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. Circuit analysis review
2. State variable analysis of linear systems
3. Laplace Transform, Inverse Laplace Transform
4. Relationship between Laplace domain and time domain, convolution
5. System poles, zeros
6. Laplace transform in circuit analysis
7. Transfer functions
8. Frequency response, passive and active frequency selective circuits, Bode plots
9. Fourier series with circuit applications
10. Two-port networks
11. Mutual inductance
### 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>1-11</td>
<td>Homework assignments, exams, and course mini-projects 1 and 2.</td>
</tr>
<tr>
<td>(C) Ability to design a system, component, or process to meet desired needs.</td>
<td>8</td>
<td>Mini-project 1 requires students to perform a rudimentary control system design.</td>
</tr>
<tr>
<td>(E) Ability to identify, formulate, and solve engineering problems.</td>
<td>2-8</td>
<td>Course mini-projects 1 and 2 were the primary measures for this outcome. Mini project 1 required analysis and design of a simple control system; mini-project 2 required students to use response data to estimate a system model.</td>
</tr>
<tr>
<td>(G) Ability to communicate effectively in written and oral formats.</td>
<td>1-8</td>
<td>Course mini-projects 1 and 2 both require semi-formal written reports.</td>
</tr>
<tr>
<td>(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices.</td>
<td>2-8</td>
<td>Homework 1, course mini-projects 1 and 2 all require extensive use of Matlab.</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) An ability to apply knowledge of mathematics, science and engineering:*

Homework assignments, in-class examinations, and the two course mini-projects are used to assess this criterion. Assessment of student performance is primarily dependent upon examination scores; 75% of the students’ final grade is based on examination scores. Homework scores account for 15% of the students’ final grade. Homework questions are designed to be somewhat more in-depth than exam questions and are designed to require some synthesis of various topics covered in the course. Two mini-projects were assigned over the course of the semester; the combined scores for these projects accounts for 10% of the students’ final grade.
Exam and homework scores indicate that students performed well relative to outcome A. The overall average of the three midterm exams and the final exam was approximately 75%. The average of all homework scores was approximately 77%, and the average of the mini-project grades was approximately 79%. All metrics used to assess this criterion are consistent and indicate that student performance was adequate relative to criterion A.

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

The primary assessment for this ABET criteria was the first of two class projects. (Students elected to do two smaller class projects rather than one, more extensive project.) The project supporting this outcome required students to analyze a closed-loop control system, determine appropriate control gains to satisfy a set of design requirements, and design a circuit to implement their control system.

In general, the students did well on this project. The overall average on the project was approximately 83.5%, indicating adequate performance relative to criteria C.

(E) An ability to identify, formulate, and solve engineering problems

Exams and homework assignments address this requirement, but in a somewhat abstract sense. The primary assessment for this ABET criteria was, therefore, the two class projects.

The class projects were intended to introduce students to practical applications of the concepts introduced in the class. The first project consisted of a control system design application, and the second project was concerned with identification of system model parameters from measured response data. Both projects were relatively simple, but required students to apply course concepts to an application which was not, strictly speaking, within the mainstream course curriculum. Minimal guidance was provided relative to the projects; instead, the students were encouraged to develop their own solution approach.

The overall project score was approximately 79%, indicating that the students’ performance relative to this objective is acceptable.

(G) Ability to communicate effectively in written and oral formats

Both class projects required at least a semi-formal report documenting their results; in general, the overall quality of these reports was adequate. The oral communication requirement was not addressed in this course. Written report formats and procedures were not formally presented during lecture, so reporting style was not a significant aspect of the students’ grade – full credit was provided as long as results were presented coherently.
(K) Ability to use techniques, skills and modern engineering tools necessary for engineering practices

This ABET criteria was addressed primarily by the class projects. The first project required students to analyze and design a closed-loop control system; the second project required students to analyze system response data to estimate unknown model parameters. Both projects required extensive use of Matlab for data analysis, response simulation, and system analysis. The overall average score for the class projects was approximately 79%, indicating adequate performance relative to objective K.

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.

Overall, the students did very well on exams, projects, and homework assignments. The overall average of the three midterm exams and the final exam was approximately 75%. The average of all homework scores was approximately 77%, and the average of the mini-project grades was approximately 79%. All metrics indicate that students achieved the intended course 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.

Students were, in general, adequately prepared for the class before entering it. Poor mathematical skills were in some cases a problem, but most students appeared to overcome these problems during the course. Significant problems, however, did occur in two areas:

1. Students had difficulty identifying appropriate circuit analysis approaches early in the semester. In general, students tended to default to either nodal analysis or mesh analysis for all circuit problems. In many cases, it was difficult for them to apply Kirchoff’s laws directly in circuit analysis. Many student expressed concern that they had been trained in prerequisite circuit analysis to apply rote (or “canned”) approaches for circuit analysis.

2. Early in the semester, students often had difficulty determining whether their solutions were reasonable, based on a physical interpretation of a circuit’s response. This inability to “cross-check” their results is disconcerting, and is probably related to some extent to item 1 above.

Students appear to have improved MATLAB skills relative to previous semesters in which this instructor has taught the course. Students still tend to struggle with interpretation of computer-generated results, though – there is a strong tendency to take the accuracy of computer-generated simulations for granted. This is probably consistent with the observations made in item 2 above.