1 Basic Information

Instructor : Dr. Ashok Ramasubramanian
Office : 207 Steinmetz Hall
Lab : 202 Butterfield Hall (check here if I am not in my office)
Phone : (518) 388-8366
e-mail : ramasuba@union.edu

Office hours : Wednesday & Friday 11:35 AM to 1:00 PM or by appointment
Walk-ins welcome

Lecture : Monday, Wednesday, Friday from 10:30 AM to 11:35 AM, Room N201
Lab session 1 : Tuesday 9:00 AM to 11:50 AM, Room N220
Lab session 2 : Tuesday 1:55 PM to 4:45 PM, Room N220

Course website : Use Blackboard, online.union.edu

2 Due Dates

Homework Assignments : Monday at the beginning of class
Lab reports : Beginning of the next lab session

3 Grading

Typical letter grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.99</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.99</td>
</tr>
<tr>
<td>B</td>
<td>83-86.99</td>
</tr>
<tr>
<td>B-</td>
<td>80-82.99</td>
</tr>
<tr>
<td>C</td>
<td>77-79.99</td>
</tr>
<tr>
<td>C-</td>
<td>73-76.99</td>
</tr>
<tr>
<td>C</td>
<td>70-72.99</td>
</tr>
<tr>
<td>D</td>
<td>60-70</td>
</tr>
</tbody>
</table>
| F     | Less than 60

Note: These ranges may be amended based on the statistical distribution of the class’s grades
4 Course Description

This class deals with the modeling, analysis, and control of physical systems.

In the modeling phase, we define, using techniques such as free-body diagrams, the differential equations governing the dynamic behavior (i.e., what is the response when the system is excited by initial conditions as well as external inputs) of various physical systems. We will deal mainly with mechanical and electrical systems. Fluid and thermal systems may be covered if time permits. The objective of the modeling step is to get a set of differential equations, called the mathematical model, that represent the dynamics of the system under test.

In the analysis phase, the model is solved analytically (e.g., using Laplace transforms) as well as computationally (e.g., using MATLAB) to get the system response.

If the response is not satisfactory, the difference between the actual response and the desired response, the error signal, is used to introduce feedback and design feedback control systems. In the final phase of the course, we will study how to design such control systems.

5 Notes on Homework

1. Homework assignments will be posted on Monday and are due the following Monday in class. Late homework will not be accepted. If the homework is not turned in time, your grade for that homework will be zero. In case of special circumstances – religious observances, athletic travel and the like – please contact me beforehand to make alternative arrangements.

2. Take pride in your work and do your best. Discussion with your peers is not only permitted, but also encouraged. However, you are responsible for your own work and each person must turn in a separate assignment even when significant collaboration is involved. Always list the persons with whom you collaborated.

3. Even though working together is allowed, each person is expected to understand what she or he is writing down.

4. I expect you to start working on the homework early. Starting it the day before it is due is a terrible idea. You are expected to read ahead and start solving problems even though the material has not yet been covered in class. Reading ahead will also greatly enhance your classroom comprehension. I strongly encourage you to use the office hours to clarify questions regarding the homework.

5. Only selected problems from the homework assignments will be graded.
6. **Homework assignments that are turned in by Friday will receive 10 extra points.**

7. **Homework presentation:**
   
   (a) Homework should be neatly done and pages must be stapled together.
   
   (b) Label all axes when presenting graphs. Always use units for physical quantities.
   
   (c) All graphs should be made using MATLAB. Excel graphs are *not* permitted.
   
   (d) Attach all rough work at the end.

6 **Notes on Lab Reports**

1. A technical report has four sections: Introduction, Methods, Results, and Discussion. You will write a full lab report for Lab 1, Lab 5, and Lab 7. Only the Results section is necessary for the rest. Naturally, those reports requiring full write-ups will be weighted higher.

2. Full details regarding grading, i.e., the respective weight of each component, will be provided at the end of each lab assignment.

3. You are required to read *Elements of Style* and use the techniques explained therein.

4. For those labs requiring a full write-up, i.e., Lab 1, Lab 5, and Lab 7, you are also required to read the handout on Technical Writing. It explains what is to go in each section (Introduction, Methods, Results, and Discussion).

5. Lab reports are due one week after completion of the lab assignment. Late submissions will not be accepted. For special circumstances, please make arrangements beforehand. **Reports that are turned in at least a day earlier will receive 5 extra points.**

7 **Notes on Exams**

1. Both exams are cumulative and take-home. You may use any class notes you have taken and any of the texts mentioned in this syllabus. Nothing else is permitted.

2. Further instructions will be given along with the exams.
8 Notes on Writing

This is a Writing Across the Curriculum (WAC) course. This means that, in addition to the technical merit of homework, lab reports, and exams, you will also be graded on the clarity and elegance of your writing. Careful attention should be paid to how you communicate your ideas. **Poor writing will result in poor grades.**

9 Honesty Policy

In Spring 2008, two seniors failed this class, received a two-term suspension, and did not graduate as a result of being academically dishonest in this class; do not let this happen to you. The ME department takes Academic Honesty very seriously.

1. Cheating of any kind will not be tolerated. Cheating on homework assignments and lab reports will at least result in a zero for that particular assignment. Additional penalties, including failure in the class, may be imposed depending on the severity of the offense. Cheating on exams will very likely result in a failing course grade.

2. Copying homework solutions from others, solution manuals, or from previously released solutions constitutes cheating, as does plagiarizing preexisting lab reports. Please be very careful to acknowledge, in writing, the contributions of others if you worked together on an assignment. Do not accept credit for work that you do not understand.

3. Ask me if you have any doubt about what might be considered academically dishonest. When in doubt, ask!

4. Engineering as a profession cannot survive if the people who practice it are not honest. You are professionals and I expect professional conduct.

10 Class Policies

1. Please show professionalism and courtesy during class. Please arrive on time, be prepared to participate in class, and do not disturb the class by talking, reading the paper, etc. Please do not leave and reenter the class during lecture.

2. **Using the computer or other electronic devices during class or lab to check email, surf the net, or play Solitaire is not permitted. Computers are to be used only when I ask you to do so.**

3. Please turn off all cell phones, beepers, palmers, and other electronic devices before class and lab.
4. Leaving the classroom to make/answer cell phone calls is not acceptable. Eating in the classroom is not acceptable.

5. Lecture attendance is not mandatory. However, you are responsible for any material presented in class.

11 Course Textbooks

Title : System Dynamics (4th edition)
Author : Katsuhiko Ogata
Publisher : Pearson Prentice Hall
ISBN : 9780131424623
Required ? : Yes

Title : The Elements of Style (4th edition)
Author : William Strunk, E. B. White
Publisher : Longman Pub Group
ISBN : 9780205309023
Required ? : Yes

Title : Modeling and Analysis of Dynamic Systems (3rd ed)
Authors : C. M. Close, D. H. Fredrick, J. C. Newell
Publisher : Wiley
ISBN : 9780471394426
Required ? : No

This is an optional text. All the pages necessary for this course are available in Blackboard.

12 Disclaimer

It is not possible to precisely predict all the events that will happen during the term. As a result, some of these rules may change as the term proceeds. I will, however, keep you appraised of all changes.
13 Topics to be Covered

Week 1 : Introduction, Review of differential equations
Week 2 : Translational and Rotational Systems
Week 3 : Laplace Transforms
Week 4 : Transfer function approach to modeling dynamic systems
Week 5 : State-space approach, RLC circuits
Week 6 : Time domain analysis
Week 7 : Frequency domain analysis
Week 8 : Introduction to control systems
Week 9 : Design of controllers
Week 10 : Root locus analysis

Note: The above schedule is subject to change. In particular, significant change is expected during the last three weeks.