Course Title:	EE 121: Electronics II
Class Information:	Spring 2020 Class time: 8:30-9:20 MWF and 2:20 to 3:10 M Location: Votey 303 M(1)WF Votey 254 M(2)
Instructor Information:	Dr. James Kay Votey 373 Phone: (802) 656-0734 jkay@uvm.edu
Office Hours:	Monday 3:30 to 4:30 Thursday 4:15 to 5:15
Prerequisite:	EE 120
Course Description:	Theory of operation of bipolar transistors. Fundamental semiconductor materials and devices. Amplifier DC and AC analysis and design. Example analog circuit functions.
Course Objectives:	1. Understand the fundamental principles of operation of bipolar junction transistors 2. To be able to find, read and understand technical literature, including manufacturer's data sheets for semiconductor devices 3. Understand fundamental assumptions and limitations of device models 4. To be able to analyze fundamental circuits using semiconductor devices 5. To be able to design fundamental circuits from a set of performance requirements including multi-stage amplifiers and switching circuits 6. To become familiar with appropriate circuit simulation tools
Course Culture:	Respect yourself and all others. I can't work on a problem or issue with the class if I do not know about it, so please let me know of any issues that come up.
Text:	D. A. Neamen, Microelectronic Circuit Analysis and Design, McGraw-Hill, 4th Ed. 2010.
Supplementary Text:	Paul Gray and Campbell Searle, Electronic Principles, Physics Models, and Circuits, John Wiley and Sons, 1969. (Available through webarchive at https://archive.org/details/ElectronicPrinciples)

Grading:	Homework: 10% Quizzes: 25% Exam I: 20% Exam II: 20%

Final: 25%

Topics:

1. Review of PN junction and introduction to Bipolar Junction Transistor physical model
2. Bipolar Junction Transistor Biasing
3. Using Transistors as electronic switches
4. Small signal models including frequency effects
5. Single stage amplifier design
6. Multi-stage amplifier design and stability effects
7. Operational amplifier design and analysis
8. Design of functional building blocks using transistor circuits

Tentative book chapters: The course will present material from the following chapters of the text (Neamen, Microelectronics Analysis and Design), as time allows.

Chapt. 5

Chapt. 6

Chapt. 7

Chapt. 8 (Bipolar section only)

Chapt. 11

Chapt. 12

Chapt. 13

Chapt. 14

Chapt. 15

General: The instructor posts all lecture notes, assignments, solutions, and additional material at the Blackboard (Bb) site for this class. This can be found at: https://bb.uvm.edu

If there is student interest, an optional problem/recitation meeting will be scheduled. This session will be used to answer student questions and discuss homework assignments. Student feedback on these sessions has been positive in past terms.

Eight to ten homeworks are assigned throughout the semester. Grading: 2/3 for solution process and 1/3 for the correct answer. Homework is due on Blackboard (no hard copies accepted) per the details posted for each assignment. Homework will typically be assigned on Monday and due on Tuesday the following week. Homework solutions will be posted on Blackboard.

Short (10 min) quizzes (nine to eleven) will be given throughout the semester, usually on Fridays. I generally give a fairly detailed description of what will be on each quiz the lecture period before it is given. This will allow you to focus your study on what will be asked on the quiz.

Exams will be given in February and April. At least one weeks notice will be given. The exams will have a comprehensive component. Two sheets of notes (two-sided) may be used on in-class exams. The final exam will be a take home design problem. A brief (~10 minute) verbal exam will be scheduled with each student to discuss their final design. The final exam grade will be based upon the quality of the design as well as the ability of the student to explain their design rationale during the verbal portion of the exam. The verbal portion of the final exam will be held during the scheduled final exam period for the course.

Late work will not be accepted unless prior arrangements have been made with the instructor. Exam/quiz conflicts should be noted early and alternate arrangements made with the instructor.

Calculators: Calculators will be allowed on most quizzes and all exams. Cell phones and computers will not be permitted during quizzes and exams, so you should have access to a dedicated calculator. Your calculator should be capable of performing exponential and trigonometric functions. However, emphasis will be placed on concepts and symbolic solutions rather than numeric results.

Attendance: Attending the lectures is highly correlated with success in this course. Attendance will not be taken, but students are expected to attend class, and are responsible for any material presented during lectures.

Academic Integrity: Students are expected to work on quizzes and exams independently. Any clarification or questions on these evaluations should be directed to the instructor. Students are encouraged to work together and to exchange ideas when working on homework. However, students must be sure to submit only their own work and to reference that work properly, including all web sources. UVM's policy on academic integrity is clearly defined and can be found at http://www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf

ADA: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with

students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan. Please visit the following site for contact information. www.uvm.edu/academicsuccess/student_accessibility_services

Religious Holidays: Students have the right to practice the religion of their choice. Students should submit in writing to the instructor by the end of the second full week of classes their documented religious holiday schedule for the semester. An arrangement could then be made to make up the missed work.

Alcohol/Cannabis: As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.

ABET Matrix:

0 - little or no contribution
1 - moderate contribution
2 - high level of contribution

- *Outcome (1)*: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
  Contribution: 2
- *Outcome (2)*: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
  Contribution: 2
- *Outcome (3)*: An ability to communicate effectively with a range of audiences.
  Contribution: 1
- *Outcome (4)*: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
  Contribution: 0
- *Outcome (5)*: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet

objectives.
Contribution: 0

- *Outcome (6)*: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Contribution: 2

- *Outcome (7)*: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Contribution: 1

- *EE Criterion (A)*: The curriculum must include probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

Contribution: 2

- *EE Criterion (B)*: The curriculum for programs containing the modifier “electrical,” “electronic(s),” “communication(s),” or “telecommunication(s)” in the title must include advanced mathematics, such as differential equations, linear algebra, complex variables, and discrete mathematics.

Contribution: 1