Syllabus for
EGR 331--Design of Control Systems
3 Credit hours
Spring 2008

I. COURSE DESCRIPTION

An introduction to the design of automatic control systems. Includes design projects based on the theory learned in EGR 330. Introduces robust and digital control systems.
Prerequisites: EGR 330.
Course fee: $35

II. COURSE GOALS

This course will enable the student to do the following:

A. Learn lag and lead compensation using Bode techniques .
B. Learn methods to design controllers for state space systems.
C. Learn how to design robust control systems.
D. Learn how to design digital control systems.
E. Gain experience in solving problems that have no single correct solution.
F. Learn to use the computer and signal analyzer operation proficiently.
G. Learn to design of automatic control systems.

III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

A. Terminal Objectives
As a result of successfully completing this course, the student will be able to do the following:
1. Design control systems using different control strategies.
2. Simulate system performance using Matlab.

B. Unit Objectives
As a result of successfully completing this unit, the student will be able to do the following:
1. Write a report for each mini-project showing the accomplishment in system design.
2. Present the results orally to the class using PowerPoint.

C. Objectives for Students in Teacher Preparation Programs
The Teacher Preparation Program meets the competency-based requirements established by the Oklahoma Commission on Teacher Preparation.

IV. TEXTBOOKS AND OTHER LEARNING RESOURCES

Required Materials
Textbook: Dorf, Richard C. and Bishop, Robert H. Modern Control Systems, 11th Ed, New York: Prentice Hall, 2008.

V. POLICIES AND PROCEDURES

A. University Policies and Procedures

1. Attendance at each class or laboratory is mandatory at Oral Roberts University. Excessive absences can reduce a student's grade or deny credit for the course.
2. Students taking a late exam because of an unauthorized absence are charged a late exam fee.
3. Students and faculty at Oral Roberts University must adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software. By submitting an assignment in any form, the student gives permission for the assignment to be checked for plagiarism, either by submitting the work for electronic verification or by other means.
4. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
5. Students are to be in compliance with University, school, and departmental policies regarding ePortfolio requirements. Students should consult the ePortfolio handbooks for requirements regarding general education and the students' majors.
    a. The penalty for not submitting electronically or for incorrectly submitting an ePortfolio artifact is a zero for that assignment.
    b. By submitting an assignment, the student gives permission for the assignment to be assessed electronically.

B. Course Policies and Procedures

1. Assessment Criterion:
   There will be four mini-projects one for each chapter. Each project carries 25% of the final grade resulting in a total of 100%.
2. Handouts, etc
   Lecture handouts, if any, will be distributed during each lecture.
3. Homework:
   Homework, if any, will be assigned at the end of each lecture and will be due at the beginning of the following lecture. Late assignments will result in a lower grade.
4. Academic Honesty:
   The students are encouraged to work out the solutions of the homework on their own. Discussions are encouraged. But copying homework solutions from classmates is considered dishonesty. Dishonesty in an exam will lead immediately to a failure grade for the course and will be reported to the Dean of Engineering and Sciences.
5. Attendance:
   The students are expected to be punctual for classes. The first three absences will not result in a grade deduction. Each absence thereafter will result in a 1% grade deduction in the final score (10% maximum). The final score will be increased by 1% for perfect attendance.
6. ePortfolio Requirements
   The final grade will be reduced by 5% for ePortfolio artifacts that are not submitted by the end of the semester (not 5% per artifact, but 5% total).

VI. COURSE CALENDAR

Session	Topic	Reading & Assignment
1.	Course Introduction and Preliminaries	
2.	Introduction to System Design and Compensation	10.1 - 10.3
3.	Phase-Lead Design Using the Bode Diagram	10.4
4.	Phase-Lead Design Using Root Locus	10.5 - 10.6
5.	Phase-Lag Design Using Root Locus	10.7
6.	Phase-Lag Design Using Bode Diagram	10.8 - 10.9
7.	Effects of Prefilters on Control Systems	10.10
8.	Design for Deadbeat Response	10.11
9.	Design Examples	10.12 - 10.13
10.	Control System Design Using Matlab	10.14 - 10.15
11.-12.	**Mini-project I and Presentation**	
13.	Introduction to State Space techniques	11.1 - 11.3
14.	Introduction to Optimal Control Systems	11.4
15.	Pole Placement Using State Feedback	11.5 - 11.7
16.	Internal Model Design and Example	11.8 - 11.9
17.	State Space Controller Design Using Matlab	11.10 - 11.11
18.-19.	**Mini-project II and Presentation**	
20.	Introduction to Robust Control Systems	12.1 - 12.2
21.	Analysis of Robustness and Systems	12.3 - 12.4
22.	Design of Robust Control Systems	12.5
23.	Design of Robust PID Controllers	12.6 - 12.7
24.	Robust Design Examples	12.8 - 12.10
25.	The Robust Internal Model Control System	12.11 - 12.12
26.	The Pseudo-Quantitative Feedback System	12.13
27.	Robust Control Systems Using Matlab	12.14 - 12.15
28.-29.	**Mini-project III and Presentation**	
30.	Introduction to Digital Controls	13.1 - 13.3
31.	The z-Transform	13.4
32.	Closed-Loop Feedback Sampled-Data Systems	13.5
33.	Stability Analysis of Sampled-Data Systems	13.6
34.	Performance of Second-Order System	13.7
35.	Closed Loop Systems	13.8 - 13.9
36.	Root Locus of Digital Control Systems	13.10 - 13.11
37.	Digital Control Systems Using Matlab	13.12 - 13.13
38.-39.	**Mini-project IV and Presentation**	

Course Inventory for ORU's Student Learning Outcomes

(EGR 331-Design of Control Systems)
(Spring 2008)

This course contributes to the ORU student learning outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.
No Contribution – Does not address the outcome.

The Student Learning Glossary at http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

OUTCOMES & Proficiencies/Capacities	Significant Contribution	Moderate Contribution	Minimal Contribution	No Contribution
1	**Outcome #1 – Spiritually Alive** Proficiencies/Capacities				
1A	Biblical knowledge				√
1B	Sensitivity to the Holy Spirit				√
1C	Evangelistic capability				√
1D	Ethical behavior			√	
2	**Outcome #2 – Intellectually Alert** Proficiencies/Capacities				
2A	Critical thinking		√		
2B	Information literacy			√	
2C	Global & historical perspectives			√	
2D	Aesthetic appreciation			√	
2E	Intellectual creativity			√	
3	**Outcome #3 – Physically Disciplined** Proficiencies/Capacities				
3A	Healthy lifestyle				√
3B	Physically disciplined lifestyle				√
4	**Outcome #4 – Socially Adept** Proficiencies/Capacities				
4A	Communication skills		√		
4B	Interpersonal skills			√	
4C	Appreciation of cultural & linguistic differences				√
4D	Responsible citizenship				
4E	Leadership capacity			√	

(Revised 10/2/07)