, positive health behavior. Prerequisite: Instructor Permission.

**PSYC 370. Adult Psychological Assessment. 3 Credits.**

Intelligence, neuropsychology, interviewing, psychodiagnosis, objective and projective personality methods, behavioral assessment, report writing. Supervised assessment practicum (100 hours) in university and in-patient mental health settings. Prerequisite: Instructor Permission.

**PSYC 371. 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: Instructor Permission.

**PSYC 372. Psychological Intervention I. 3 Credits.**

Introduction to psychotherapy, theories, and strategies. Skill building in case formulation, therapeutic goals, and effective intervention techniques. Supervised therapy practicum (100 hours) in university setting. Prerequisite: Instructor Permission.

**PSYC 373. Psychological Intervention II. 0 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: Instructor Permission.



**PSYC 374. Advanced Clinical Practicum. 0-1 Credits.**

Year-long, 20 hours/week supervised service delivery involving psychological intervention assessment and consultation. May be repeated for credit. Pre/co-requisites: Enrollment in Ph.D. program in Clinical Psychology; Instructor permission.

**PSYC 375. Internship in Clinical Psych. 0 Credits.****PSYC 380. Contemporary Topics. 3 Credits.**

Selected topics in depth, emphasis on critical analysis of original literature. Recent topics: anxiety, behavioral pharmacology, biological bases of memory, depression, organizational behavior, psychotherapy research, primate behavior, skilled performance.

**PSYC 381. Clinical Research Seminar. 3 Credits.**

Year-long seminar on methods and design in clinical research. Oral and written presentation of a research proposal and results. Required twice for clinical students. Prerequisite: Instructor Permission.

**PSYC 382. Adv Professional/Research Sem. 1-2 Credits.**

Discussion of current research and student research presentation in areas of concentration ("clusters"). Prerequisite: Graduate standing in General/Experimental Program.

**PSYC 385. Advanced Readings & Research. 1-3 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.

**PSYC 391. Master's Thesis Rsch. 1-18 Credits.****PSYC 395. Special Topics. 0-12 Credits.****PSYC 410. Preliminary Examination. 3 Credits.****PSYC 491. Doctoral Dissertation Research. 1-18 Credits.**

## 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 or equivalent.

**PA 295. Advanced Special Topics. 1-6 Credits.**

Current issues and new developments in public policy and public administration. Prerequisite: Permission.

**PA 296. Advanced Special Topics. 1-6 Credits.**

Current issues and new developments in public policy and public administration. Prerequisite: Permission.

**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.

**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. 0 or 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.****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 312. Mgmt in Hlth 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.

**PA 313. Public Policy Implementation. 3 Credits.**

A seminar considering aspects of the public policy implementation process from initiation to completion and evaluation with regards to system design, policy goals, communication, compliance, and political environment.

**PA 314. Administrative Law. 3 Credits.**

Examines legal foundations of public administration focusing on legal issues of most importance to present or future administrators.

**PA 315. Hlth Srv & Med Care in US. 3 Credits.**

Defines the milieu of issues and challenges faced by managers in the health services setting.

**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 318. Admin Theory & Practice. 3 Credits.**

Extensive examination of literature pertaining to the practice and theory of public administration. Explores public/private partnerships, intergovernmental management, ethics, and administrators as agents for organizational change.

**PA 319. State Administration. 3 Credits.**

Elements of public management at the state level i.e. the state/federal relationship regarding control; management within the force field of local conflict and cooperation; and management within the context of inter-agency conflict and cooperation. Cross-listed with: POLS 224.

**PA 320. Local Government Admin. 3 Credits.**

This course is a primer on local government administration in the US using the case method to experience the complexity of the challenges one confronts in the field.

**PA 321. Negotiation & Mediation. 3 Credits.**

Explores the principles of today's negotiations and mediations through readings, heavy emphasis on practical exercises between students, and case analyses of actual negotiations. Prerequisite: Graduate standing.

**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 325. Health Care Policy. 3 Credits.**

This course addresses policy issues affecting the structure, performance and change in the U.S. health care system, with a specific focus on the role of health care managers. Pre/co-requisite: CDAE 102, CDAE 124, or Instructor permission.

**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 334. Organizational Behav&Cultures. 3 Credits.****PA 342. Sustainability & Transportatn. 3 Credits.**

Introduction to the complex interconnection of engineering, policy, science and social science that characterize transportation systems, mobility problems and solutions. Interdisciplinary teams conduct case studies. Prerequisite: Instructor permission required. Cross-listed with: CE 312, TRC 312.

**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 395. Special Topics. 1-6 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.**

This course explores major areas of environmental public health (EPH), including environmental hazards, exposures, and related health outcomes, including emerging topics in environmental public health. Co-requisite: PH 302.

**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.**

Epidemiology 2 exposes students 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 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 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 313. Public Health & Social Justice. 3 Credits.**

Analytical examination of the relationship between health policies and programs and social justice issues in the United States with exemplars from other countries.

**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.**

This course 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 319. Environmental Health Law & Pol. 3 Credits.**

Introduces non-lawyers to American law as it relates to the protection of environmental and public health.

**PH 392. Culminating Project Experience. 1-6 Credits.**

This 6-credit MPH culminating project experience prepares students to apply knowledge and skills in a culminating experience that reflects research and practice needs of actual populations. Prerequisites: PH 301, PH 302, PH 303, PH 304, PH 305, PH 306.

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

See Schedule of Courses for specific titles.

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

See Schedule of Courses for specific titles.

**PUBLIC SERV TECH GEN (PSTG)****Courses**

**PSTG 300. Nurse Midwifery Grad Program. 1-6 Credits.**

**PSTG 993. Sub Degree Program. 0 Credits.**

**PSTG 994. NECOP Exchange Program. 0 Credits.**

**PSTG 997. Intent to Enroll. 0.5-18 Credits.**

**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. Pre/co-requisites: ANPS 019/ANPS 020, and Undergraduate Physics.

**RMS 220. Research I. 3 Credits.**

Focus is on critical analysis of research literature. Emphasis on critically reading and interpreting published research regarding applicability to the practice of health care professionals. Pre/co-requisite: Undergraduate Statistics.

**RMS 244. Patient Mgmt Therapeutic Modal. 0 or 3 Credits.**

Lecture/laboratory experience re theory and application skills for therapeutic modalities including heat, cold, light, water, sound, electricity, massage, traction, pneumatic pressure, and biofeedback. Pre/co-requisite: ANPS 019/ANPS 020.

**RMS 351. Exercise in Health and Disease. 3 Credits.**

Effects of exercise on physiological function, emphasizing muscular, skeletal, cardiovascular, pulmonary, neurological and endocrine systems, and the relationship of diet/exercise to health/wellness across the lifespan. Prerequisites: DPT major or Graduate standing; Anatomy/Physiology recommended.

**RELIGION (REL)****Courses**

**REL 291. Tpcs in Hist & Phenom of Rel. 1-6 Credits.**

Prerequisite: Nine hours in Religion, with six hours at the intermediate level; Junior standing. May be repeated up to six hours.

**REL 292. Tpcs in Hist & Phenom of Rel. 1-6 Credits.**

Prerequisite: Nine hours in Religion, with six hours at the intermediate level; Junior standing. May be repeated up to six hours.

**SECONDARY EDUCATION (EDSC)****Courses**

**EDSC 200. Contemporary Issues. 3 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within the boundaries of an existing course. Prerequisite: Twelve hours in education and related areas.

**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 Tch. 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. Teaching Internship. 8-12 Credits.**

Collaboration with professional teachers in design and implementation of effective instruction, with special focus on developing programs in a high school setting. Prerequisite: EDSC 203, EDSC 207, EDSC 209, EDSC 215, EDSC 216, and Special Methods.

**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 257. Tchng Math in Secondary Schools. 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 295. Lab Experience. 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.

**EDSC 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.

## 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 225. Transf Ourselves&Comm:SW Persp. 3 Credits.**

An MSW foundation elective that examines systems of oppression and social work strategies to decrease biased practices and create more equitable communities and institutions. Prerequisite: Matriculation in the foundation year of graduate study in Social Work; or Instructor permission.

**SWSS 226. Assessment Theory Social Work. 3 Credits.**

An MSW foundation elective analyzing competing and complementary assessment theories and their implications in social work in health/mental health and with children and families. Prerequisite: MSW standing 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 228. Aging:A Strength&Hum Right Per. 3 Credits.**

An examination of aging for social work policy and practice from the perspectives of strengths, social justice, human rights and critical social constructionism.



**SWSS 229. D2:Soc Work&Disability Rights. 3 Credits.**

A multi-cultural, age, gender, economic and international exploration of having a disability in terms of language, labeling, rights, social location, legislation, services and personal narratives.

**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 296. Social Work in Global Context. 3 Credits.**

Study of social work issues in different parts of the world. Located at the University of Lapland in Finland. Prerequisite: Background in human services or social work major; or MSW standing; permission of the Instructor.

**SWSS 301. Social Work in Health. 3 Credits.**

Based on examinations of current trends with clients of multiple ages, needs, and cultural perspectives, this course examines social work roles in delivering health services. Prerequisites: Completion of foundation coursework; MSW advanced standing; or Instructor permission.

**SWSS 302. Social Work in Mental Health. 3 Credits.**

Advanced knowledge and skills in working with children with severe emotional disturbances and adults with persistent mental illness. Community-based services are emphasized. Prerequisites: Completion of foundation coursework; MSW advanced standing; or Instructor permission.

**SWSS 310. Soc Work W/ Children & Fam I. 3 Credits.**

Focus is on families whose major task is child rearing and child caring. Covers advanced knowledge, concepts, and methods of contemporary child/family services within a family-centered approach. Prerequisites: Completion of foundation course work; MSW advanced standing; or Instructor permission.

**SWSS 311. Soc Work W/Children & Fam II. 3 Credits.**

Focus is on families with adolescents, families with no children and families with dependent adults. Advanced analysis of families from an adult member perspective and from a critical view of family ideology and myth. Prerequisites: Completion of foundation coursework; MSW advanced standing; or Instructor permission.

**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 Anl&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 331. Feminist Social Work Practice. 3 Credits.**

An advanced MSW concentration elective that analyzes practice conceptions and dilemmas of feminist social work in a global context and emphasizes professional activism and leadership. Prerequisite: Completion of MSW foundation course work; or Instructor permission.

**SWSS 332. SW w/Battered Women&Children. 3 Credits.**

An advanced MSW concentration elective that investigates theoretical and practical issues of social work practice with battered women and their children and develops related recommendations. Prerequisite: Completion of MSW foundation course work; or Instructor permission.

**SWSS 333. Social Work with Groups. 3 Credits.**

An advanced MSW concentration elective that integrates professional history, conceptual overviews and direct experience with methods for group work distinctive to social work practice. Prerequisite: Completion of MSW foundation course work or Instructor permission.

**SWSS 334. Intrdsc Sem Neurodev Disabil I. 3 Credits.**

Seminar exploring interdisciplinary process, collaborative teaming, cultural competence and family-centered care as they relate to children and families affected by neurodevelopmental and related disabilities. Pre/co-requisites: Permission of Instructor, Graduate standing. Cross-listed with: CMSI 311, EDSP 295, GRNU 296, PSYC 380, MSVR 381.

**SWSS 335. Intrdsc Sem Neurodev Disabil 2. 3 Credits.**

Seminar exploring interdisciplinary process, collaborative teaming, cultural competence and family-centered care as they relate to children and families affected by neurodevelopmental and related disabilities. Pre/co-requisite: Graduate standing. Cross-listed with: CMSI 312, EDSP 295, GRNU 296, PSYC 380, MSVR 381.

**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 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 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. Concentration Yr Field Pract. 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 concentration. Prerequisite: Completion of all Foundation Year Graduate Level Coursework; permission of Field Education Coordinator.

**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.

**SWSS 398. Final Project. 1-3 Credits.**

A written identification and analysis of a social work issue related to the student's concentration is prepared and presented. Prerequisite: Successful completion of foundation coursework and Instructor permission. Variable three credits. Total of three credits required. Fulfills Graduate College comprehensive examination requirement.

## SOCIOLOGY (SOC)

### Courses

**SOC 202. Population Dynamics. 3 Credits.**

Analysis of the factors affecting human population growth and distribution, migration patterns, and the relationship between economic activity and population trends. Prerequisite: Six hours of Sociology including PSYC 001 and PSYC 100, or PSYC 001 and PSYC 101, or Instructor permission.

**SOC 205. Rural Communities in Mod Soc. 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 including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission. Cross-listed with: CDAE 205.

**SOC 206. Urban Communities in Mod Soc. 3 Credits.**

The changing structure and dynamics of urban social organization in context of modernization and urbanization. Emphasis on cities and metropolitan areas in the U.S. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 207. Community Org & Development. 3 Credits.**

Communities as changing sociocultural organizational complexes within modern society. Special attention given to problems of formulation and implementation of alternative change strategies. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission. Cross-listed with: CDAE 218.

**SOC 209. Small Groups. 3 Credits.**

Examination of the structure and dynamics of small groups and the interpersonal, informal network of relations that characterize the interaction of members. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 211. Soc Movements & Collective Behav. 3 Credits.**

Examination of origins, development, structure, and consequences of crowds, riots, crazes, rumors, panics, and political and religious movements and their relationships to cultural and social change. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 213. Women in Dev in 3rd World. 3 Credits.**

An examination of the meaning and measurement of development, sociodemographic characteristics, sex stratification, and effects of Colonialism and Westernization on women's issues in the third world. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission. Cross-listed with: WGST 205.

**SOC 214. Delinquency. 3 Credits.**

Analysis of the nature and type of juvenile behavior that violates law, the mechanisms for defining such behaviors as delinquent, and their causes and consequences. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 216. Criminal Justice. 3 Credits.**

Analysis of the social structures and processes in the arenas of criminal justice, the labeling of criminal offenders, and other issues related to crime, punishment, and justice. Prerequisites: SOC 001 and SOC 100, or SOC 101.

**SOC 217. Corrections. 3 Credits.**

Analysis of the social structures and processes involved with individuals designated as offenders of criminal law: probation, prison, parole, and programs of prevention and rehabilitation. Prerequisite: Six hours of Sociology, including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 222. Aging & Ethical Issues. 3 Credits.**

Analysis of selected ethical issues posed by an aging society and faced by older persons, their families, health care and service providers, and researchers. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 225. Organizations in Mod Society. 3 Credits.**

Examination of basic classical and contemporary theory and research on the human relations, internal structures, environments, types, and general properties of complex organizations and bureaucracies. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 240. Political Sociology. 3 Credits.**

Examination of the social organizations of power and authority in modern societies and the dynamics and institutional relationships of political institutions, interest groups, parties, and the public. Prerequisites: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 243. Mass Media in Modern Society. 3 Credits.**

Intensive examination of selected topics in the structure of media organizations and their relationships to and impacts upon the major institutions and publics of contemporary issues. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 254. Sociology of Health & Medicine. 3 Credits.**

The social organization and institutional relationships of medicine in society and the role of sociocultural factors in the etiology, definition, identification, and treatment of illness. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 255. Soc of Mental Health. 3 Credits.**

Analysis of the social structures and processes involved in the identification, definition, and treatment of mental illness and its sociocultural etiology and consequences. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 258. Sociology of Law. 3 Credits.**

Analysis of the sociocultural structure of the legal institution and its relationships to other institutions: the social organization of the legal profession, lawmaking, and the courts. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**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: six hours of Sociology including SOC 001 and SOC 100, or Instructor permission.

**SOC 275. Meth of Data Anyl in Soc Rsch. 3 Credits.**

Quantitative analysis of sociological data; includes table, regression, and path analysis, scaling and factor analysis, and the analysis of variance emphasizing multivariate techniques. Prerequisites: six hours of Sociology including SOC 001 and SOC 100, or Instructor permission.

**SOC 279. Contemporary Sociological Thry. 3 Credits.**

Critical examination of contemporary functional, conflict, exchange, interactionist, and structural theoretical approaches. A number of other theoretical approaches selected by seminar participants also examined. Prerequisites: Six hours of Sociology including SOC 001 and SOC 101, or Instructor permission.

**SOC 281. Seminar. 3 Credits.**

Presentation and discussion of advanced problems in sociological analysis. Prerequisite: Twelve hours of Sociology; Instructor permission.

**SOC 282. Seminar. 3 Credits.**

Presentation and discussion of advanced problems in sociological analysis. Prerequisite: Twelve hours of Sociology; Instructor permission.



**SOC 288. Rsch Meth Teaching Sociology. 3 Credits.**

The development and evaluation of the teaching of sociology.  
Prerequisite: Twelve hours of Sociology; permission of Department.  
Open only to students who serve concurrently as teaching assistants in the Department.

**SOC 289. Rsch Meth Teaching Sociology. 3 Credits.**

The development and evaluation of the teaching of sociology.  
Prerequisite: Twelve hours of Sociology; permission of Department.  
Open only to students who serve concurrently as teaching assistants in the Department.

**SOC 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 100, or Instructor permission.

**SOC 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 297. Readings & Research. 1-6 Credits.**

Prerequisite: Six hours of Sociology including SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SOC 298. Readings & Research. 1-6 Credits.**

Prerequisite: Six hours of Sociology included SOC 001 and SOC 100, or SOC 001 and SOC 101, or Instructor permission.

**SPANISH (SPAN)****Courses****SPAN 246. Reading Cervantes. 3 Credits.**

A topical approach to the study of Cervantes, author of Don Quijote de la Mancha, and his works' significance as a reflection of/on Spain's literary-cultural landscape. Prerequisite: SPAN 140.

**SPAN 286. Writing Revolution-Latin Amer. 3 Credits.**

Topics may include early uprising against Spain, representation of revolutionary figures (Simon Bolivar, Pancho Villa, etc.), contemporary resistance to imperialism, among others. Prerequisite: SPAN 140.

**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: SPAN 140.

**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: SPAN 140.

**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: SPAN 140.

**SPAN 292. Modern Cultures of Spain. 3 Credits.**

A study of the cultures of Spain from the Enlightenment to the present, emphasizing the major intellectual, political, and artistic developments. Prerequisite: SPAN 140.

**SPAN 295. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: SPAN 140.

**SPAN 296. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles. Prerequisite: SPAN 140.

**SPAN 297. Advanced Readings & Research. 1-6 Credits.**

Permission of Chair required. Prerequisite: SPAN 140.

**SPAN 298. Advanced Readings & Research. 1-6 Credits.**

Permission of Chair required. Prerequisite: SPAN 140.

**SPECIAL EDUCATION (EDSP)****Courses****EDSP 200. Contemporary Issues. 1-3 Credits.**

Designed so that its content and structure may accommodate special issues not especially appropriate within 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 207. Cooperative Learning. 3 Credits.**

Theoretical and experiential instruction in procedures to increase social acceptance and academic achievement of exceptional learners in mainstream settings through cooperative learning. Prerequisites: Instructor permission.

**EDSP 216. Curr&Insruct in Special Ed. 3 Credits.**

Introduction to curriculum and instruction for individuals who present academic and behavioral challenges. Emphasis on assessment, evaluation, curriculum, instruction, theories of learning and social development. Pre/co-requisite: Instructor Permission.

**EDSP 217. Behavior Analysis in SpecialEd. 3 Credits.**

Individualized instruction for learners with significant disabilities emphasizing learning principles, behavior analysis, and research based instruction and interventions. Prerequisite: Instructor Permission.

**EDSP 221. Family Centered Services. 3 Credits.**

An in-depth study of families of children with special needs; family ecology; interaction and life cycle. Development and implementation of family/professional collaboration strategies. Practicum required. Prerequisite: 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 228. Adv Methods & Instr Special Ed. 3 Credits.**

Students apply advanced principles of behavior analysis in the development and implementation of instructional programs for learners with moderate and severe disabilities. Prerequisite: Instructor permission and introductory behavior analysis course.

**EDSP 275. Voc Instr Students W/Spec Need. 3 Credits.**

Development of instructional strategies for including students with disabilities in vocational education. Procedures for developing, implementing, and evaluating individualized vocational plans. Prerequisite: Admission to an approved teacher certification program or Instructor permission.

**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 297. Adolescent Lit & Math Curric. 3 Credits.**

Development, adaptation and assessment of literacy and mathematics curriculum for adolescent age students with disabilities. Prerequisite: Instructor Permission.

**EDSP 298. Special Educ Practicum. 1-6 Credits.**

Students provide direct instruction for six learners with learning disabilities, mental retardation, behavior disorders, and/or multidisabilities. Prerequisite: Instructor permission.

**EDSP 301. Historic Trend Issues Services. 0 or 3 Credits.**

Study treatment of individuals with disabilities, including effects of discrimination, advocacy, litigation, legislation, sociological perspectives and economic considerations in education, vocational, residential service systems. Prerequisite: Instructor permission.

**EDSP 302. Phys&Dev Char of Indiv w/Disab. 3 Credits.**

Normal development - birth through six years, developmental disorders, disabilities, medical/health considerations. Management of significant disabilities through the employment of such procedures as handling, positioning, and feeding. Prerequisite: Instructor permission.

**EDSP 305. Res Dev&Coll:Fam/Sch/Com/Agncy. 3 Credits.**

An overview of collaborative teaming, function assessment and Vermont's System of Care for students with emotional and behavioral disabilities. A practicum experience is included. Prerequisite: BA.

**EDSP 306. Emot&Behav Dis/Child&Adolesc. 3 Credits.**

This course provides an overview of emotional disorders (e.g., depression, anxiety, ADHD, conduct disorder) experienced by youth and relevant assessment tools for an educational setting. Prerequisite: BA.

**EDSP 307. Prev&Interv Strategy:Students. 3 Credits.**

This course covers effective prevention and intervention strategies with, or at-risk, for emotional and behavioral disorders. It covers such topics as classroom management, social skills training, anger management, internalizing disorders. Prerequisite: BA in Education/related field.

**EDSP 310. Curr & Tech in Spec Education. 3 Credits.**

Curricular and assessment areas essential to education of students with disabilities. Development, adaptation of curricula and assessment in early education, elementary and secondary and adult levels for mild, moderate, and severe disabilities. Prerequisite: Instructor permission.

**EDSP 311. Curr & Tech in Spec Education. 0 or 3 Credits.**

Curricular and assessment areas essential to education of students with disabilities. Development, adaptation of curricula and assessment in early education, elementary and secondary and adult levels for mild, moderate, and severe disabilities. Prerequisite: Instructor permission.

**EDSP 312. Adv Behavior Prin in Spec Ed. 3 Credits.**

A survey on behavior theory and research applications for learners with learning disabilities, mental retardation, behavior disorders, and multidisabilities. Prerequisite: Acceptance to M.Ed. program or Instructor permission.

**EDSP 313. Adv Behavior Prin in Spec Ed. 0 or 3 Credits.**

A survey on behavior theory and research applications for learners with learning disabilities, mental retardation, behavior disorders, and multidisabilities. Prerequisite: Acceptance to M.Ed. program or Instructor permission.

**EDSP 316. Research Sem in Spec Educ. 3 Credits.**

Research which addresses key issues in special education is reviewed and evaluated. Students write and present a research review with attention to practitioner needs. Prerequisite: EDSP 301, EDSP 310, EDSP 312; a course in quantitative research design.

**EDSP 317. Dsgn & Eval of Ed/Sev Handcpd. 3 Credits.**

Students analyze, adapt curricula for severely disabled, utilizing knowledge of normal, abnormal motor development, feeding techniques, adaptive, prosthetic devices, medial aspects, parent professional partnership, socialization, normalization, legal aspects. Prerequisite: Instructor permission.

**EDSP 319. Intern Sp Personnel in Spec Ed. 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: Permission. for special education services. Prerequisite: Instructor permission.

**EDSP 320. Lab Exp:Ed Prgmng/Sev Handcppd. 3 Credits.**

Students identify, evaluate severely disabled learners, demonstrate competency in handling, positioning, feeding. Current skill levels assessed, educational programs designed, including objectives, teaching/learning procedures, evaluation, measurement.

Prerequisite: Master's degree or equivalent; 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 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.

**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 384. Intern: Course Dev & Implement. 6 Credits.**

Instruction in developing competency-based courses in special education for inservice teacher training. Practicum involves team teaching with University special education faculty. Prerequisite: Certification as a Consulting Teacher/Learning Specialist and Instructor permission.

**EDSP 385. Intern: Adv Syst Dev & Mgmt. 3-6 Credits.**

Competency-based instruction in developing and adapting technological programs for advanced system-level change. Prerequisite: EDSP 319 for six hours; Instructor permission.

**EDSP 386. Intern:Mgmt Lrng Env for Hdcpd. 1-6 Credits.**

Implementation of data-based individualized education in one-to-one, small group, and large group instruction for severely disabled student(s) in special or regular classrooms. Prerequisite: EDSP 217, EDSP 290, EDSP 228 or Instructor permission.

**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: EDSS 387.

**EDSP 391. Master's Thesis Research. 1-6 Credits.**

Thesis topic must be approved by a faculty committee.

**EDSP 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.

## STATISTICS (STAT)

### Courses

**STAT 200. Med Biostatistics&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.

Prerequisites: STAT 111, STAT 141 or STAT 143; or STAT 211.

Cross-listed with: BIOS 200.

**STAT 201. 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. Prerequisites: STAT 111 with Instructor permission, or STAT 141. Co-requisite: STAT 211.

**STAT 211. 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: Junior standing. Cross-listed with: BIOS 211.

**STAT 221. Statistical Methods II. 3 Credits.**

Cross-listed with: BIOS 221. Multiple regression and correlation. Basic experimental design. Analysis of variance (fixed, random, and mixed models). Analysis of covariance. Computer software usage. Prerequisites: STAT 141 or STAT 143, or STAT 211.

**STAT 223. 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. Prerequisites: Any 200-level Statistics course; STAT 221 or STAT 225 recommended; matrix algebra recommended. Cross-listed with: BIOS 223.

**STAT 224. 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. Prerequisites: STAT 141 or STAT 143, or STAT 211.

**STAT 225. Applied Regression Analysis. 3 Credits.**

Simple linear and multiple regression models; least squares estimates, correlation, prediction, forecasting. Problems of multicollinearity and influential data (outliers).

**STAT 227. Adv Statistical Methods II. 3 Credits.**

Cross-listed with: PSYC 341. Continuation of PSYC 340. In-depth study of the analysis of variance and multiple regression. Further study of analysis and interpretation of data from the behavioral sciences. Prerequisites: STAT 211 with computer experience or PSYC 340.

**STAT 229. 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. Prerequisites: STAT 221 or above. Cross-listed with: BIOS 229.

**STAT 231. 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. Prerequisites: STAT 211, STAT 221 recommended.

**STAT 233. Survey Sampling. 3 Credits.**

Design and data analysis for sample surveys. Simple random, stratified, systematic, cluster, multistage sampling. Practical issues in planning and conducting surveys. Prerequisites: STAT 211; or STAT 141 or STAT 143 with Instructor permission.

**STAT 235. 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. Cross-listed with: BIOS 235.

**STAT 237. Nonparametric Statistical Mthd. 3 Credits.**

Nonparametric and distribution free methods; categorical, ordinal, and quantitative data; confidence intervals; rank and chi-square hypothesis tests; computer-intensive procedures (bootstrap, exact tests). Prerequisite: STAT 211; or STAT 141 or STAT 143 with Instructor permission.

**STAT 241. Statistical Inference. 3 Credits.**

Introduction to statistical theory: related probability fundamentals, derivation of statistical principles, and methodology for parameter estimation and hypothesis testing. Prerequisites: STAT 151 or STAT 153 or STAT 251, STAT 141 or equivalent, MATH 121. Cross-listed with: BIOS 241.

**STAT 251. 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. Prerequisites: MATH 121; STAT 151 or STAT 153 recommended. Cross-listed with: MATH 207, BIOS 251.

**STAT 252. Appl Discr Stochas Proc Models. 1 Credit.**

Markov chain models for biological, social, and behavioral systems models. Random walks, transition and steady-state probabilities, passage and recurrence times. Prerequisite: STAT 151, STAT 153, or STAT 251.

**STAT 253. Appl 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. Prerequisites: STAT 211 or STAT 225; or STAT 141 or STAT 143 with Instructor permission. Cross-listed with: CSYS 253.

**STAT 256. Neural Computation. 3 Credits.**

Introduction to artificial neural networks, their computational capabilities and limitations, and the algorithms used to train them. Statistical capacity, convergence theorems, backpropagation, reinforcement learning, generalization. Prerequisites: MATH 124 or MATH 271, STAT 153 or equivalent, and computer programming. Cross-listed with: CS 256, CSYS 256.

**STAT 261. 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. Prerequisites: STAT 251 or either STAT 151 or STAT 153 with Instructor permission. Cross-listed with: BIOS 261.

**STAT 265. Integrated Product Development. 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.

**STAT 281. Statistics Practicum. 1-4 Credits.**

Intensive experience in carrying out a complete statistical analysis for a research project in substantive area with close consultation with a project investigator. Prerequisites: Any one of STAT 200, STAT 201, STAT 221 through STAT 237, or STAT 253; Some statistical software experience preferred. No credit for Graduate students in Statistics or Biostatistics.

**STAT 295. Advanced Special Topics. 1-6 Credits.**

For advanced students. Lectures, reports, and directed readings on advanced topics. Prerequisite: As listed in course schedule.

**STAT 308. Applied Biostatistics. 3 Credits.**

The rationale and application of biostatistical methods in the biological, health and life sciences with emphasis on interpreting and reporting results. sciences. Prerequisite: STAT 141 or equivalent. Cross-listed with: MPBP 308, BIOS 308.

**STAT 321. Seminar in Advanced Statistics. 1 Credit.**

Seminar presentations and discussions of statistical literature pertaining to the theoretical aspects of methods studied in STAT 221, STAT 223, STAT 224, STAT 225, and STAT 229, respectively. Corequisites: STAT 221 for STAT 321; STAT 223 for STAT 323; STAT 224 for STAT 324; STAT 225 or STAT 221 for STAT 325, STAT 229 for STAT 329. STAT 241 or STAT 261 recommended.

**STAT 323. Seminar in Advanced Statistics. 1 Credit.**

Seminar presentations and discussions of statistical literature pertaining to the theoretical aspects of methods studied in STAT 221, STAT 223, STAT 224, STAT 225, and STAT 229, respectively. Co-requisites: STAT 221 for STAT 321; STAT 223 for STAT 323; STAT 224 for STAT 324; STAT 225 or STAT 221 for STAT 325, STAT 229 for STAT 329. STAT 241 or STAT 261 recommended.

**STAT 324. Seminar in Advanced Statistics. 1 Credit.**

Seminar presentations and discussions of statistical literature pertaining to the theoretical aspects of methods studied in STAT 221, STAT 223, STAT 224, STAT 225, and STAT 229, respectively. Co-requisites: STAT 221 for STAT 321; STAT 223 for STAT 323; STAT 224 for STAT 324; STAT 225 or STAT 221 for STAT 325, STAT 229 for STAT 329. STAT 241 or STAT 261 recommended.

**STAT 325. Seminar in Advanced Statistics. 1 Credit.**

Seminar presentations and discussions of statistical literature pertaining to the theoretical aspects of methods studied in STAT 221, STAT 223, STAT 224, STAT 225, and STAT 229, respectively. Co-requisites: STAT 221 for STAT 321; STAT 223 for STAT 323; STAT 224 for STAT 324; STAT 225 or STAT 221 for STAT 325, STAT 229 for STAT 329. STAT 241 or STAT 261 recommended.



**STAT 329. Seminar in Advanced Statistics. 1 Credit.**

Seminar presentations and discussions of statistical literature pertaining to the theoretical aspects of methods studied in STAT 221, STAT 223, STAT 224, STAT 225, and STAT 229, respectively. Co-requisite: STAT 221 for STAT 321; STAT 223 for STAT 323; STAT 224 for STAT 324; STAT 225 or STAT 221 for STAT 325, STAT 229 for STAT 329. STAT 241 or STAT 261 recommended.

**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-requisites: STAT 241 or STAT 251 or Instructor permission.

**STAT 355. Statistical Pattern Recognition. 3 Credits.**

Analysis of algorithms used for feature selection, density estimation, and pattern classification, including Bayes classifiers, maximum likelihood, nearest neighbors, kernels, discriminants, neural networks and clustering. Prerequisites: STAT 241 or STAT 251, or Instructor permission. Cross-listed with: CS 355, CSYS 355.

**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. Pre/co-requisites: STAT 223 or STAT 225; CS 016/CE 011 or permission. Cross-listed with: CSYS 369.

**STAT 380. Sem: Statistics & Biostatistics. 0.5-1 Credits.**

Presentation and discussion of current topics, methodological research and applications in Statistics and Biostatistics by graduate students, faculty and guest speakers. Prerequisite: Instructor Permission.

**STAT 381. Statistical Research. 1-3 Credits.**

Methodologic or data analytic research culminating in oral and written reports to the faculty. Prerequisite: Instructor Permission. Cross-listed with: BIOS 381.

**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 391. Master's Thesis Research. 1-6 Credits.****STAT 395. Advanced Special Topics. 1-3 Credits.**

Lectures or directed readings on advanced and contemporary topics not presently included in other statistics courses. Prerequisites: As listed in course schedule. Cross-listed with: BIOS 395.

**TEACHER EDUCATION (EDTE)****TRANSPORTATION RESEARCH CENTER (TRC)****Courses****TRC 310. Transportation Systems Seminar. 1 Credit.**

Introduction to the complex interconnections of engineering, policy, science and social science that characterize mobility systems. Seminar emphasizes academic research, articles and student writing. Prerequisites: Graduate standing and Instructor permission.

**TRC 312. Sustainability & Transportatn. 3 Credits.**

Introduction to the complex interconnection of engineering, policy, science and social science that characterize transportation systems, mobility problems and solutions. Interdisciplinary teams conduct case studies. Prerequisite: Instructor permission required. Cross-listed with: CE 312, PA 342.

**TRC 314. Risk/Behavior in Transportatn. 3 Credits.**

In-depth examination of human, environmental and vehicle factors in transportation crashes. Students develop safety research proposals and statistical measurements of risk and rates. Prerequisite: Instructor permission required.

**TRC 316. Land Use Policy & Economics. 3 Credits.**

Economic and social forces that drive urban and suburban land use patterns, such as urban sprawl, and the policy mechanisms designed to intervene in those processes. Pre/co-requisites: Graduate standing; Instructor permission. Cross-listed with: NR 377.

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

See Schedule of Courses for specific titles.

**VERMONT STUDIES (VS)****Courses****VS 295. Advanced Special Topics. 1-6 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Advanced undergraduate or Graduate standing.

**VS 296. Advanced Special Topics. 1-6 Credits.**

See Schedule of Courses for specific titles. Prerequisite: Advanced undergraduate or Graduate standing.

**WATER RESOURCES (WR)****Courses****WR 391. Master Thesis Rsch. 1-12 Credits.**

Credit as arranged.

**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, BIOL 002 or equivalent; 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, BIOL 002, WFB 161.

**WFB 271. Wetlands Wildlife. 2 Credits.**

Breeding biology, behavior, habitat management, and population ecology of wetland wildlife with emphasis on waterfowl.

Prerequisites: WFB 174, NR 103.

**WFB 272. Wetlands Wildlife Laboratory. 1 Credit.**

Laboratory and field assessment of the ecology and management of wetland habitats and their associated wildlife populations.

Prerequisite: Previous or concurrent enrollment in WFB 271 or NR 260.

**WFB 273. Terrestrial Wildlife. 3 Credits.**

Integration of ecological principles, wildlife biology, land use, and human dimensions in wildlife. Emphasis on development and maintenance of terrestrial wildlife habitat, and population regulation of terrestrial species. Prerequisite: WFB 174.

**WFB 274. Terrestrial Wildlife Lab. 1 Credit.**

Laboratory and field experience related to terrestrial species and management of their habitat. Field project required. Prerequisite:

Previous or concurrent enrollment in WFB 273.

**WFB 275. Wildlife Behavior. 3 Credits.**

Behavior and social organization of game and nongame species as they pertain to population management. Prerequisites: One year of Biology; an ecology course; WFB 074 or WFB 174 recommended.

**WFB 279. Marine Ecology. 3 Credits.**

Structure and function of major marine communities, including open ocean, benthos, coral reefs, and estuaries. Emphasis on unique ecological insights gained in the marine environment.

Prerequisites: BIOL 001 and BIOL 002, an ecology course, or Instructor permission.

**WFB 283. Terrestrial Wildlife. 4 Credits.**

Wildlife ecology with an emphasis on management and conservation of species, populations, and ecosystems. Prerequisite: WFB 174.

**WFB 285. Advanced Special Topics. 1-6 Credits.****WFB 311. Ecology of Fishes. 3 Credits.**

Structure of fish assemblages, zoogeography, morphology, life history strategies, bioenergetics, competition, predation, and fish effect on ecosystems. Prerequisites: Graduate standing or Instructor permission; NR 140 or STAT 201; an ecology course.

**WFB 352. Population Dynamics & Modeling. 4 Credits.**

Modeling and analysis of animal population dynamics, as influenced by environmental, ecological, and management factors; estimation of population size, density, survivorship, reproduction, and migration.

Prerequisite: NR 140 or STAT 211; an ecology course.

**WFB 387. Graduate Special Problems. 1-6 Credits.**

Advanced readings or special investigation dealing with a topic beyond the scope of existing formal courses or thesis research, culminating in an acceptable paper. Prerequisite: Instructor Permission.

**WFB 388. Graduate Special Problems. 1-3 Credits.**

Advanced readings or special investigation dealing with a topic beyond the scope of existing formal courses or thesis research, culminating in an acceptable paper. Prerequisite: Instructor Permission.

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