

METROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS

College of: Professional Studies

Department: Engineering and Engineering Technology

Prefix & Course Number: CPE 3715 Crosslisted With*: _____

Course Title: Control Systems Analysis

Transcript Course Title (30 characters): Control Systems Analysis

Check All That Apply: Required for Major: _____ Required for Minor: _____ Specified Elective: X
Required for Concentration: _____ Elective: _____ Service Course: _____

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

Federal Credit Hour Definition: A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:
(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)

Credit Hours: 4 (3+2) Schedule Type: B Grade Mode: L

Face-to-Face or Equivalent Hours per course:

Lecture 45 Lab 30 Internship _____ Practicum _____ Other (please specify type and hours): _____

Additional Student Work Hours per course: 120

Variable topics umbrella course: No X Yes _____ If yes, number of credits/repeats allowed _____

Specified repeatable course: No X Yes _____ If yes, number of credits/repeats allowed _____

Prerequisite(s): CPE 2145 and CPE 3400 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

APPROVED:

Department Chair OR Program Director

Date

Dean OR Associate Dean

Date

Associate VP, Academic and Student Affairs

Date

*If crosslisted, attach completed Course Crosslisting Agreement Form

Prefix and Course Number:

Banner Enforced Coding:

Prerequisite(s): CPE 2145 and CPE 3400 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Registration restrictions: Level _____ Class _____ Program/Major _____ Student attribute _____

Catalog Course Description:

This course analyzes classical, linear, continuous-time control systems. Topics include: Laplace transforms, Bode plots, stability, transient response, steady-state response, and the design of PID, Lag and Lead compensators. The laboratory section of the course uses the classical approach to the analysis and design of control systems.

Specific Variable Topics Course Description (if applicable, umbrella course description included above):

Required Reading and Other Materials will be equivalent to:

Golnaraghi, Kuo (2010). *Automatic Control Systems, 9th edition* or latest edition. Hoboken, NJ: John Wiley & Sons, Inc.

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. Analyze linear feedback system stability, response, and performance
2. Determine the closed-loop transfer function from desired performance
3. Design compensation to achieve a closed-loop behavior, using PID compensators
4. Describe the advantages/disadvantages of feedback and quantify system robustness
5. Create and interpret Bode plots of system frequency response
6. Make time and frequency domain measurements of control systems
7. Make transfer function models of control systems based upon noise measurements
8. Design, build, test lead lag, compensatory control systems and PID

Detailed Outline of Course Content (Major Topics and Subtopics) or Outline of Field Experience/Internship (experience, responsibilities and supervision):

- I. Introduction to Control Systems
 - A. Basic history
 - B. Basic principles of negative feedback
 - C. Introduction to classification of systems
- II. Models (classical)
 - A. Concept of modeling
 - B. Differential equations applied to physical systems
 - C. Laplace transform
 - D. Transfer functions
 - E. Block diagrams
 - F. Signal flow graphs
 - G. Linearization of nonlinear modes
 - H. Rigid body PD and PID control
 - I. Fundamentals of servo control
- III. System Stability
- IV. Steady-state Error and Error Coefficients

Evaluation of Student Performance:

1. Lab Reports
2. Examinations
3. Written Assignments