Rensselaer

Course Syllabus

Course Information

Electronic Instrumentation		ENGR 2300	Section 01 02
RPI Fall 2017	4 cr		
Studio	MR	8:00AM-9:50AM	JEC 4201
Studio	MR	4:00AM-5:50AM	JEC 4201

Course Website: http://ei-rpi.org

Prerequisites or Other Requirements:
MATH-2400: Differential Equations and PHYS-1200/1260: PHYSICS II are the formal prerequisites for this course. We also use concepts from essentially all required math courses, physics courses, and basic engineering courses.

Instructors

Professor Paul Schoch — schocp@rpi.edu
Office Location: J Building 4203 — (518) 276-6072
Office Hour: Mon. 2-3pm, JED 6027, also open door

Professor Mahmood Hameed — hameem2@rpi.edu
Office Location: JEC 7006 — (518) 276-8441
Office Hours: MR 2 – 4PM

Teaching Assistant(s)

Name	Office	Office Hours	Email Address
Prottay Adhikari	JEC 4201	T6-9pm, W6-9pm	mondap2@rpi.edu
Joe Ebel	JEC 4201	R6-7pm	ebelw@rpi.edu
Waleed Mansha	JEC 4201	Wnoon-1pm	manshm@rpi.edu
Phillip Kwon	JEC 4201	Sunday4-6pm	kwonp2@rpi.edu
Garrison Johnston	JEC 4201	Sunday6-9pm, M6-9	johnsg7@rpi.edu
Michael Camire	JEC 4201	R6-8pm	camirm@rpi.edu

Course Description

A survey, application-oriented course for engineering and science majors. Transducers and measurement devices. DC and AC analog circuits including impedance, power, frequency response, and resonance. Diodes, transistors and operational amplifiers. Signal conditioning, noise, and shielding. Digital electronics, A/D and D/A conversation. Power supplies, rectifiers, and electromagnetic devices.

Course Text(s)

All materials online
Optional: 'Practical Electronics for Inventors,' by Paul Scherz and Simon Monk

Supplemental Reference

See course website

Course Goals / Objectives

Build basic background in circuit, electronic and sensor fundamentals for students outside of electrical and computer engineering.

Course Content

Instrumentation Methodology
Analog Electronics
Sensors
Analog/Digital Transitional Electronics
Digital Electronics

Student Learning Outcomes

1. Students will be able to analyze simple DC circuits and will understand AC steady-state responses of resistance, inductance and capacitance in terms of impedance and be able to analyze simple AC circuits.
2. Students will be familiar with basic properties of operational amplifiers and the analysis of simple operational amplifier circuits.
3. Students will be able to identify circuit symbols and operations of logic gates.
4. Students will understand functions and characteristics of diodes, transistors, and transformers.
5. Students understand the concept of frequency response and the transient responses of capacitors and inductors.
6. Students will be able to draw accurate schematics and use them to perform electrical measurements, construct circuits on breadboards and model the circuit response using PSpice.
7. Students will be proficient in the use of a standard set of electrical instruments, both in their traditional stand-alone form and as pc-based virtual instruments.
8. Students will be able to effectively interface between electrical systems and essentially all other engineering systems (e.g. biological, thermal, mechanical, photonic …) through the use of sensors and actuators and the application of basic engineering design principles.

Course Assessment Measures

Assessment	Due Date	Learning Outcome #s
Exam	3 Per Term	1, 2, 3, 4, 5, 6, 7, 8
Homework	8 per Term	1, 2, 3, 4, 5, 6, 7, 8

Grading Criteria

3 Quizzes (45%)
There will be three quizzes on the four main topics of the course. All Quizzes will be closed book, but students will be given a 8.5" x 11" crib sheet. Specific topics to be addressed on each quiz are listed on the course website. Any new topics will be announced at least one week before the quiz date. Check the webpage on Quiz Information to see the kind of questions you can expect to see on the quizzes. Attendance at quizzes is required. Official requests for an alternate quiz time and/or additional time to complete quizzes will be accommodated if received two weeks before the scheduled quiz time. Requests received at a later time will be considered up to two days before the quiz, but will be accommodated only if arrangements can be made.

8 Homework Assignments (8%)
All homework assignments are on LMS. There are eight graded out of 10-15 points each; one for each experiment. They are generally due a few days before the experiment is due. For the exact dates, check the course website. You have three chances to take the homework. If you miss the due date, you will have two chances to get a maximum score of 12 points in three days time. If you miss this deadline, you will still be able to do the homework any time before the end of the semester for a maximum score of 7.5 points.

26 Daily Question Sets (2%)
An additional homework assignment is to watch the prep video for each of the 26 classes and answer one or more questions on material in the video at the beginning of the class. The sum total of the daily question grades make up (2%) of the overall course grade.

8 Experiments (22%)
Experiment write up (80 points) Experiment write ups are not supposed to be a formal report. They should include the following: (1) Annotated plots required for each section; (2)Answer the questions for each section; (3) Include a summary of key points; (3) Discuss mistakes and problems; (4) List member responsibilities. The cover/signature sheet (with dated signatures) must be attached to the front of the report or the report will be considered incomplete and will not be graded. Participation (20 points) 20 out of 100 points of your grade will be based on class attendance and participation. You will earn 20 points for each experiment if you are in attendance and doing your share. You can make up class time missed during open shop and give the following form to your instructor: EImakeup.pdf. Late Penalty -- For full credit, the write-up must be turned in on the due date. This is the date listed on the course calendar unless you are informed otherwise in class. The late penalty for experiment write up is as follows: For each school day late (weekends and vacations are not counted): 4 points per day for the first two days and 7 points per day for each additional day. Thus, if the report is handed in

5 days late, the penalty is 29 points. Please note that there are, at most, 5 school days per week.

4 Design Projects (18%)
Project Reports (80 points) -- The general issues to be addressed in each report include (but are not necessarily limited to) the following. Please note that the guidelines and exact point breakdown are somewhat different for each project. (1) Introduction: Introduce and describe the goals of the project. Usually, you will be asked to list at least two issues from the course that have an impact on the project. (2) Background and Theory: Describe the theoretical background you need to understand the experiment. (3) Initial Design: Describe the initial project design. This is often given to you. Develop a plan for building and testing the design. Discuss implementation problems. Present initial design results. (4) Final Design: Describe the changes you made for your final design. Present final design results. Discuss implementation problems. (5) Conclusions: Compare results for initial and final designs. (6) Personal Responsibilities: Discuss how you divided up the tasks. (7) Appendices: Supporting graphs, data, calculations, simulations, etc. and a list of references. (8) Extra Credit: All projects have some opportunity to gain extra credit.
Participation (20 points): Participation will be awarded in a similar manner to the experiments.
Late Penalty -- The Design Project Reports are due on the dates indicated on the course calendar. If they are handed in late, a penalty will be applied in a similar manner to the experiments.

Overall Class Participation (5%) -- Five percent of your grade will be based on participation. This will include class attendance, your active participation during class, and a fair contribution to write-ups. This assessment will be based on the observations of the TA's, the instructors and your fellow students. More information about attendance and participation is available on the course webpages.

Attendance Policy

See Website

Other Course Policies

See Website

Academic Integrity

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts that violate this trust undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities defines various forms of Academic Dishonesty and you should make yourself familiar

with these. In this class, all assignments that are turned in for a grade must represent the student's own work. In cases where help was received, or teamwork was allowed, a notation on the assignment should indicate your collaboration.

Submission of any assignment that is in violation of this policy will result in a grade of zero for the assignment.

If you have any question concerning this policy before submitting an assignment, please ask for clarification.