ENGS-220: Circuits and Electronics
Spring 2025

Meeting Space for Lecture: Trexler Hall 273	Time: MWF 2:20 – 3:20 pm
Instructor: Dr. Avijit Sarker	Office: Trexler 266B
Email: sarker@roanoke.edu	Office hours: TBD
Course Site: Roanoke College	Laboratory hours: Tues, 8:30 – 11:30 am
Phone: 662-380-1775 (cell); 540-375-2320(office)	Meeting Space for Lab: Trexler Hall 273

Prerequisites: PHYS 202

Co-requisite: ENGS 220L

Course Materials:
Required Book:
Introduction to Mechatronics and Measurement Systems (4th Edition)
https://www.amazon.com/Introduction-Mechatronics-Measurement-Systems-Alciatore/dp/0073380237
https://mechatronics.colostate.edu/

Class Lecture

Course Overview: This course provides a foundational understanding of electrical and electronic engineering, covering key topics such as electric circuits and components, semiconductor electronics, system response, analog signal processing using operational amplifiers, and digital circuits. Students will explore the principles and applications of essential circuit elements, analyze the behavior of systems in time and frequency domains, study the properties and functionalities of semiconductor devices, and design both analog and digital circuits. Through a combination of theoretical learning and hands-on experiments, this course equips students with the skills to analyze, design, and troubleshoot complex electrical and electronic systems.

Learning Outcomes: By the end of this course, students will be able to:

1. **Understand and Analyze Circuits**: Apply fundamental principles, such as Ohm's Law and Kirchhoff's Laws, to analyze and solve DC and AC circuits with passive and active components.
2. **Explain Semiconductor Concepts**: Demonstrate an understanding of semiconductor materials and devices, including diodes and transistors, and their applications in electronic circuits.

3. **Evaluate System Responses**: Analyze the dynamic behavior of electrical systems in the time and frequency domains, using transfer functions and system modeling.
4. **Design Analog Circuits**: Design and implement analog signal processing systems using operational amplifiers for various applications like filtering, amplification, and signal conditioning.
5. **Develop Digital Circuits**: Design and analyze digital circuits, including combinational and sequential logic systems, using Boolean algebra and digital design principles.
6. **Integrate Theory and Practice**: Combine theoretical knowledge with hands-on skills to build, test, and troubleshoot electrical and electronic circuits and systems.
7. **Communicate Technical Information**: Prepare clear, concise reports and presentations to effectively communicate circuit design, analysis, and results.
8. **Work in Teams**: Collaborate with peers to solve problems and complete projects, demonstrating teamwork and project management skills.

Time Commitment: Students are expected to put in approximately 12 hours per week of work in order to successfully complete this course, including class time. The exact amount of time each student needs to devote to this class to be successful will vary, but 12 hours is a reasonable amount of time to budget for this class.

Attendance: Attendance and participation are essential for achieving the planned learning outcomes of this class. You are required to attend every class and attendance will be taken daily. If you show up 10 minutes late, you will be marked absent. I understand that some absences are unavoidable. Any planned absences should be communicated with me in advance (~2 days in advance). Unexpected absences should be communicated with me as soon as possible. It is your responsibility to make up for the work that you missed.

Grading: Grades for this course will be based on homework assignments, tests, quizzes, participation, and a project. Grades will be assigned using the following scale: A 100-93, A- 92.9-90.0, B+ 89.9-87.0, B 86.9-83, B- 82.9-80.0, C+ 79.9-77.0, C 76.9-73, C- 72.9-70.0, D+ 69.9-67.0, D 66.9-63, D- 62.9-60.0, F 59.9-0. The approximate grading distribution is in the table below.

Homework (7~10x)	15%
Quizzes (7~10x)	15%
In-Lab participation	15%
Unit Exams (3x)	30%
Final Exam (Lecture)	15%
Final Project or Exam (Lab)	10%

Homework: There will be approximately one set of problems each week. The homework sets will be posted on Inquire. Assigned homework must be submitted by the indicated due date. See the late work policy below for more details.

Quizzes: These will be about 10-20 minutes long and will be held during the lecture time. The quiz date will be announced during one lecture period prior to the quiz date. Quizzes can only be made-up for excused absences.

In-Lab Participation: This will be lab activities per week with many hands-on activities. You are expected to be in the lab and actively engaged in activities and submit reports.

Unit Exams: There will be three-unit exams during the semester. Each exam will cover the material listed on the syllabus or as informed by me in class.

Final Exam: There will be a cumulative final exam at the end of the semester. It is an in-class exam and will take place Thursday April 24 from 2.00 to 5.00 pm.

Laboratory: Please note that this class has a required lab and a significant portion of the course work is dedicated to lab work. This is an opportunity to put into practice many of the techniques and principles that are introduced within the classroom. While we have a weekly lab meeting, many lecture days will also include hands-on activities. Final Exam on lab or project is due on the last day of the lab.

Late Work: All work should be submitted by the assigned deadline. If you have extenuating circumstances that prevent you from submitting work on-time, please communicate with me in advance. Late work may be accepted, but for reduced credit. After one week past the originally-assigned due date, no credit will be awarded for the assignment.

Make-up Exams: Make-up exams may only be allowed prior approval or documented extenuating circumstances. I reserve the right to give an alternative exam, which may include different questions and/or a different format.

Office Hours: Feel free to text me to set up a meeting. I'm available on weekdays between 10:00 AM and 5:00 PM. If I'm unavailable, we can arrange a Zoom meeting instead.

Class Disruption: All students are entitled to a professional learning environment. Students should not act in a manner which will distract and disrupt the class learning experience. Cell phones or any other electronic communication/entertainment devices, except for tablets/laptops used for taking notes, must be either turned off or silenced at all times during the lecture period.

Academic Integrity: Maintaining academic integrity is a mutual responsibility for all of us. I will be respectful of your time and make sure I am available during my office hours and will communicate with you in a timely manner. I expect the same in terms of your timeliness, honesty and sustained effort. Plagiarism and cheating are unacceptable and also violate RC policies. Refer to the "Academic Integrity" page on the RC website– https://www.roanoke.edu/inside/a-z_index/academic_integrity
Included here is an explanation of how violations of the College's academic integrity policy are handled.

Accessible Education Services: Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at aes@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment.

Diversity: I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Name/Pronouns: I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.