CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ETE 305

COURSE OUTLINE

Course Information	**ABET Unit Classification** (4 Quarter Units)	
Department: Engineering Technology	Math:	
Course Number: ETE 305/305L	Basic Science:	
Course Title: Electronic Devices and Circuits/Lab	Engineering Topics:	4
Revision Date: 05/27/05	*Contains significant design content:*	Yes
Revised by: Lyle B. McCurdy	Other:	
Compliant: Catalog 2004/05	Curriculum Designation:	Required

I. Catalog Description

ETE 305/305L Electronic Devices and Circuits/Lab (3/1)

BJT and FET high frequency models. Frequency effects of coupling, bypass and interelectrode capacitance upon gain and input-output impedance of single and multistage BJT and FET amplifiers. Bode plots, differential amplifiers. 3 lectures/problem-solving and 1 three-hour laboratory. Prerequisites: ETE 204, 210, MAT 131.

II. Prerequisites and Co-requisites

Students are expected to have a working knowledge of BJT and JFET biasing, DC and AC load lines, maximum signal swing, and computing mid-band gain and input/output impedance using appropriate small-signal active device models.

III. Textbook and/or Other Required Material

Pierce, J.F. and . Paulus, J., Applied Electronics, Techbooks, 1991, ISBN 1-878907-42-5, Williamsburg Court, Fairfax, VA, 1991.
Keown, OrCAD PSpice & Circuit Analysis, 4th ed., or equivalent

IV. Course Objectives

After completing this course the student will be able to:

1. Analyze/design multistage BJT, JFET, and CMOS amplifiers in CB/CG, CE/CS, and CC/CD configurations. This includes the use of d-c and a-c load lines, gain, input-output impedance, maximum signal swing, and frequency response.

2. Analyze/design multi-stage BJT, JFET, and MOSFET amplifiers using d-c and capacitor-coupling, including differential amplifiers and power amplifiers, etc.

3. Use PSpice to simulate the circuits specified in outcomes 1 and 2 above in lecture and lab.

4. Breadboard, test, gather and assimilate data from representative circuits from 1 and 2 above, and document the results into formal laboratory reports written to professional standards as specified by the laboratory instructor.

V. Expanded Course Description

1. Gain and Frequency Response of Multistage BJT, JFET, and MOSFET Amplifiers (3 weeks)

Effects of coupling and emitter /source bypass capacitors upon the low-frequency corners of typical CB, CE, CC and CG, CS, and CD JFET, depletion and enhancement-mode MOSFET amplifiers. Time constant equivalents and models; time-constant interaction; making bode plots of gain magnitude and phase response at the low, mid, and high-frequency ends of the spectrum; Miller effect.

2. BJT and JFET Differential Amplifiers (2 week)

Biasing; constant current tails using resistors and constant-current sources; differential and common-mode gain calculations; common-mode rejection ratio; maximum signal swing; input/output impedance; use of CE-CD stages to level shift output to zero when inputs are grounded.

3. BJT Switching Circuits and Multivibrators (2 week)

Fundamentals of BJT CE switches and astable multivibrators; use of saturation and overdrive; movement of Q-point up and down the DC load line. BJT astable multivibrators as an example of saturated-mode switching circuits.

4. BJT and MOSFET Power Amplifiers (2 week)

Fundamentals of class-A amplfiers with transformers for impedance matching. Use of BJT and MOSFET class-B power amplifiers.

5. CMOS Circuits (1 week)

Fundamentals of CMOS logic circuits. Use of enhancement-mode MOS transfer characteristic curves to determine ON-OFF operating characteristics of basic CMOS logic inverters and logic gates.

VI. Class/Laboratory Schedule

Lecture: Two 75 minute sessions per week
Lab: One 3 hour session per week.

VII. Contribution of Course to Professional Component

Lecture: Students learn to analyze and design single stage and multistage amplifier circuits particularly with respect to the associated frequency limitations.

Lab: A wide range of measurement techniques are used in lab exercises. Students learn to design/analyze circuits, simulate test results with PSpice, set-up test apparatus, gather data and to prepare technical reports.

VIII. Evaluation of Students

The instructor evaluates outcomes using the following methods: homework assignment submittals, midterm and final exams, one-on-one discussions during office hours, laboratory experiments, and laboratory reports.

The student grades are typically based on the following factors: quizzes, homework, midterm exam and final Exam.

IX. Relationship of Course to Program Outcomes

Crse Obj	Program Outcomes										
	(a) **Use of modern tools of discipl**	***(b)*** **Use of math, science, Engg & Tech**	***(c)*** **Do experi -ments**	***(d)*** **Dsn of sys & compo nents**	***(e)*** **Work on teams**	***(f)*** **Do Tech probs**	***(g)*** **Eff Com**	***(h)*** **Life-long learn**	***(i)*** **Prof, ethics, social resps**	***(j)*** **Prof, soc, globl, diversity**	***(k)*** **Qual, Cont impr, timeli ness**
1		X		X		X					
2		X		X		X					
3		X		X		X					
4	X					X					
5	X	X	X	X	X	X	X				

X. Typical Laboratory Experiments. Here, the students are expected work with single and multi-stage BJT and JFET amplifiers in the frequency domain in practical laboratory applications. Circuit simulations using Pspice is required. The following labs are oriented to achieve this purpose:

Lab 1. CB-CE BJT frequency and transient response. Pspice simulation and formal laboratory report required.

Lab 2. CE-CC BJT frequency and transient response. Pspice simulation and formal laboratory report required.

Lab 3. CS-CE RC-coupled amplifier frequency and transient response. Pspice simulation and formal laboratory report required.

Lab 4. BJT or JFET diff amp with CE-CC output for d-c offset elimination. Pspice simulation and formal laboratory report required.

Lab 5. Power amplifier design project. Use power transistors in a push-pull mode to drive a small motor. Pspice simulation and formal laboratary report required.