



University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Mechanical Engineering
 M.S./Ph.D. in Mechanical Engineering



Course Syllabus

1. General Information:	
Alpha-numeric codification: INME 6036 Course Title: Control System Design and Applications Number of credits: 3 Contact Period: Three hours of lecture per week	
2. Course Description:	
English: Design of electromechanical products; use of electronic parts in design. Applications of logic design. Selection and construction of control loop parts such as sensors and actuators. Design, build, and test of a miniature controlled system.	
Spanish: Diseño de productos electromagnético; uso de electrónica en el diseño. Repaso y aplicación de métodos clásico y de estado. Introducción a métodos de control digital. Selección y construcción de componentes usado en Sistema de laso cerrado con sensores y actuadores. Diseño, construcción y prueba de un sistema de control en miniatura.	
3. Pre/Co-requisites and other requirements:	
Pre-requisite: Authorization of the Director of the Department	
4. Course Objectives:	
<ul style="list-style-type: none"> • Understanding classical control design. • Applying state-space approach to design systems. • Creating interfaces between electrical and mechanical systems. • Designing and building a control system. 	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input type="checkbox"/> computation <input type="checkbox"/> laboratory <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop <input type="checkbox"/> art workshop <input checked="" type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input checked="" type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
6. Minimum or Required Resources Available:	
None	
7. Course time frame and thematic outline	
General Topics	Contact Hours
Review of classical control theory: Laplace transformation and solutions, linearization using Taylor series, modeling first and second order-systems.	6

Characterization of electrical/mechanical systems through experimentation: Laboratory I and II	2
Review of classical control design techniques: timebase, rootlocus, nyquist, bode diagrams	6
Design Project No. I	2
Introduction to Mathematical fields, operations, vector spaces, eigenvalues, eigenvectors	4
State-space modeling of systems	5
State space design	5
Design Project No. II	5
Introduction to digital controls	4
Comparison of classical control design techniques and digital techniques	3
Design Project No. III	
Exams	3
Total hours: (equivalent to contact period)	45

8. Grading System

Quantifiable (S/NS) Not Quantifiable

9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	40
<input checked="" type="checkbox"/> Final Exam	1	20
<input type="checkbox"/> Short Quizzes		
<input checked="" type="checkbox"/> Oral Reports	1	20
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	20
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
TOTAL:		100%

10. Bibliography:

Textbook:

Cheng, Dai-Zhan, Hu, Xiaoming and Tielong Shen. 2011. *Analysis and Design of Nonlinear Control Systems*. New York: Springer. [Available at the Circulation Collection (QA402.35 .C474 2010), UPRM General Library]

Other resources:

1. Tarbouriech, Sophie, Garcia, Germain, and Adolf Hermann Glattfelder. 2007. *Advanced Strategies in Control Systems with Input and Output Constraints*. New York: Springer. <http://dx.doi.org/10.1007/978-3-540-37010-9>. [Available via Springer eBooks, UPRM General Library Databases]
2. Levine, William S. 2010. *The Control Handbook*. Florida: CRC Press. <http://dx.doi.org/10.1201/b10383>. [Available via MechanicalENGINEERINGnetBASE, UPRM General Library Databases]
3. Electronic resources available through the Library's website: <http://www.uprm.edu/library/cre/listdbsp.php?l=1&st=0&topic=77>.

11. Law 51: The Comprehensive Educational Services Act for People with Disabilities:

States that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information, contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

12. Academic Integrity

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws. —

13. Certification 06-43 of the Academic Senate

"The academic guidelines for offering online courses," defines: Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 06-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

14. Sexual Harassment: Certification 130-2014-2015 states:

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

Revised: February, 2019