PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

ACTIVE DEVICES II W/LAB
EET 2220

Class Hours: 3.0 **Credit Hours: 4.0**

Laboratory Hours: 3.0 **Date Revised: Fall 2001**

NOTE: This course is not intended for transfer credit.

Catalog Course Description:

A study of integrated circuits and special purpose solid-state devices. Topics include silicon-controlled rectifiers, triacs, diacs, unijunction transistors, varistors, thermistors and varactors, timers, op amps and other linear devices and applications.

Entry Level Standards:

The student must have knowledge of basic DC circuits to include series and parallel circuits and network theorems such as Thevenin's and Norton's theorems. A complete understanding of Kirchhoff's Laws and power is also required.

Prerequisite:

EET 1210

Textbook(s) and Other Reference Materials Basic to the Course:

Fundamentals of Linear Electronics, Integrated and Discrete, by James F. Cox, Delmar Publishers, 1998. ISBN: 0-8273-6851-8.

I. Week/Unit/Topic Basis:

The following is intended as a guide to the instructor. The material covered in the course may be changed by the instructor depending upon the progress, etc., of the class.

Week	**Topic**
1	Review of Op-Amp Basics
2	Op-Amp Limitations
3	Op-Amp Applications
4	Filters
5	Sine Wave Oscillators
6	Non Sinusoidal Oscillators
7	Special IC’s

8	Power Switching and Amplifying
9	Thyristors
10	Power Supplies
11	Power Supplies
12	Data Conversion
13	Optoelectronics
14	Optoelectronics
15	Semester Review
16	Final Exam

II. Course Objectives*:

A. Understand the applications of operational amplifiers including integrators, differentiators, signal compressors and expanders, and bandpass and notch filters. I, II

B. Understand the application of comparators including Schmitt Triggers. I, II

C. Use voltage doublers and triplers to, regulate power supplies. I, II

D. Use power devices including SCR's. I, II

E. Use sensors to calibrate a temperature probe. I, II

*Roman numerals after course objectives reference goals of the EET program.

III. Instructional Processes*:

Students will:

1. Participate in classroom discussions which challenge their abilities to think creatively and visualize complex spatial and mathematical relationships to solve problems. *Problem Solving and Decision Making Outcome*

2. Work in teams to conduct laboratory experiments and also to solve special problem assignments. These activities are designed to foster interpersonal skills in teamwork and develop and enhance leadership skills, students' abilities to express ideas, and students' abilities to reach consensus solutions for the team through negotiation. *Active Learning Strategy, Problem Solving and Decision Making Outcome, Personal Development Outcome*

3. Use electronic test equipment to test electrical circuits constructed from schematics in the laboratory and acquire data. Use computers with applications software to simulate, analyze, and predict the behavior of electrical circuits. Compare expected responses to experimental responses of electrical circuits. Use the Internet for special assignments such as locating data sheets on electronic components. Use computers with word processing software to prepare reports. *Technological Literacy Outcome, Information Literacy Outcome, Numerical Literacy Outcome*

4. Prepare reports on laboratory experiments which include methodology, mathematical analyses of electrical circuit models, a comprehensive comparison of calculated results

with experimental results, and conclusions. *Communication Outcome, Numerical Literacy Outcome*

5. Discuss the importance of personal qualities such as personal responsibility, time management principles, self?esteem, sociability, self?management, integrity and honesty in school and in the workplace, and dynamics of change in the workplace. *Personal Development Outcome, Cultural Diversity and social Adaptation Outcome, Transitional Strategy*

*Strategies and outcomes listed after instructional processes reference Pellissippi State’ s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Acquire technical information from various media in the Educational Resource Center, manufacturers' data books or computer disks, or elsewhere, and apply the information to solve problems related to electronic circuits. A,B,D,E

2. Function as an effective team member in the lab or in classroom team assignments. D,E

3. Prepare technical reports. E

4. Describe the basics of operational amplifiers including differential amplifiers. A

5. Locate op-amp data sheet parameters and apply to physical circuits. A,D

6. Describe the operation of an instrumentation amplifier. A

7. Calculate the output voltage and gain, given an instrumentation amplifier circuit and an input voltage. A,D,E

8. Calculate the output voltage of a logarithmic amplifier with a given input voltage. A,D,E

9. Explain the operation and calculate the output frequency of a Wien-bridge oscillator. A,D,E

10. Compare the current-differencing amplifier (CDA) to the op amp, and calculate the output voltages and gains of the noninverting and inverting CDAs. A,D,E

11. Calculate the trigger voltages and currents of both inverting and noninverting CDA comparators with and without hysteresis, and explain the operation and applications of the CDA window comparator. A,D,E

12. Describe the operation of the operational transconductance amplifier (OTA) and draw its schematic symbol. A,D,E

13. Describe an application for the op amp current-to-voltage converter. A

14. List the general procedures for troubleshooting op amps. A,D,E

15. Describe the functions of the voltage-to-frequency converter (VCF), phase-locked loop (PLL), and frequency-to-voltage converter (FVC) and calculate related parameters such as output frequency, capture and lock ranges, and output voltages. A,D,E

16. Calculate the resolution of a digital system. D,E

17. Describe the analog-to-digital (A/D) and digital-to-analog (D/A) conversion processes, and describe the operation of two analog-to-digital converters (ADCs) and two digital-to-analog converters (DACs). A

18. Describe the operation of an analog switch. A,E

19. Define current sourcing and sinking. A,D

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 80% of grade

The evaluation in the classroom will be determined by a combination of tests, quizzes, homework, final exam, and laboratory activities. Correct usage of English is necessary (on tests, laboratory reports, or any other documents submitted to the instructor), and will be evaluated. The percentage that each of these factors count and the frequency of tests, quizzes, and homework is left to the discretion of the instructor, but the following is offered as a guide:
Tests and pop quizzes: 55%
Homework: 5%
Final Exam: 20%

B. Laboratory Expectations: 20% of grade

The laboratory grade will be determined by a combination of performance within the lab (including teamwork) and the degree of preparation and comprehension demonstrated in the lab report. The laboratory grade will not appear on the student's transcript, but will be included in the course grade. There will be typically twelve labs during the semester to go along with the classroom material. The following is offered as a guide for the instructor:
Performance in labs 20%
Lab Reports (neatness and content) 60%
Laboratory Tests and Exam 20%

Laboratory topics may vary, but will be related in a timely manner to course work. Students must attend the laboratory sessions to successfully complete the course. The following list of topics is suggested:
A. Instrumentation amplifier
B. Voltage-controlled oscillator
C. Frequency-to-voltage converter
D. Tachometer probe
E. Stepper motors
F. SCR principles
G. Triac/diac principles
The use of PSPICE will be incorporated in the labs involving op-amps to the extent possible.

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

93 - 100	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 - 77	C
60 - 69	D
Below 60	F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (Pellissippi State Catalog). Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

Unexcused absences and class or lab work not made up in a timely manner may very well result in a reduced grade for the course or in failure of the course. It is the student's responsibility to be present when the instructor informs the class of attendance and work requirements, or otherwise the student must contact the instructor for this information.

B. Other Policies:

The student is encouraged to read the regulations for student conduct in the PSTCC Catalog and Handbook.