ME 355 – UNDERGRADUATE CONTROLS LABORATORY

FALL 2011
Section 1: 11:15 – 2:15 PM
Section 2: 2:30 PM – 5:30 PM
243 Reber Building

Door Code: ____ then ____ then ____

Instructor: Dr. Sean Brennan Email: sbrennan@psu.edu
Office: 157 E Hammond Building Phone: (814) 863-2430
Office hours: By appointment. I’m usually free before/after class. Office hours may be held in the classroom if this helps. Inquire beforehand.

Course TA: Name: Michael Beeney Email: mdb5126@psu.edu
Office: 243 Reber
Office hours: By appointment, but also usually free before/after each lab.

Textbook: (provided) ME 355 Laboratory Manuals
(optional) MATLAB Student Edition… You can find this software at all campus bookstores, at any of the campus computer labs, etc.

Lab Groups: Labs will be conducted in groups of 3, assigned at the start of the semester.

Prerequisite: ME 345 – Instrumentation, Measurement, and Statistics,
I’m expecting each student to walk in the door with a basic familiarity with typical tools used for systems and signals analysis from ME370, including Laplace Transforms, eigenvalues, bode plots, etc. Students should have a firm understanding of mass-spring-damper systems along with detailed knowledge characteristic responses of these systems in underdamped, critically damped, over-damped conditions. This class will strongly complement ME450, hence why this class is listed as a corequisite. Students who have not had ME450 or who are not presently in this class will NOT be allowed to take this course.

Many assignments will require the use of MATLAB, so knowledge of this software is beneficial but not expected walking in the door. For students who are not familiar with this software, extensive tutorials are provided. However, a memory of structured programming as well as some willingness to learn this material is expected.

Course Objectives: Upon completion of the course, students should be able to:
1. Identify the actuators, sensors, plants, and controllers of physical control systems.
2. Calibrate sensors commonly used in control systems.
3. Measure steady state, step, and frequency response of various systems.
5. Design simple controllers for various systems.
6. Implement controllers and test control performance.
Grading: Because this is a lab section, attendance will be graded per the point distribution below.

**Option I:** An initial grade based on 100 total points will be assigned per the metric below. If the student is satisfied with this grade, then the Lab Development Project is not required.

- Attendance (2 points each lab for 8 labs) = 16 points
- Individual prelab quizzes (4pts each, except 2 for 1st) = 30 points
- Top 6 group lab scores (9 points each) = 54 points
- **Total** 100 points

**Option II:** If the student is not satisfied with the initial grade, a Lab development project may be conducted whose purpose is to develop a significant improvement to an existing lab, or a new lab experience. In this case, the grade will be based on 120 total points, with the 20 additional points coming from the additional lab development project.

Questions: Please feel free to ask questions before or after class, since this saves E-mail exchanges, scheduled meetings, etc. E-mail works as well, and if the question is good, I’ll always CC the entire class.

But one key request: include a hypothesis. In other words, don’t simply ask “What do I do here?” or “What do you mean?”. Instead, write, “I think you mean X here, is this correct?” or, “I think I should do Y, right?”

Finally, the homework is meant to challenge you, but don’t bang your head against a wall, especially on a software issue. If you aren’t getting anywhere after a reasonable effort (20-30 minutes is a reasonable amount of time to work on a problem section), please just ask!

Quizzes: Short quizzes (5 minutes each) will be given at the start of each lab (e.g. every other week) based on assigned reading from the text or other supplemental material provided in class. Each quiz will be worth 4 points. Because the purpose of this quiz is to ensure that students arrive to class on time and prepared to start their labs, no makeup quizzes will be allowed. If a student must miss a class due to an emergency, senior project, interview, etc and gives AT LEAST 24 hours advanced notice in writing (E-mail to Dr. B and the TA), they will be allowed to take a late quiz and allowed to do their lab either alone or with others who miss the class.

In the case a cell phone, pager, buzzer, etc goes off in class, there will be an automatic on-the-spot pop quiz for that student’s entire group. The grade on this quiz will replace the highest quiz scores for the group.
Muddiest points: At unannounced times at the end of class, all students will be asked to write out a short (1-2 sentence) question concerning a topic covered in class that week that they felt was not well-explained or remains unclear. These are like quizzes, but are only graded pass/fail and there are no wrong answers. The scores for these simply substitute for the quizzes for that day.

Schedule:

<table>
<thead>
<tr>
<th>Lab Sessions</th>
<th>Reading/Worksheet</th>
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<tbody>
<tr>
<td>0 Introduction/Orientation</td>
<td>Introductory literature, lab safety</td>
</tr>
<tr>
<td>1 Rectilinear System</td>
<td>Worksheet   (2 sessions)</td>
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<tr>
<td>2 Torsion System</td>
<td>Worksheet</td>
</tr>
<tr>
<td>3 Industrial Servo System</td>
<td>Worksheet</td>
</tr>
<tr>
<td>4 Magnetic Levitation System</td>
<td>Worksheet</td>
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<tr>
<td>5 Inverted Pendulum System</td>
<td>Worksheet</td>
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<tr>
<td>6 Servo Robot System</td>
<td>Worksheet</td>
</tr>
<tr>
<td>7 Moment Gyroscope System</td>
<td>Worksheet   (2 sessions)</td>
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Policy on cheating: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. The University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others. The academic integrity web site for the College of Engineering is at [http://www.psu.edu/oue/aappm/G-9.html](http://www.psu.edu/oue/aappm/G-9.html).

Specific to this class: Students are encouraged to work together on homework assignments; however, original solutions are required.

So how do I expect you to work together but not copy? My threshold of cheating is defined as follows: If the person grading the assignments is able to identify which other groups provided solutions for your assignment, and their help is not clearly documented, then this is cheating. If cheating or copying is suspected, all students involved will receive a warning if the violation is minor and if this is their first such warning. For obvious and major violations… e.g. major portions of the assignment are copied, then no credit will be given for the assignment. After the first warning warning, any subsequent cheating – minor or major – will result in a zero and the student will be referred to the college for additional reprimand. Cheating beyond 2 warnings will result in automatic failure of the course and will be immediately processed as an academic integrity violation.