Control Systems
EGR 314

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Office: S 324
Office Hours: MTWR 10:30 AM – 11:30 AM / MW 1:30 PM – 2:30 PM / TR 2:00 PM - 3:00 PM
Department: Department of Physics and Astronomy
Class meeting time and place: MWF 9:00 am – 9:50 am / S 321

Course Description:
Introduction to automatic control systems; mathematical models of physical systems; block diagrams and
signal flow graphs; transient and steady state responses; PID controllers; stability of linear feedback
systems; root-locus and Routh’s criteria; frequency response methods; polar, Nyquist and Bode plots;
stability margins; state-variable formulation. Prerequisite: EGR 215 or PHY 262.

Text and Materials:

Course Calendar:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Chapter</th>
<th>Reading Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Control Systems</td>
<td>1</td>
<td>1.2-1.10</td>
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<tr>
<td>2</td>
<td>Mathematical Models of Systems</td>
<td>2</td>
<td>2.2-2.10</td>
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<tr>
<td>3</td>
<td>State Variable Models</td>
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<td>3.2-3.10</td>
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<tr>
<td>4</td>
<td>Feedback Control System Characteristics</td>
<td>4</td>
<td>4.2-4.10</td>
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<tr>
<td>5</td>
<td><strong>Exam 1 (Chapter 1, 2, 3)</strong></td>
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<tr>
<td>6</td>
<td>The Performance of Feedback Control Systems</td>
<td>5</td>
<td>5.2-5.11</td>
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<tr>
<td>7</td>
<td>The Stability of Linear Feedback Systems</td>
<td>6</td>
<td>6.2-6.7</td>
</tr>
<tr>
<td>8</td>
<td>The Root Locus Method</td>
<td>7</td>
<td>7.2-7.5</td>
</tr>
<tr>
<td>9</td>
<td><strong>Spring Break – No Classes</strong></td>
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<td>10</td>
<td>PID Controllers</td>
<td>7</td>
<td>7.6-7.10</td>
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<td>11</td>
<td>Frequency Response Methods</td>
<td>8</td>
<td>8.2-8.8</td>
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<tr>
<td>12</td>
<td>Stability in the Frequency Domain</td>
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<td>9.2-9.5</td>
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<tr>
<td>13</td>
<td><strong>Exam 3 (Chapter 7, 8)</strong></td>
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<tr>
<td>14</td>
<td>Stability in the Frequency Domain</td>
<td>9</td>
<td>9.6-9.11</td>
</tr>
<tr>
<td>15</td>
<td>The Design of Feedback Control Systems</td>
<td>10</td>
<td>10.2 – 10.14</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam (All Chapters)</td>
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Assignments:
There will be assignments almost every week. These assignments are due one week after they have been
posted.

Quizzes:
A small 10-15 minutes quiz will be given at the end of every chapter. The idea of the quiz is to reinforce
your understanding of the material covered in the chapter.
Exams:
There will be a total of three regular exams during the semester, and one comprehensive final exam. The exams will be based on the homework, and the materials covered during the lecture.

Grading Policy:

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Attendance</td>
<td>5%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>15%</td>
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<tr>
<td>Exams</td>
<td>40%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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Late Policy
Any assignment should be returned in time. In the case that the assignment is returned late it will be affected by the following policy:

<table>
<thead>
<tr>
<th>Time Late</th>
<th>Deduction</th>
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<tbody>
<tr>
<td>Less than 2 hours</td>
<td>5</td>
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<tr>
<td>More than 2 hours less than 12</td>
<td>10</td>
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<tr>
<td>More than 12 hours less than 24</td>
<td>20</td>
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<tr>
<td>More than 24 hours less than 48</td>
<td>50</td>
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<tr>
<td>More than 48 hours</td>
<td>100</td>
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Homework Guidelines
As engineers you should learn how to be organized, you will need to present reports and results to your superiors and these need to be professional. For that reason, you will need to start learning how to be organized. The homework should be returned complying with the following format:

1. Use engineering paper
2. Name should be on the top left corner
3. Pages should be numbered on the top right corner using the following format “3/10”
4. Problems should be organized and in order
5. Problem number should be clear and readable

Failing to comply with any of these will result in a **10 points** deduction.

Attendance Policy:
Attendance will be taken at the beginning of each class. Five points had been allocated for attendance. I understand that things happen, and you are not able to attend class a couple of times. Therefore, you are allowed to miss only 4 lectures without deduction.

Program Learning Outcomes (PLO)
1. The student will demonstrate proficiency in the basic and applied fields of engineering.
2. The student will apply physical principles to novel situations, both in the classroom and in research settings.
3. The student will develop good experimental technique, including proper setup and care of equipment, conducting experiments and analyzing results in order to observe physical phenomena, assess experimental uncertainty, and make meaningful comparisons between experiment and theory.
4. The student will develop effective written and oral communication skills, especially the ability to transmit complex technical information in a clear and concise manner.
5. The student will be able to work effectively in groups or teams.
6. The student will appreciate the importance and practice of ethics in science.
Student Learning Outcomes (SLO)
By the end of the course, a successful student will be able to:
- Determine the sensitivity, steady-state error, rise-time, time-to-peak, settling-time, percentage
  peak overshoot, and transient response to step, impulse, and ramp input signals. (PLO 1)
- Determine the absolute stability of a control system using the Routh-Hurwitz criterion. (PLO 2)
- Determine the stability of a control system using the Root-Locus method. (PLO 2)
- Analyze the performance of PI and PID controllers for a simple control systems. (PLO 2)

General Education Core Curriculum Objectives/Outcomes (EEO)
There are no specific general education core curriculum objectives in this course. This course is not a
general education core curriculum course.

Academic Integrity (A-9.1)
Academic integrity is a responsibility of all university faculty and students. Faculty members promote
academic integrity in multiple ways including instruction on the components of academic honesty, as well
as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1)
using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a
class; (2) the falsification or invention of any information, including citations, on an assigned exercise;
and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is
presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1)
submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of
another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or
another source; and (3) incorporating the words or ideas of an author into one's paper without giving the
author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Withheld Grades Semester Grades Policy (A-54)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic
chair/director, a grade of WH will be assigned only if the student cannot complete the course work
because of unavoidable circumstances. Students must complete the work within one calendar year from
the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students
register for the same course in future terms the WH will automatically become an F and will be counted
as a repeated course for the purpose of computing the grade point average.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with
disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room
325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the
course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request
services in a timely manner may delay your accommodations. For additional information, go to
http://www.sfasu.edu/disabilityservices/.