EE 311/311L - Systems
Fall Semester 2010

Required Course

Catalog Data: (3-0.5) 3.5 credits. Prerequisites: EE 221 completed with a grade of —C or better, EM 216 completed or concurrent. Mathematical, topological, and circuit models of electro-systems, such as electromagnetic, electromechanical, electro thermal, etc.

Prerequisites: EE 221 and background in:
• Electronic circuits.
• Transient circuits
• Sinusoidal analysis
• Introduction to Laplace analysis


Chapter Order: 1,2,3,5,4,7,6,8,10(Bode as time permits)

Supplementary Books:

Instructor: Dr. C. R. Tolle EP 323 394-6133 charles.tolle@sdsmt.edu

Office Hours: WF 3:00pm-4:00pm, T 8:00am-10:00am, or by appointment.

Lecture: Section 01 EP 253 2:00pm-2:50pm MWF
Lab: Open Lab EP 340

Goals: The student completing the course should be able to apply hardware and software design concepts to understand first and second order systems transient and steady state response analysis.

Tentative Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Attendance, Participation, and Professionalism</td>
<td>5%</td>
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<tr>
<td>Quizzes &amp; Homework Assignments</td>
<td>10%</td>
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<td>Lab Projects</td>
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<tr>
<td>3 Mid Terms (21%, 22%, and 22%)</td>
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The instructor reserves the right to modify this grading break down if warranted.

Grades will be assigned according to natural grade groupings. However it is anticipated that the following scale will be used to assign final grades.

<table>
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<th>Percentage Range</th>
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<td>100 – 90</td>
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<td>below 59</td>
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The instructor reserves the right to modify this scale if warranted.
Topics:
- beginning system modeling
- transient and steady state response analysis
- stability analysis
  - i.e. Routh-Hurwitz criterion, root-locus techniques, and frequency domain techniques
- state space methods
- beginning design of systems to satisfy the given specifications
- modern computational software tools for analysis and design of feedback systems
  - i.e. MATLAB (possible alternative software programs: Octave, Maple, or Sage).

General Policies: Students are encouraged to work together on assigned homework problems. However, all homework, projects, and tests must not be plagiarized (from any source – even your classmates). Plagiarism is on the rise and it is not acceptable in any form! If caught plagiarizing, you will receive an F for the course and referred to the Department Head and Dean for further action. In short, you are expected to accomplish your own work! When using other's works cite them! Make-up tests will not be given unless a prior arrangement is made with the instructor. Students have two weeks following the return of any graded material to appeal the score.

Note that according to “Policy Governing Academic Integrity” in the SDSM&T Undergraduate Catalog, the instructor of record for this course has discretion of how acts of academic dishonesty are penalized, subject to the appeal process, and that “Penalties may range from requiring the student to repeat the work in question to failure in the course” (72-73).

Assigned work will be due on at the start of class on the due date unless otherwise stated. Late work will receive up to ½ credit within one week of due date, i.e. up to the start of class one week later. After that time, late homework will not be accepted without the permission of the instructor.

Laboratory projects: Students learn to simulate ordinary differential equations (ODE) as well as simulate state space systems in Matlab and Simulink. They also learn to measure transient time constants for simple first and second order circuits.

Freedom in learning: Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should contact the dean of the college which offers the class to initiate a review of the evaluation.

ADA note: Students with special needs or requiring special accommodations should contact the instructor and/or the campus ADA coordinator, Ms. Jolie McCoy, at 394-1924 at the earliest opportunity.

OUTCOMES:
Upon completion of this course, students should demonstrate the ability to:
1. Use techniques such as linearization, dynamic response, Laplace transforms to model systems.
2. Use block diagrams to represent systems.
3. Use signal flow graphs to represent systems.
4. Determine the sensitivity of the output to changes in the transfer function.
5. Determine how disturbances affect the output of a system
6. Analyze the performance of a system in the time domain.
7. Analyze the performance of a system in the frequency domain.
8. Analyze the stability of a linear control system.
9. Use root-locus methods to analyze feedback control systems via gain adjustment.
10. Use state variable models to analyze a system.
11. Be comfortable using Matlab as an analytical tool.
*12. Apply the principles of a PID (proportional, integral, derivative) to a controller strategy.
* as time permits
RELATION OF COURSE TO PROGRAM OBJECTIVES:
These course outcomes fulfill the following program objectives:
(a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The following table indicates the relative strengths of each course outcome in addressing the program objectives listed above (on a scale of 1 to 4 where 4 indicates a strong emphasis).

<table>
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<tr>
<th>Outcomes Objectives</th>
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ABET category contents estimated by faculty member who prepared this course description:
Engineering Science - 2.5 credits, or 70%  Engineering Design - 1.0 credits, or 30%

PREPARED BY:
Charles R. Tolle, Date: last update Aug. 27, 2010