EGE416 01 CONTROL SYSTEMS I (3 credits)
COURSE SYLLABUS
Fall 2015 Semester

1. GENERAL INFORMATION

Professor: Dr. Julio J. González
Office: REH 202
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Office hours: Tuesday 10:00 AM – Noon
Wednesday 09:00 AM – 11:00 AM

Textbook: "Automatic Control Systems" by Farid Golnaraghi & Benjamin C. Kuo, 9th edition, John Wiley and Sons, Inc., 2010.
Classroom: CSB 222

2. DESIRED LEARNING OUTCOMES

I. Students will demonstrate their ability to model control systems, including: a) obtaining a model from a given experimental outcome, b) translating a model mathematical formulation into an equivalent one, as well as their ability to analyze control systems, including: a) obtaining the system output for a given input, b) determining stability, c) finding the steady-state error, d) finding the gain and phase margins.

II. Students will demonstrate their ability to design control systems to satisfy predetermined design specification, such as overshoot, settling time, gain and phase margin, etc. They will also demonstrate their design skills through a Design Project Report, which will include a) producing a descriptive abstract and a motivating introduction, b) explaining mathematical calculations and the generation of theoretical expectations, c) analyzing simulation results and their match with theoretical expectations and d) providing relevant conclusions

3. STUDENT OUTCOMES

This course contributes to the Student Outcomes specified in the following table:

Student Outcome	Course Desired Learning Outcome	Level of Contribution 3 = strong; 2 = moderate; 1 = marginal
a) An ability to apply knowledge of mathematics, science and engineering	I	3
e) An ability to identify, formulate and solve engineering problems	II	3

4. COURSE CONTENTS

Automatic control systems: concept of feedback; Review of pertinent mathematical background: The Laplace Transform ;The transfer function; Signal Flow graph and Mason's gain formula; The state-space approach; Mathematical modeling of physical systems. Stability analysis: The Routh-Hurtwitz method; Stability analysis in the parameter space; Analysis using the Evans diagram; Analysis using Bode diagrams; Design of lag-phase and lead-phase controllers using Evans and Bode diagrams; Design of State-Feedback controllers.

5. TENTATIVE SCHEDULE FOR TOPICS

WEEK	TOPIC
1	Automatic control systems: concept of feedback
2	Review of mathematical background: The Laplace Transform
3, 4	The transfer function. Signal Flow graph and Mason's gain formula.
5, 6	The state-space approach. Mathematical modeling of physical systems
7, 8	Stability analysis: The Routh-Hurtwitz method. Stability analysis in the parameter space.
9, 10	Analysis using the Evans diagram.
11, 12	Analysis using Bode diagrams.
13	Design of lag-phase and lead-phase controllers using Evans and Bode diagrams
14	Design of State-Feedback controllers.

6. SCHEDULE FOR EXAMINATIONS, PROJECTS AND HOMEWORK

Event	Date Assigned	Date due
Homework 1	08/28	09/04
Homework 2	09/04	09/11
Homework 3	09/11	09/18
Homework 4	09/18	09/25
Homework 5	09/25	10/02
First Mid-term Exam	**10/06**	**10/06**
Homework 6	10/16	10/23
Homework 7	10/23	10/30
Homework 8	10/30	10/06
Homework 9	10/06	11/13
Homework 10	11/13	11/20
Design Project	11/20	12/11
Second Mid-term Exam	**11/24**	**11/24**
Homework 11	12/01`	12/04
Final Examination	**12/15**	**12/15**

NOTES:

- The mid-term examinations will take place at CSB 222 from 08:00 AM to 09:25 AM
- The final examination will take place at CSB 222 from 08:00 AM to 10:00 AM
- The project has to be handed out in REH 202 before 4 PM
- The homework assignments will be due at the beginning of class, 08:00 AM. After that, the instructor will provide students with the homework solutions. No homework will be accepted after the solutions have been handed out. Therefore, if you are late to class and the homework solutions have already been handed out, you will receive a grade of "0" for the homework that is due that particular date.

7. GRADING POLICY

7.1. Grade Distribution

Homework:	10%
Project report:	20%
First test:	20%
Second test:	20%
Final test:	30%

Total:	100%

NOTE: The course will be automatically failed if any of the following conditions apply:

- **Cheating in any possible way**. *In addition to failing the course, the student will be subject to all pertinent academic measures.*
- *Failing to take any of the three examinations or present the project report*
- *Obtaining less than the passing grade (55%) in more than one examination.*
- *Obtaining less than the passing grade (70%) in the project report. Your project grade will result from a combination of the quality of the report and your knowledge on the project as demonstrated in the final examination*
- *Obtaining less than a 70% average in the homework. In calculating the homework average, one homework assignment (the one with the lowest grade) will be dropped for every student*

7.2. Letter Grade Assignment

Your letter grade will be determined from your overall grade as follows:

Numerical grade	Letter grade
$G \geq 90$	A
$85 \leq G \leq 89$	A-
$80 \leq G \leq 84$	B+
$75 \leq G \leq 79$	B
$70 \leq G \leq 74$	B-
$65 \leq G \leq 69$	C+
$60 \leq G \leq 64$	C
$55 \leq G \leq 59$	C-
$G < 55$	F

NOTE: Do not think that this number-letter assignment is too lenient. Please bear in mind that the tests consist of problems that you will be facing for the first time. A 70 for example, will require a significant and continual amount of studying, and therefore, a B- reflecting that 70 will be a very well deserved letter grade.

7.3. Grading discrepancy

In case of grading discrepancy, the student should see the grader within a week from the date the graded document is handed in to the class (regardless of whether the student is or is not present that particular date). After this period of time has elapsed, grades will not be changed.

7.4. Class Attendance

Attendance to classes is strongly encouraged. The grade will be negatively affected when more than three unjustified missed classes occur.