

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Electrical and Computer Engineering
 Bachelor of Science in Electrical Engineering

Course Syllabus

1. General Information:	
Alpha-numeric codification: INEL 5508 Course Title: Digital Control Systems Number of credits: 3 Contact Period: 3 hours of lecture per week Elective in INEL 5508	
2. Course Description:	
English: Analysis and design of digital control systems. Stability, controllability, and observability of discrete systems. Practical considerations when implementing a digital control system. Spanish: Análisis y diseño de sistemas de control digital. Se estudia la estabilidad, controlabilidad y observabilidad de sistemas de tiempo discreto. Se enfatizan consideraciones prácticas para la implantación de los sistemas de control digital.	
3. Pre/Co-requisites and other requirements:	
INEL 4505	
4. Course Objectives:	
Analyze, design and implement digital control systems for single-input single-output physical systems. Discretize simple physical systems and specify performance criteria. Design a single-input single-output feedback controller capable of achieving the design criteria for the system. Implement a digital controller using a digital computer and software, and validate the performance of the closed-loop system.	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input checked="" 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 type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
6. Minimum or Required Resources Available:	
Eight workstations equipped with mechanical systems to be controlled, electrical measurements equipment, personal computers with data acquisition boards and software (Matlab, Simulink, RTW, and LabVIEW).	
7. Course time frame and thematic outline	
Outline	Contact Hours
Modeling of digital and discrete systems	3
Discrete Time Systems and the Z-transform	6
State space representation of discrete systems. Properties of the models	4
Sampling and reconstruction	7
Analysis of sampled data open-loop and closed-loop control systems	5
System time-response characteristics	5
Stability analysis	3
Digital controller design	9
Exams	3
Total hours: (equivalent to contact period)	45
8. Grading System	
<input checked="" type="checkbox"/> Quantifiable (letters) <input type="checkbox"/> Not Quantifiable	
9. Evaluation Strategies (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.	

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	50
<input checked="" type="checkbox"/> Final Exam	1	20
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	20
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Homework Sets	4	10
TOTAL:		100%

10. Bibliography:

C.L. Phillips, H.T. Nagle, Jr., Digital Control System Analysis and Design, 3rd Edition, Prentice Hall, 1995.

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. Contribution of Course to meeting the requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			√

13. Course Outcomes

Map to Program Outcomes

- | | |
|---|-----|
| 1. Analyze, design and implement digital control systems for single-input single-output physical systems. | (a) |
| 2. Discretize simple physical systems and specify performance criteria. | (a) |
| 3. Design a single-input single-output feedback controller capable of achieving the design criteria for the system. | (c) |
| 4. Implement a digital controller using a digital computer and software. | (e) |
| 5. Validate the performance of the closed-loop system. | (b) |
| 6. Work as part of a team. | (d) |
| 7. Preparation of a written report about the final project. | (g) |
| 8. Use modern engineering tools (MATLAB, LabVIEW, PSPICE...) for the design and implementation of a process control and instrumentation system. | (k) |

Person(s) who prepared this description and date of preparation: Gerson Baeuchamp, Submitted by: Eduardo J. Juan Feb 2007