

ABET COURSE SYLLABUS**ECSE-2050 Introduction to Electronics**

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| Course Catalog Description: | Operational amplifiers basics and non-idealities, The physics and operation of semiconductor diodes, bipolar junction transistors, and field-effect transistors in elementary analog circuits. Amplifier biasing and small-signal analysis. Elementary bipolar and MOSFET digital circuits. Prerequisite: ECSE-2010. Fall, and Spring terms annually. <i>4 credit hours, 6 contact hours</i> | |
| Pre-Requisite Courses: | Electric Circuits (ECSE-2010) | |
| Co-Requisite Courses: | None | |
| Prerequisites by Topic: | <ol style="list-style-type: none"> 1. Ohm's Law 2. Thevenin and Norton Equivalent Circuits 3. Controlled Sources 4. Ideal operational amplifiers 5. Transformers 6. Frequency Response 7. Familiarity with PSpice | |
| Textbook: (and/or other required material) | Behzad Razavi, " <i>Fundamentals of Microelectronics</i> ". First edition | |
| References: | R. Jaeger and T. Blalock., 2 nd Edition, <u>Microelectronic Circuit Design</u> , McGraw-Hill, 2004 Any SPICE Book; For example, Gordon W. Roberts, and Adel S. Sedra, "SPICE" 2 nd Ed., 1997. | |
| Course Coordinator: | Mona Hella, Assistant Professor, Electrical, Computer and Systems Engineering | |
| Overall Educational Objective: | Study the analysis and design of basic analog circuits, including operational amplifiers, diode circuits, Bipolar (BJT) and Field effect transistor (FET) amplifiers. Analysis and design of digital circuits. | |
| Course Objectives: | <ol style="list-style-type: none"> 1. Analyze diode circuits using large and small signal analysis 2. Analyze MOS amplifiers (Common-gate, common-source, and common-drain) 3. Analyze BJT amplifiers (Common-emitter, common-collector, and common-base) 4. Perform DC analysis for BJT and MOS amplifiers 5. Demonstrate circuit analysis techniques for ideal and non-ideal op amps. 6. Analyze Differential structures to estimate differential and common-mode gain, and impedances 7. Understand the fundamentals of digital circuits | |
| How Course Objectives are Assessed: | 2 Quizzes+ Final | 70% |
| | Homework | 15% |
| | Laboratory | 15% |

Relation to EE/CSE/EPE Outcomes

N = none
M = moderate
H = high

| Outcome | Level | Demonstrate Proficiency |
|---|---------|--------------------------|
| | N, M, H | e.g. Exams, projects, HW |
| Mathematics, science and engineering | H | Exams, HW |
| Basic disciplines in Electrical Engineering | H | Exams, HW |
| Depth in Electrical Engineering | M | |
| Basic disciplines in Computer & Sys. Eng. | N | |

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| Depth in Computer and Systems Eng. | N | |
| Basic disciplines in Electric Power Eng. | M | Exams, HW |
| Conduct experiments and interpret data | H | Lab. exercises |
| Identify, formulate and solve problems | H | Exams, HW |
| Design a system, component or process | H | HW |
| Communicate in written and oral form | M | Exams, HW |
| Function as part of a multi-disciplinary team | N | |
| Preparation for life-long learning | M | Lab. exercises |
| Ethical issues; safety, health, public welfare | N | |
| Humanities and social sciences | N | |
| Laboratory equipment and software tools | H | Lab. exercises |
| Variety of instruction formats | M | Student evaluations |

Topics Covered:

(number of hours or classes for each)

1. Review of basic concepts (6 hours)— (3 classes)
2. Diode Fundamentals and Applications (14 hours)—(4 classes + 3 lab. session)
3. MOSFET physics and amplifier circuits (22 hours) –(7 lectures + 4 lab. session)
4. BJT physics and amplifier circuits (18 hours) --- (6 lectures + 3 lab. sessions)
5. Operational amplifiers (6 hours)—(2 classes + 1 lab. session)
6. Differential amplifiers (6 hours) –(2 lectures + 1 Lab. Session)
7. Digital Circuits (3 lectures)

Computer Usage:

Circuit Simulators such as PSPICE are used in in-class activities, homeworks, and take-home exams

Laboratory Experiences:

1. Diode device behavior
2. Rectifier and power supply circuits
3. MOSFET device behavior and biasing
4. MOSFET amplifier characterization (gain, bandwidth, input and output impedance)
5. BJT device behavior and biasing
6. BJT Amplifier (gain, bandwidth, input and output impedance)
7. Operational amplifier behavior
8. Differential amplifier behavior
9. Digital Circuits Fundamentals

Design Experiences:

Design of basic amplifier structures (homeworks and take home exams)

Independent Learning Experiences:

Class/Lab Schedule:

Lectures MR 2-3:50 pm.
Labs. (2 sections) Section 1 W 10:00AM-12:00PM, Section 2 W 12:00PM-2:00PM,

Contribution to the Professional Component:

- (a) College-level mathematics and basic sciences: 0.5 credit hours
(b) Engineering Topics (Science and/or Design): 2.5 credit hours
(c) General Education: 0.0 credit hours

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| Prepared by: | Mona Mostafa Hella |
| Date: | Oct 15 th , 2009 |