Washington State University  
School of EECS  
Electrical Engineering Course Assessment Report

Course Number  EE 311  
Course Title  Microelectronics  
Semester Offered:  Spring 2008  
Instructor  Osman  

10th Day Enrollment 39  Number Completing Successfully (C grade or better) 37

I. Assessment Outcomes from the Course Syllabus

☑ (A) Ability to apply knowledge of mathematics, science and engineering.  
☐ (B) Ability to design and conduct experiments as well as analyze and interpret data.  
☑ (C) Ability to design a system, component, or process to meet desired needs.  
☐ (D) Ability to function on multidisciplinary teams.  
☐ (E) Ability to identify, formulate, and solve engineering problems.  
☐ (F) An understanding of professional and ethical responsibility.  
☐ (G) Ability to communicate effectively in written and oral formats.  
☑ (H) A broad education necessary to understand the impact of engineering solutions in global, economic, and societal context.  
☑ (I) Recognize the need for, and have the ability to engage in life long learning.  
☐ (J) Have a broad education and knowledge of contemporary issues.  
☑ (K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.

II. List of Course Topics from the Course Syllabus

1. Introduction to electronics.  
2. Operational amplifiers.  
3. Diodes: physics, small-signal model, applications.  
4. BJT: physics, biasing, small-signal model.  
5. BJT single-stage amplifiers: analysis and design.  
6. BJT current mirrors.  
7. BJT differential amplifiers: analysis and design.  
8. MOSFETs: physics, biasing, small-signal model.  
9. MOSFET single-stage amplifiers: analysis and design.  
10. MOSFET current mirrors and differential amplifiers.  
11. Frequency response.
### III. Course Assessment Summary Table: one row of the table should be devoted to each of the checked outcomes in part I.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Topics</th>
<th>Specific Measures (Samples should be available in the course materials file for inspection.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Ability to apply knowledge of mathematics, science and engineering.</td>
<td>2-11</td>
<td>Most homework, quizzes and exams</td>
</tr>
<tr>
<td>(C) Ability to design a system, component, or process to meet desired needs.</td>
<td>2-11</td>
<td>HW 6,8 &amp;18, Q 3 &amp; 6, E 2.2, 2.3, Final.2</td>
</tr>
<tr>
<td>(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.</td>
<td>2 - 11</td>
<td>Q 3,4,5,7, E1.1, 1.2, 2.1, 2.5, F1,4,5,8,9</td>
</tr>
</tbody>
</table>

### IV. Using the table as a guide, for each outcome summarize your evaluation of the students’ achievement of that outcome; cite student performance on the identified measures as evidence to support your conclusions.

(A) Ability to apply knowledge of mathematics, science and engineering.

The entire course involves the application of mathematics to analyze and design amplifier circuits and determine their performance parameters. The underlying physics responsible for the characteristic of diodes and transistors. This ability can be assessed by the students’ overall average.

(C) Ability to design a system, component, or process to meet desired needs.

Although most of the course emphasizes analysis of circuits, more emphasis is directed to design in the latter part of the course. 40% of exam 2 and quizzes 3 and 6 include design related questions.

(H) A broad education necessary to understand the impact of engineering solutions in global, economic, and societal context.

(I) Recognize the need for, and have the ability to engage in life long learning.

(J) Have a broad education and knowledge of contemporary issues.

There are no specific measures of these three outcomes in this course. It is recommended that these outcomes be removed from the syllabus for EE311.

(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.

Techniques introduced in this class include small and large signal models, small signal analysis, zero value time constants, Miller’s theorem and summing point constraints for op-amps. Half of the final exam questions concern these techniques.
V. Qualitative Assessment of Student Performance: using the arguments above and other data support the claim that students who completed this course with a grade of C or better have achieved each of the intended outcomes of this course.

The final comprehensive examination is used as assessment tool of student’s performance and comparing them to other groups. The highest score was 114, the mean score was 80, the lowest score was 53, and the standard deviation was 17. Figure 1 shows the histogram of scores for the assessment exam. This class had the higher mean and high score than Spring 2007, which is a 3% improvement over spring 2003 and spring 2004. The standard deviation is back up to near 20 this year and is the same as last year. The percentage of students scoring 90 or above is 33% compared to 19% in 2007. The percentage scoring below 60 was 3%, which is significantly smaller than the 13% in 2007.

![Figure 1. Histogram of assessment exam scores from EE311 Spring 2008](image)

The lowest grade on the final of a passing student was 53 out of 120. The lowest overall weighted average including homework, quizzes, exams and a comprehensive final was 55%. Assessing Outcome A is based on the overall average, which is greater than 55% for every student. The final is a good assessment for Outcome K, since over half the questions concern techniques to analyze circuits. The minimum score was about 55%, which shows some competence in using these skills. Outcome C is not a major objective of this course but directly impacts about 15% of their overall average.

VI. Concerns: state any concerns you may hold about this class – were the students adequately prepared coming into it? Are there topics or outcomes where (some) students were weak after completing the course? Other concerns? Were there any comments on students’ course evaluations that should be addressed in future instances of the course? This section is very important for improving our program: it provides critical input to the curriculum committee for identifying areas requiring attention.
I increased the number of quizzes from 5 to 7 and the number of exams from 2 to 3 in order to allow more practice on problem solving. This worked out well as was reflected in higher midterm exam grades.

I arranged for the TA to provide weekly review and problem solving sessions in the evening starting the third week of the class. I also provided review sessions and posted old exam on the web site before each midterm. The students appreciated these sessions.

I was pleased with the textbook Sedra and Smith, Fifth Edition.

I recommend that we provide students with design problems involving the use of circuit simulation tools specially when dealing with multistage and differential amplifiers.

Signature __________________________________________ Date: _______________________

Please email a copy of the completed form to Patricia Arnold, patricia@eecs.wsu.edu and deliver a signed hardcopy to her mailbox.