Syllabus

EE 3110 Microelectronics I

Course Number and Title: EE 3110, Microelectronics I
Credits: 4

Instructor: Suketu Naik  Website: http://faculty.weber.edu/snaik/EE3110.htm
Office: WSU Campus, ET 137  Phone: (801) 626 6892  Email: suketunaik@weber.edu
Office Hours: Wed 9:15-10:15am, Tue 1:30-3:00pm or by appointment.

Class Time and Location: Tue, Thurs 10:30-11:45am in M2 100 (Portable towards the East of ET building)
Lab Time and Location: Wed 1:30-4:30 pm in ET 127

Text:  Microelectronic Circuits 6th edition, Sedra and Smith

Description: Fundamental semiconductor device characteristics including diodes, MOSFETs and bipolar transistors; small and large signal characteristics and design of linear circuits. Laboratory activities to include the design, construction, computer simulation, and analysis of semiconductor circuits and amplifiers.

Prerequisite: CHEM 1210 and EE 2260 or EE 3010

Student Learning Outcomes: The students will demonstrate:

1. The knowledge of semiconductor devices including diodes, BJT transistors, and field effect transistors.
2. The knowledge of semiconductor circuit design and modeling.
3. The ability to design, build, and analyze transistor circuits, multi-stage amplifiers, operational amplifiers, current drivers, and interface circuits.

Student Assessment:

1. Homework assignments:  15%
2. Reading assignments:  5%
3. Laboratory assignments: 20%
4. 1st Midterm examination:  20%
5. 2nd Midterm examination: 20%
6. Final examination: 20%

Grades:

Grades will be assigned as follows based on the weighted average of exams, labs, and homework as shown above. Grading scale may be normalized to the highest grade in the class per the instructor’s discretion.
Please note that C or better is required in order to obtain BSEE degree. If you fail to meet this requirement, you will have to retake the class.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
<th>Grade</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt; 93%</td>
<td>C+</td>
<td>77-80%</td>
</tr>
<tr>
<td>A-</td>
<td>90-93%</td>
<td>C</td>
<td>73-77%</td>
</tr>
<tr>
<td>B+</td>
<td>87-90%</td>
<td>C-</td>
<td>70-73%</td>
</tr>
<tr>
<td>B</td>
<td>83-87%</td>
<td>D</td>
<td>60-70%</td>
</tr>
<tr>
<td>B-</td>
<td>80-83%</td>
<td>F</td>
<td>&lt; 60%</td>
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</tbody>
</table>

**Topic Outline:**

1. Chapter 1: Signals and Amplifiers
2. Chapter 3: Semiconductors
3. Chapter 4: Diodes
4. Chapter 5: MOS Field Effect Transistors (MOSFET)
5. Chapter 6: Bipolar Junction Transistors (BJT)

**Schedule:**

Please refer to the class website for the tentative list of class schedule, homework problems, and the labs: [http://faculty.weber.edu/snaik/EE3110.htm](http://faculty.weber.edu/snaik/EE3110.htm)

**Homework:**

*Homework will be assigned in class and will be due on class period after it is assigned* (Example: If it is assigned on Thur 8/28, it will be due on Thur 9/4). Late homework will not be accepted.

Homework will not be graded unless put in the proper format (see the format below) on engineering paper. It must be clear and well organized. Use only one side of each sheet. Write your name, the class number (EE 3110) and assignment number on the top (see the format below). Do not use multiple columns; separate problems with horizontal bars and box each answer.

**Homework Grading:** 2 points per homework problem will be given: 1 point for the correct answer and 1 point for showing the correct steps in solving the problem. Homework that does not conform to the format (see the format below) will be penalized one point.

**Laboratory Experiments:**
Laboratory experiments will be performed periodically throughout the semester at the discretion of the instructor. 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 (see the format below). For your information, lab book guidelines are also provided.

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.

Cheating and plagiarism: Just don’t…
# Homework Format

<table>
<thead>
<tr>
<th>Staple</th>
<th>Month / Day / Year</th>
<th>Course Number</th>
<th>Name (Last, First)</th>
</tr>
</thead>
</table>

### 1.1 a

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

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Leave some space between definition and solution

Show Problem Solution.

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**SHOW ALL WORK**

Box Final Answer and Units

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Separate parts with one line

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Separate problems with a double line.

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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.
Lab Report Format (make sure to write your name)

<table>
<thead>
<tr>
<th>Title</th>
<th>Introduction to Lab Books (Title should be at the top of every page and referenced in the Table of Content).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab #</td>
<td></td>
</tr>
</tbody>
</table>

**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 subsequent 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

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

with an explanation for all discrepancies over 10%.

*Sign and date each page and at the end of the lab*
Lab Book Guidelines

1. Keeping a proper lab book is essential to establish ownership of intellectual property (which is the primary output of all engineering). Try to follow these guidelines outside of this class as a good practice to maintain lab books.

2. Start each lab at the top of a new page. For each lab, write your name, lab number, and the title at the top of the page. See the format below.

3. Use the first page in your lab book as table of contents. Each time you start a new lab, add an entry with its title, date and page number. See example below:

   EE 3110 Lab book  
   C. Xavier  
   Table of Contents

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Title</th>
<th>Date</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diodes: Rectifier</td>
<td>9/11/2014</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MOSFET: Frequency Response</td>
<td>9/12/2014</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>...</td>
<td>...</td>
<td>...</td>
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</tbody>
</table>

4. Conclude each lab with a summary or conclusion that briefly describes how the circuit/code/etc performed. Summary or conclusion should mention the problems you encountered and if/how you addressed it.

5. Don’t use three ring binders or spiral bound notebooks. Use a proper bound Lab book.

6. Number all pages! Number them by hand if necessary.

7. Printed work can be included in the book. Make sure to tape it neatly or glue it properly.

8. Sign or initial and date each page. If a page contains work from different dates, it should be separated with horizontal lines and each section (from different dates) should be signed or initialed and dated.

9. Don’t leave blank pages. If you don’t want to use a page, then draw a diagonal line from one corner to the other. Initial and date the blank page.

10. Do not a) overwrite something, b) scribble out something, or c) use white-out to cover something. If you make small errors, STRIKE them out with single lines. If you make large set of errors, use diagonal lines. If the strikeout occurs on a different day (e.g. two weeks from the day you wrote something), it should also be initialed and dated.

11. Use your lab book! Make it your work book. Do not write on separate papers or sheets or sticky notes. Try not to transfer notes from scratch paper into the lab book.