



ECE Department

ECE 454 – System Level Analog Electronics

Fall 2006

Instructor Information

Instructor: Marc E. Herniter

Office Hours : [See Schedule.](#)

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PREREQUISITE: [ECE 351](#)

REQUIRED MATERIALS:

OPTOINAL TEXTBOOK: *Schematic Capture With Cadence PSpice, 2nd Edition*, M.E. Herniter, Prentice Hall, 2003. ISBN: 0-13-048400-8. (The first edition is O.K. if you already have it.)

OPTIONAL TEXTBOOK: *Design with Operational Amplifiers and Analog Integrated Circuits, 3rd Ed.*, Sergio Franco, McGraw-Hill, 2002, ISBN: 0-07-232084-2. (optional)

LECTURE NOTES: Lecture notes are available at the bookstore. You will need the Adobe Acrobat Reader version 4 or higher to view these notes.

REQUIRED SOFTWARE:

PSpice: OrCAD PSpice and Capture version 15.2. Instructions for installing the software are available on my website at http://www.rose-hulman.edu/~herniter/Rose_Classes/ECE454/454_index.htm.

EVALUATION METHODS: Your final grade will be based on the schedule below:

Homework	20%
Lab	30%
Midterm Exam	25%
Final Exam	25%

- Your grade will be based on a curve generated at the end of the semester or the standard 90%, 80%, 70%, 60% scale, whichever represents the performance of the class. Note that a curve can both raise or lower the standard scale.
- Approximate class standings and grade distributions will be distributed after the exam and during the quarter.
- A grade of incomplete will only be given for circumstances beyond a student's control. Class load, extra curricular activities, and jobs are all circumstances that are under the control of a student and will not justify a grade of incomplete.

COURSE POLICIES:

HOMEWORK: There will be 10 homework assignments (order of magnitude estimate). These assignments should be done independently. Homework is due at the beginning of class on the due date. Late homework will not be accepted. Solutions are available on [my web site](#). The files are downloadable and can be viewed with the Adobe Acrobat Reader. **You are required to use the standard RHIT format for homework.**

ATTENDANCE: Attendance is required.

LATE HOMEWORK: Homework is due at the beginning of class on the specified due date. Late homework will not be accepted.

IN CLASS EXAMS: These exams are open book, open notes, and open brain (your brain only). Personal computers may only be used during exams to view the class notes. You may not use Maple or PSpice during the exam.

HONOR CODE: The honor code will be enforced in this class.

MAKEUP EXAMS: Makeup exams will not be given.

LABORATORY: We will construct a 16 watt audio amplifier with the following components:

- DC Power Supplies
- Power amplifier (Darlington Push-Pull)
- Equalizer (hi-pass, band-pass, and low-pass filters)
- Pre-Amp (Input Signal Selection, volume, fixed gain)
- Amplitude monitor/LED Bar graph display

INSTRUCTIONAL PHILOSOPHY: Topics will be covered in three levels: Theoretical analysis, simulation, and laboratory verification. The following synthesis procedure is used to gain an understanding of circuits covered in the class: The theoretical analysis of the circuit is covered to understand the operation of the circuit or to design a circuit. Circuit simulation using industry standard analysis tools to verify the theoretical analysis or circuit design. If the simulations agree with theoretical analysis, the circuit is constructed in the lab. **Measurements of the circuit performance are made and compared to the theoretical calculations and simulation results.**

INSTRUCTIONAL OBJECTIVES

1. Linear Circuits
 - Inverting And Non-Inverting Amplifiers
 - Summing And Difference Amplifiers.
 - Current To Voltage Converter
2. Bias Currents And Offset Voltages
 - Bias Currents
 - Offset Voltages
 - Integrator, Differentiator
 - Arbitrary Addition/Difference Amplifier With Bias Current Compensation
3. Non-Linear Circuits
 - Schmidt Triggers
 - Comparators
 - Rectifiers

- Limiters
- Analog Switches
- Sample And Hold
- Peak Detectors
- 4. Miscellaneous Circuits
 - Current Sources
 - Voltage Regulators
 - Push-Pull Audio Amplifier
 - Instrumentation Amplifiers
 - Misc
- 5. OP Amp Frequency Response And Slew Rate
- 6. OP Amp Stability And Compensation
- 7. OP AMP Signal Generators
 - Sine Wave
 - Square Wave
 - Ramp
- 8. Real OP Amps
 - PSRR
 - CMRR
- 9. Noise