Class Hours: Tu-Thu 2:30 PM – 3:45 PM
Professor: Dr. Douglas P. Looze
Office: KEB 113F Phone: (413) 545-0973 email: looze@ecs.umass.edu
Office Hours: Tu 4:00 – 5:00PM; W 3:00 – 5:00PM

Course Web Page: https://moodle.umass.edu/ (login using OIT ID)
The moodle page contains all the course material to date, including this syllabus, the problem sets, and the lecture notes.


Exams: There will be one (2 hour) exam given during the semester and a final exam given during exam week. The midterm exam will be 30% of the course grade. The final exam will be worth 40% of the course grade.

Homework: There will be approximately 8 assignments which will be due at the beginning of the lecture on the specified date. Late homework will not be accepted – regardless of the reason. Homework will constitute 30% of the grade.

Objectives:
1. Understand and be able to represent dynamic response.
2. Understand the principles and objectives underlying feedback control, and how these affect the architecture of the control system.
3. Understand and be able to apply analysis tools do determine control system performance.
4. Design a feedback control system to achieve specified objectives.

Table 1. Relationship of Course Objectives to ABET EC2000 Program Outcomes

<table>
<thead>
<tr>
<th>ABET Outcome</th>
<th>Course Objectives 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>a) Apply knowledge of math, science &amp; engrg.</td>
<td>X</td>
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<td>b) Design &amp; conduct experiments; analyze &amp; interpret data</td>
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<td>c) Design a system, component or process to meet desired needs</td>
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<td>d) Function on multi-disciplinary teams</td>
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<td>e) Identify, formulate, solve engineering problems</td>
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<td>f) Understand professional, ethical responsibility</td>
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<td>g) Ability to communicate effectively</td>
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<td>h) Understand impact of engineering soln. in global &amp; societal context</td>
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<td>i) Need to continue life-long learning</td>
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<td>j) Knowledge of contemporary issues</td>
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<td>k) Ability to use techniques, skills and tools needed for engrg. practice</td>
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OUTLINE

1. System response  
   a) Laplace Transforms  
   b) Time Response  
   c) Stability  
   d) Frequency response  
   Review FPE Chapters 1–3  
   (1)*

2. Control System Objectives  
   a) Potential for Control  
   b) Performance  
      i) Measures  
      ii) System type  
   FPE Chapter 4.1–4.2  
   (3)

3. Classic PID Control  
   a) Proportional, Integral and Differential Elements  
   b) Effects on system response  
   c) PID tuning rules  
   FPE Chapter 4.3  
   (3)

4. Root locus  
   FPE Chapter 5  
   (2)

5. Frequency Response Analysis  
   a) Bode diagrams  
   b) Nyquist diagrams  
   c) Stability margins  
   FPE Chapter 6.1–6.4  
   (5)

5. Design of control systems  
   a) Design objectives  
   b) Compensation techniques  
   c) Computer implementation  
   FPE Chapter 6.6, 6-7, 8.1–8.3  
   (12)

6. Exam  
   (1)

* Approximate number of 75 min. lectures.