

MIAMI UNIVERSITY
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF ENGINEERING TECHNOLOGY

ENT 418 Electromechanical Control Systems 3 credit hours
Covers advanced control topics including state variable methods, higher order system response, transient response, and stability analysis.

PREREQUISITES BY COURSE :

MTH 251 Calculus II

ENT 301 Dynamics

ENT 401 Computerized Instrumentation and Feedback Control

GENERAL OBJECTIVES :

After completing this course, the student will have:

- An understanding of basic power electronics.
- The ability to determine and analyze transfer functions for electromechanical systems.
- An understanding of the operation of DC servo motors from a transfer function approach
- An understanding of first and second order lag processes.
- An understanding of root locus techniques and Bode plots.
- Be able to utilize control techniques that provide stability to electromechanical systems

TOPICAL OUTLINE

Week 1 Homogeneous Differential Equations
Appendix B Introduction to Matlab

Week 2 Mesh and Nodal Network Analysis Review

Week 3-4 Modeling in the Frequency Domain

Week 5 Modeling in the Time Domain

Week 6 Time Reponse

Week 7 Reduction of Multiple Subsystems

Week 8 Stability

Week 9 Root Locus Techniques

Week 10 PID Control

Weeks 11-15 Laboratory Experience

TEXT MATERIAL:

Nise, Norman, Control Systems Engineering, Wiley, 2008 ISBN: 978-0-471-79475-2

REFERENCES:

Franklin, G. Feedback Control of Dynamic Systems, Prentice Hall, Fifth Edition, 2006

Johnson, Curtis, Process Control Instrumentation Technology, Seventh Edition, Wiley, 2002.

Bateson, Robert N. Introduction to Control System Technology, Prentice Hall, 2002 ISBN 0-13-30688-6

PREREQUISITES BY TOPIC:

Differentiation and integration of single functions
Computerized Instrumentation

COMPUTER USAGE:

Computer projects will be assigned using MATLAB and Labview.

METHOD OF PRESENTATION

Lectures, demonstrations, and problem solving are integrated into the course. The student is encouraged to engage in dialogue as topics are presented and/or when understanding is not complete.

METHOD OF EVALUATION

The student will be evaluated on class participation, homework grades and performance on quizzes and final exam.

Labs	45%
Test 1	15%
Test 2	15%
Test 3	15%
Homework	10%

D. Hergert 11/09

ENT 418 Weekly Syllabus

Week	Topic	Homework
Week 1	Introduction to Differential Equations Introduction to Matlab (Appendix B)	TBA
Week 2	Mesh and Nodal Analysis	TBA
Week 3,4	Chapters 1,2	Chap 2-1,2,6,7,8,12,16,18,33,34,43
Weeks 4-5	Chapter 3 Test 1 (Week 4)	Chap 3-1,11,14,19
Week 6	Chapter 4	Chap 4-14,20,23,25,26
Week 7	Chapter 5 Test 2	Chap 5-4,6,9,11,14,20,26,27,69
Week 8	Chapter 6	Chap 6-1,3,4,5,9,17,23,39
Week 9	Chapter 8	Chap 8-1,2,3,4,5,6
Week 10	PID Control Test 3	
Week 11	Lab 1 PID Control Lab 2 Determining the Transfer Function for a DC Motor	
Week 12	Lab 3 Cam Design for Servo Motor	
Week 13-15	Lab 4 Stepper Controlled XY Table	
Week 16	Final Report Due	