ACTIVE DEVICES I W/ LAB
EET 1210

Class Hours: 3  Credit Hours: 4
Laboratory Hours: 3  Revised: Fall 2012

Catalog Course Description:

An introductory course in solid-state devices and the basic circuits in which they are used. Topics include semiconductor physics, diode circuits, bipolar transistor circuit analysis, FET circuit analysis and Op-Amp basics and uses.

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.

Prerequisites:

EET 1012

Corequisites:

None

Textbook(s) and Other Course Materials:


Parts Kit: Approximate Cost $25.00.

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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</thead>
</table>
| 1    | Lecture: Introduction to Diodes & Diode Circuits  
      Lab: 2.1 & 2.2 |
| 2    | Lecture: Power Supplies  
      Lab: 18.1 |
| 3    | Lecture: Special Diodes  
      Lab: 3.1 & 3.2 |
| 4    | Lecture: Bipolar Transistor  
      Lab: Test 1 |
| 5    | Lecture: Transistor Circuits  
      Lab: 4.1 |
Lecture: Transistor Circuits
Lab: 5.1

Lecture: Other Transistor Circuits
Lab: 6.1

Lecture: Field-effect transistor amplifiers and MOSFETS
Lab: 7.1

Lecture: Power Circuits: Amplifiers and Switches and Thyristors
Lab: Test 2

Lecture: Basics of Operational Amplifiers
Lab: 9.1

Lecture: Op-Amp Limitations
Lab: 10.1

Lecture: Op-Amp Applications
Lab: 11.1

Lecture: Filter Circuits
Lab: 12.1

Lecture: Review
Lab: Test 3

Final Exam Period

II. Engineering Technology General Outcomes (Educational objectives)

I. Apply basic engineering theories and concepts creatively to analyze and solve technical problems

II. Utilize with a high degree of knowledge and skill equipment, instruments, software, and technical reference materials currently used in industry.

III. Communicate effectively using developed writing, speaking, and graphics skills.

IV. Assimilate and practice the concepts and principles of working in a team environment.

V. Obtain employment within the discipline or matriculate to a four year program in engineering or industrial technology

III. Engineering Technology Concentration Competencies*

Students will:

A. Apply the knowledge, techniques, skills, and modern tools for the concentration of study to specifically defined engineering technology activities

B. Demonstrate the knowledge of mathematics, science, engineering and technology to engineering technology problems using developed practical knowledge

C. Conduct and report the results of standard tests and measurements, and conduct, analyze and interpret experiment or project results
D Function effectively as a member of a technical team
E Identify, analyze and solve specifically defined engineering technology-based problems
F Employ Written, oral and visual communication in a technical environment

- At the program level all 6 competencies apply to roman numerals I – V of the Engineering Technology General Outcomes (Educational objectives) listed above.

IV. Course Goals*:

The course will

1. The course will guide students toward understanding the operation and applications of the PN junction diode. (A, B, C, D, E, F)

2. Understand the operation of and how to properly bias/connect transistors and operational amplifiers. (A, B, C, D, E, F)

3. Calculate the DC and AC voltages present in transistor circuits and op amp circuits. (A, B, C, D, E, F)

4. Perform mid-band analysis of single and multistage small-signal bipolar and field effect transistor amplifiers and op amp circuits. (A, B, C, D, E, F)

5. Connect any of the circuits studied and make basic AC and DC measurements to verify circuit performance and reinforce the theory. (A, B, C, D, E, F)

6. Understand and perform frequency response of amplifiers. (A, B, C, D, E, F)

7. Understand the operation of thyristors and other special devices studied in the course. (A, B, C)

8. Demonstrate, as an individual and as a team member, library/information skills, time management skills, problem-solving skills, material management skills, and communication skills. (C, D, F)

*Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

V. Expected Student Learning Outcomes*:

Students will: be able to:

a. Identify the anode and cathode of a diode. (1)

b. Obtain the diode characteristics from a curve tracer. (1, 5)

c. Determine the forward and reverse breakdown voltage for any diode. (1, 5)

d. Construct a bridge rectifier circuit with filter capacitor and measure ripple. (1, 5)

e. Identify a voltage multiplier and calculate frequency and voltage output. (1)

f. Identify clamper circuit and calculate voltages. (1)

g. Construct a zener regulator circuit. (1, 5)
h. Explain the characteristics of a LED. (7)
i. Explain the operation of a photo diode. (7)
j. Explain the operation of an opto coupler. (7)
k. Properly take measurements using the Oscilloscope. (5)
l. Obtain transistor characteristics from a curve tracer. (2, 5)
m. Explain the operation of the transistor as a switch. (2)
n. Connect circuits which will properly bias the transistor. (2, 5)
o. Calculate and measure the DC and AC voltages present in bipolar and field-effect transistor circuits (2, 3, 5, 8)
p. Perform midband analysis of single and multistage bipolar and field-effect transistor small-signal amplifiers. (4, 8)
q. Explain Miller's Theorem and the use of decibels. (2, 3, 5)
r. Calculate the frequency response of an amplifier. (6)
s. Perform frequency response measurement techniques in the laboratory on amplifiers. (6, 8)
t. Function as an effective team member in the lab or in classroom team assignments. (8)
u. Prepare a technical report. (8)

* Numbers after Expected Student Learning Outcomes reference the course goals listed above.

VI. Evaluation:

A. Testing Procedures: 80% of grade

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Tests</td>
<td>40%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

B. Laboratory Expectations: 20% of grade

The laboratories for all EET courses are an essential part of conveying the concepts to the student. The labs would closely follow the classes in content and in time of presentation so that the student is actually verifying these concepts to his or her self. The student will be able to apply the theory learned in class. The laboratory grade will be determined by a combination of performance within the lab and the quality and demonstrated comprehension of the lab report. There will be at least twelve labs during the semester to go along with the classroom material.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Performance in labs (subjective)</td>
<td>50%</td>
</tr>
<tr>
<td>Lab Reports (neatness and content)</td>
<td>30%</td>
</tr>
<tr>
<td>Laboratory Test</td>
<td>20%</td>
</tr>
</tbody>
</table>

C. Field Work:

Students shall participate in one class field trip. A report will be required that will be part of the laboratory grade.
D. Other Evaluation Methods:

None

E. Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93</td>
<td>100</td>
</tr>
<tr>
<td>B+</td>
<td>88</td>
<td>92</td>
</tr>
<tr>
<td>B</td>
<td>83</td>
<td>87</td>
</tr>
<tr>
<td>C+</td>
<td>78</td>
<td>82</td>
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<tr>
<td>C</td>
<td>70</td>
<td>77</td>
</tr>
<tr>
<td>D</td>
<td>60</td>
<td>69</td>
</tr>
<tr>
<td>F</td>
<td>Below 60</td>
<td></td>
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VII. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of Academic Affairs.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

• Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
• Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with
Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at [http://www.pstcc.edu/sswd/](http://www.pstcc.edu/sswd/).