Hellen and John C. Hartmann Department of Electrical and Computer Engineering

New Jersey Institute of Technology

ECE 392 Electrical Engineering Laboratory II

Course description:
Studies, assembling, testing and analysis of basic analog circuits. Emphasis on electronic measurement techniques, instrumentation and data analysis. Simulations of dc, ac, and transient circuit response on a personal computer.
Credits and contact hours: 1 credit, 3 contact hours
Course coordinator's name: Marek Sosnowski
Text book:
Laboratory Manual for ECE 392 (on ECE laboratory website)
Other supplemental materials: Nilsson, J.W. and Riedel, S.A., *Electric Circuits*, 9^{th} *Edition*, Pearson Prentice Hall, Upper Saddle River, NJ, 2011
Prerequisites ECE 231, HSS 101, *co-requisites*: ECE 232
Information
Laboratory work related to ECE 271 and ECE 372. Covers the practical design and testing of electrical and electronic circuits. Introduces engineering design and measurement concepts by the use of selected design projects. Design, construct and test electronic circuits using semiconductor components. Use of Multisim/PSpice for solving dc, ac and transient problems on the personal computer.

Course Learning Outcomes:
Students will be able to:

(1) Use FET transistor to build a constant current source and a variable resistor. (2) Build Emitter Follower circuit with a BJT transistor
(3) Design the Common Emitter Amplifier with specific gain.
(4) Design and build active low pass and high pass filters using operational amplifiers. (5) Design and build sine wave oscillator using an operational amplifier with positive feedback. Distinguish operational characteristics of logic TTL and CMOS gates.
(6) Complete a circuit project based on own design and methods learned in this laboratory.

ABET Criterion 3 Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLO 1-6);
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 (CLO 1-6)
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CLO 1-6)

Experiments:

1. Field Effect Transistor and J-FET
2. The Emitter Follower
3. Common Emitter Amplifier
4. OP-AMP Basics
5. OP-AMPS; Active Filters
6. Non-linear Circuits; Positive Feedback
7. Digital Circuits
8. Design Project

Attendance

A laboratory is a practical experience requiring proper equipment and involving teamwork.
Therefore, attendance at all laboratory sessions is required. Students who miss a laboratory session must make up for it at the first opportunity and arrange it with the instructor. A student absent at a regular lab session has to make his or her measurements and not use the data obtained by the group partner.

Laboratory Notebook

Students are required to have a Laboratory Notebook which should have current record of laboratory procedures, schematics and data. Prior to every lab session you should enter in the notebook a brief plan of experimental tasks, including schematic and other relevant information. Each entry in the notebook must be dated.The Laboratory Notebook provides documentation of your experimental work and will be reviewed by the instructor and used for evaluating your performance. Show your notebook to the instructor at the end of every lab session before leaving.

Deliverables

Pre-laboratory assignments precede each set of experiments, which prepares you for work in the laboratory. Prelabs are completed at home by each student individually and are to be handed to the instructor prior to doing the experimental work. Besides entry of the experimental plan in the notebook the prelabs usually consist of simulations and schematics of the experimental design.
Laboratory Reports are prepared by each group of students, who have worked together on experiments, after all measurements and analysis are completed. Reports should be typed and have the standard properly filled cover page. All pages must be numbered, and all figures and graphs must have captions and numbers. The axes of the graphs must be labeled, and the units indicated. Schematics of all circuits should be included and the conditions under which data were obtained (such as input voltage, frequency etc.) must be clearly indicated. Divide report in numbered sections starting with Introduction, which states briefly the objectives of the experiment. Follow with Experimental Procedures, describing the experimental setup. Next is Experimental Data, followed by Discussion, which includes data analysis, derivation of parameters and comparison with simulations. You may include a separate Simulations section if it is justified by its size. Finally, a very important section Conclusions, in which you should briefly comment on the results and their agreement (or not) with your expectations or modeling.
Simulation software: MULTISIM, MS EXCEL, MATLAB or other.

GRADING POLICY:

The course grade is based on the average grade of all experiments. Each experiment grade consists of the following elements:

1. Preparation for the experiments including Prelab assignment 15 %
2. Laboratory Report:
    a) Quality of presentation and format 15 %
    b) Experimental data 40 %
    c) Analysis simulations and discussion 30 %

The grade of an individual student may be lower than for the rest of the team based on poor attendance or participation in the laboratory. The instructor may modify the above as he or she sees fit.

NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.