ETR 250 – Solid State Circuits

Prerequisites:

ETR113, ETR114 or equivalent

Co-Requisites:

None

Course Description: Teaches theory and application of amplifiers and oscillators. Includes amplifier circuit configurations, amplifier classes, operational amplifiers, power amplifiers, bandwidth distortion, and principles of feedback.

Course credits: 4 cr. **Lecture Hours:** 3 **Lab Hours:** 3 Total 6 hours per week.

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Course Objectives:

When the student has successfully completed this course, he or she will be able to:

1. Discuss the nature of semiconductor materials.
2. Identify and analyze the operation of power supply circuits and components.
3. Analyze and discuss the operation and biasing of semiconductor devices.
4. Analyze and discuss circuits using bipolar transistors, field-effect transistors, and op-amps.
5. Explain and analyze the operation of circuits using negative feedback.
6. Construct electronic circuits in the lab and use the voltmeter and oscilloscope to analyze and verify operation.
7. Use PSPICE to simulate and analyze electronic circuit performance.

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Required Materials:

1. Text**:** Thomas L. Floyd and David M. Bushla, The Science of Electronics Analog Devices. Copyright © 2005 by Pearson/Prentice-Hall, Inc. ISBN: 0-13-087540-6
2. Scientific Calculator
3. Software: PSPICE v9.1 Student
4. Software: ETCAI v5
5. Components for project

Supplemental Materials:

1. Handouts for certain topics

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Course Content:

Week #	Class	Topic	(Ch -Section)
1	1	Introduction, Course Policies and Administrative Stuff	Chapter 1
	2	Semiconductor Physics, P-N Junction Diodes	(2-1,2-2)
		Lab: Chapter 1 Problems	
2	3	Diode Types, Biasing and Characteristics, and misc. applications	(2-3,2-4)
	4	Power Supply Rectifier Types, filtering, and Regulation	(2-5,2-6,2-7)
		Lab: Diodes	
3	5	**Test #1 - Chapters 1-2 (Available in the LTC for Hybrid Students)**	
	6	Bipolar Junction Transistors—Specifications, Testing, Biasing and Stability	(3-1,3-2, 3-6)
		Lab: Transistor Biasing	
4	7	Small-Signal Amplifier Concepts—Common-Emitter (CE) Amplifiers, Linearit	(3-3,3-4)
	8	Other Transistor Amplifier Configurations (CC, CB),	(3-4)
		Lab: Common Emitter Amplifiers	
5	9	Transistor as a Switch	(3-5)
	10	Field-Effect Transistor (FET) Types, Characteristics and Biasing	(4-1 to 4-5)
		Lab: Transistor Switches and Attenuators	
6	11	FET Amplifiers and Switches	(4-6,4-7)
	12	Multistage Amplifiers—Coupling Methods, Class of Operation, and Efficien	(5-1 to 5-3)
		Lab: JFET Common-Source Amplifier	
7	13	Push-Pull and Complementary-Symmetry Power Amplifiers. Other misc. Am	(5-4,5-5)
	14	RF and Differential Amplifiers	(5-5,5-6)
		PSpice Lab: Complementary-Symmetry Amplifier	
8	15	**Test #2 - Chapters 3, 4, and 5**	
	16	Intro to Operational Amplifiers (Op-Amps), differential amplifiers, Specs.	(6-1, 6-2, 6-3)
9	17	Negative Feedback, Inverting and Non-Inverting Amplifiers, Characteristics	(6-4, 6-5)
	18	Op-Amp Comparators and Summing Amplifiers and Other Circuits	(7-1 to 7-5)
		Lab: Inverting and Non-Inverting Amplifiers	
10	19	Active Filters—Overview	Chapter 8
	20	Oscillators—Overview	Chapter 10
		Lab: Op-Amp Oscillator	

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Week #	Class	Topic	(Ch -Section)
11	21	**Test #3 - Chapters 6, 7, 8, 10**	
	22	Voltage Regulators—Overview ONLY	Chapter 11
12	23	Measurement and Control Circuits—Transducers	12-1–12-2
	24	Measurement and Control Circuits (cont'd)—Applications	12-3–12-5
		Lab: IC Voltage Regulator	
13	25	Power Control Devices (Thyristors) and Circuits	(12-6)
	26	Project Kickoff	
		Lab: SCR and TRIAC Testing	
14	27	Project	
	28	Project	
15	29	Project	
	30	Present Project/Exam Review	
16	31	Final Exam	

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Notes to Instructors

1. All instructors teaching this course will use the same textbook.

2. Suggested Grading Scheme:

Scheduled Tests	30%
Homework	20%
Labs	30%
Project	10%
Comprehensive Final Exam	10%

Grading Scale:
A = 90 – 100
B = 80 – 89
C = 70 – 79
D = 60 – 69
F = below 60

3. Recommended lab materials, sample tests and supplemental handouts are available from the program head.

4. Instructors should notify the program head at least a day in advance for any special accommodations or materials that will be needed for class.

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