EE 3120 Course Syllabus

Electronics Engineering EE 3120, Microelectronics II
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WSU Davis Room 304A
Office Hours: Mon., Wed. 10:30 AM - Noon, & Tue., Thurs. 4:00-5:00 pm at Davis, or by appointment.

Text:  Microelectronic Circuits, Sedra and Smith

Description: Intermediate topics related to microelectronics including differential and multistage
amplifiers, frequency response, feedback systems, power amplifiers, filters, and signal
generation. Lecture and lab combination. Laboratory activities to include the design,
construction, computer simulation, and analysis of filters and advance circuits.

Information: This course is required for the BS Electronics Engineering degree. It can be taken
any time after achieving upper-division status.

Student Learning Outcomes: The students will demonstrate:
  1. The knowledge of how to transform physical circuits into a mathematical representation.
  2. A knowledge of high-pass, low-pass, bandpass, and bandreject filters composed of
    passive and active components.
  3. The ability to analyze circuit models using ideal circuit components, computer
    simulations, and physical prototypes.
  4. The ability to design, build and analyze 1st and 2nd order circuits.

Student Assessment:
  1. Homework assignments (15%)
  2. Research Paper (5%)
  3. Laboratory assignments (20%)
  4. Midterm Examination (20%)
  5. Midterm Examination (20%)
  6. Final Examination (20%)

GRADING:
Grades will be assigned as follows based on the percentage breakdown after dropping the low
area. Grading scale may be normalized to the highest grade in the class per the instructor’s
discretion.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>&gt; 93%</td>
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<tr>
<td>A-</td>
<td>90-93%</td>
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<tr>
<td>B+</td>
<td>87-90%</td>
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<tr>
<td>B</td>
<td>84-87%</td>
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<td>Grade</td>
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<tr>
<td>B-</td>
<td>80-84%</td>
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<td>C+</td>
<td>77-80%</td>
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<td>C</td>
<td>73-77%</td>
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<tr>
<td>C-</td>
<td>70-73%</td>
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<td>D+</td>
<td>67-70%</td>
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<tr>
<td>D</td>
<td>63-67%</td>
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<tr>
<td>D-</td>
<td>60-63%</td>
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<td>F</td>
<td>&lt; 60%</td>
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**Course Assessment:**
1. Student reviews (each semester the course is taught)
2. Faculty review (annually)
3. Advisory committee review (every two years)

**Credits and Contact Hours:** One semester credit hour, one contact hour per week.

**Prerequisite:** EE 3110 Microelectronics I

**Text:** Microelectronic Circuits, 6th Edition, 2010
Adel S. Sedra and Kenneth C. Smith

**Topic Outline:**
1. Building Blocks of Integrated Circuit Amplifiers
2. Differential and Multistage Amplifiers
3. Frequency Response
4. Feedback
5. Output Stages and Power Amplifiers
6. Operational Amplifier Circuits
7. Filters and Tuned Amplifiers
8. Signal Generators and Waveform-Shaping Circuits

**LABORATORY EXPERIMENTS:**
Laboratory experiments will be performed periodically throughout the semester at the discretion of the professor. You must make all requested calculations and measurements specified and record for a laboratory report. All work will be recorded in a laboratory book in the format listed below. You must assemble and write up your own report. Your report should show and include original work such as changes in the schematic or different types of related designs you tried. You will be expected to be honest in reporting your data. If you do not get the same results as expected, then you should try to understand and explain why your data was different from what you expected. You need to spend time troubleshooting your circuits, and in your report, include a little section that explains what you did and what you learned. Include and show any calculations you did. Most important is a conclusion section that ties everything together and
explains what was learned. Things that cannot be read will cause you to lose points. Lab reports will be required for each lab.

REPORT PROCEDURES:
Your laboratory report should include the following sections:
1. Introduction and Overview of the Experiment – Explain in general terms what is supposed to happen in the experiment. Include circuit performance specifications.
2. Theory – Explain any principles, equations, or logical results predicted by fundamentals being learned.
3. Design Calculations – Show all steps from a system or block diagram to the final logic diagram.
4. Schematic Diagram of the circuit(s) to be built. Include device types, part values, reference designators, pin numbers, power supply voltages and grounds, and signal names.
5. List parts and materials needed or used.
6. List trainer circuit sections or laboratory test equipment used in the experiment.
7. Neatly show your data and results. Use tables or graphs, and describe your results.
8. Summarize what you did and learned from the experiment.

A good test of your report is to ask a friend to read it. Another person should have enough information in the report to duplicate your work. Lab reports will be due at the start of the class meeting the following week. (If lab is performed on Tuesday then the report will be due at the start of the following Tuesday’s class.)

HOMEWORK:
Homework will be assigned in class and is due at the start of the next class meeting the following week. (If the homework is assigned on Thursday it will be due at the beginning of class on the following Thursday’s class.) Homework problems will be assigned in class. 2 points per homework problem are given. 1 point for the correct answer and 1 point for showing the correct steps in solving the problem. Homework will not be graded unless put in the proper format (given below) and on engineering paper. Quizzes will be given throughout the semester at the instructor’s discretion. Late work will not be accepted.

Services for Students with Disabilities: Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in Room 181 of the Student Services Center. SSD can also arrange to provide course materials (including the syllabus) in alternative formats if necessary.
<table>
<thead>
<tr>
<th>Month / Day / Year</th>
<th>Course Number</th>
<th>Name (Last, First)</th>
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</thead>
</table>

1.1a

Complete Problem Definition. Including figures, graphs, schematics, etc. May be copied directly from the assignment.

*Leave some space between definition and solution*

Show Problem Solution.

**SHOW ALL WORK**

Box Final Answer and Units

Separate parts with one line

1.1b

Separate problems with a double line.

1.2

Repeat the above format for all remaining problems.

NOTES:

1. Use only one side of engineering paper [E-2].
2. Staple multiple pages.
3. Number all pages [page # / of #].
4. You can work more than one problem per page if space is available.
5. Use PENCIL and eraser.
6. PRINT, no script. All printing must be neat and horizontal.
7. Each problem definition should have all pertinent information required to understand the problem without referring to the textbook.
8. Organize your solution so that it can be easily followed.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Introduction to Lab Books (Title should be at the top of every page and referenced in the Table of Content).</th>
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</thead>
<tbody>
<tr>
<td><strong>Lab #</strong></td>
<td>14</td>
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**Purpose:** Purpose statements should be short descriptions of what you will be doing on the following pages. It may be cut and pasted directly out of the lab handout. (i.e. The purpose of this lab is to layout the lab book format.)

**Preliminary:** Should follow the sequence of the lab handout with all subsections being recorded in an outline type format. Subsections must include a description of all subsequence calculations. Subsections descriptions may be cut and pasted directly from the lab handout.

1. This section should be done prior to the scheduled lab time.
2. Do Not just write the equations, there must be a verbal description of what the equations are trying to accomplish.
3. Show All Work
4. All Graphs should have a short caption and have all axis labeled.
5. Box Important Information
6. Should be done in BLUE OR BLACK PEN
7. Strike out or Cross out all errors (DO NOT ERASE)
8. Any blank area must be designated by having an ‘X’ or ‘Page left blank’ written in.
9. Should be done in order. See advise via email or face to face if a section does not make sense. If you jump around you will not be prepared for the following subsections.
10. **Must be completed prior to any actual circuit construction.**

**Procedure:** Should follow the format of the preliminary but include all actual measurements, and the condition/settings of the test equipment, performed in the lab.

**Conclusion:** Should be at least ½ a page in length and include answers to any question called out directly in the lab. It should also summarize all of your findings in a common table and compare the designed and measured values and any

\[
\text{%error} = \left(\frac{|\text{Measured Value} - \text{Calculated Value}|}{\text{Calculated Value}}\right) \times 100\%
\]

with an explanation for all discrepancies over 10%.

*Sign and date each page and at the end of the lab*