Washington State University  
School of EECS  
Electrical Engineering Course Assessment Report

Course Number       EE 341  
Course Title        Signals and Systems  
Semester Offered    Spring 2007  
Instructor          T. Garlick  
10th Day Enrollment 5  Number Completing Successfully (C grade or better) 4

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. Classification and properties of signals and systems  
2. Discrete and continuous-time impulse response, convolution, differential and difference equations 
3. Fourier representation of discrete and continuous-time signals 
4. Frequency response of LTI systems, sampling and reconstruction 
5. Introduction to filter design 
6. Amplitude modulation 
7. Angle modulation (FM and PM) 
8. Information, entropy, and Huffman codes
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</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Ability to apply knowledge of mathematics, science and engineering.</td>
<td>1 - 8</td>
<td>Midterm and final exams</td>
</tr>
<tr>
<td>(C) Ability to design a system, component, or process to meet desired needs.</td>
<td>5 - 8</td>
<td>HW#6, problems 6.7 &amp; 6.8</td>
</tr>
<tr>
<td>(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.</td>
<td>1 - 8</td>
<td>HW#7, problems 6.15 &amp; 6.17</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.

Essentially all homework and exam problems require students to apply knowledge of mathematics, science and engineering. Due to the control the instructor has over the environment in which they are completed, exams form a more rigorous assessment tool than homeworks. I have therefore chosen the two exams as the specific measures for outcome A. Midterm scores were: 92, 76, 78, 73. Final scores were: 92, 92, 72, 77. Based on these scores I conclude that all four students achieved this outcome.

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

Design problems tend to be somewhat open-ended and difficult to fit into the time constants of an exam. Therefore, homework problems serve as a better measure for this outcome. Problem 6.7 required students to design a continuous-time system to achieve a desired input/output behavior. Problem 6.8 required students to design a frequency-domain descrambler to undo the effects of a specific scrambler presented in the problem statement. All four students completed both problems. Out of a total of ten points they scored: 10, 10, 8, 8. Based on these scores I conclude that all four students achieved this outcome.
(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.

The use of Matlab/Scilab was emphasized throughout this course ("Matlab" even appears in the name of the text). It's not practical to test the use of this tool on an exam, so as an assessment I chose two homework problems that required simple and more slightly more advanced programming. Problem 6.15 required students to generate a few bits of PAM, PSK and FSK sequences and plot them. Problem 6.17 required students to write a program to code and decode a signal using an 8-ary alphabet, to explore quantization effects and to plot intermediate and final results. All four students successfully generated code and plots. Based on these scores I conclude that all four students achieved this outcome.

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.

All students performed achieved acceptable measures for the three outcomes A, C and K. This course is mostly concerned with outcome A which was measured using exam scores. Midterm exam scores ranged from 73 to 92 while final exam scores ranged from 72 to 92. Based on these results, students completing with C or better achieved the intended outcomes.

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.

The primary student comment was that the course material is often too abstract, especially the first part of the course before students have had a chance to see the applications to communications. Students typically like to be able to visualize the application of theory as they are learning it.

Students are not as fluent with Matlab/Scilab as I would like. Ideally they would be able to quickly produce code to simulate and check analytic solutions or brainstorm solutions to difficult problems and so see this tool as an aid and a time saver. Instead they tend to see programming as a challenging task. More homework problems devoted specifically to programming could help overcome this. Given the small class sizes we typically have, it should be feasible to include programming problems on at least one of the exams. This would provide a more rigorous assessment tool.

Signature Todd Garlick  Date: 2007-05-11

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