REGULAR COURSE SYLLABUS

School of: Professional Studies

Department: Engineering Technology

Prefix & Course Number: EET 4710  Crosslisted With*: ____

Course Title: Digital Control Systems Design

Banner course title (30 characters): Digital Control Sys Design

Check All That Apply: Required for Major: ____ Required for Minor: ____ Specified Elective: ____

Required for Concentration: X  Elective:  X  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 the award of credit hours. 34CFR 600.2 (11/1/2010)

Credit Hours: 4 (4+0)

Face-to-Face or Equivalent Hours per course:

Lecture 60  Lab____  Internship ____  Practicum ____  Other (please specify type and hours):

Additional Student Work Hours per course: 120

Schedule Type: L  Grade Mode: L

Variable topics umbrella course: No X Yes ____  If Yes, number of credit hours allowed ____

Specified repeatable course: No  X  Yes ____

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: EET4710
Prerequisite(s): EET 3710 or EET 3715, with a grade of "C" or better
Corequisite(s): ______
Prerequisite(s) or Corequisite(s): ______
Banner Enforced:
  Prerequisite(s): EET 3710 or EET 3715, with a grade of "C" or better
  Corequisite(s): ______
  Prerequisite(s) or Corequisite(s): ______
Registration restrictions: Level ______ Class ______ Program/Major ______ Student attribute ______

Catalog Course Description:
Students in this course will learn the process and theory of the design of digital control systems, using classical and modern control theory. State variable feedback control laws and observers are designed.

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

Required Reading and Other Materials will be equivalent to:

Specific, Measurable Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:
1. Analyze both classical and modern digital control systems.
   a. Develop competency in the use of the z-transform as an analysis tool
   b. Determine stability of systems through a wide variety of techniques
2. Develop methods for stable design of digital control systems
   a. Use a variety of discrete mathematical techniques for digital control system design
   b. Develop an understanding of the applications of digital control systems
3. Design a variety digital control systems
   a. Lag, Lead, and lag-lead compensation
   b. Pole-placement technique
   c. State variable feedback control systems
   d. State observers control systems
   e. Fuzzy logic control systems.

Detailed Outline of Course Content (Major Topics and Subtopics):
I. Introduction to Digital Control

II. Z Transforms:
   A. Discrete-time Systems
   B. Transform Methods
   C. Theorems of Z transform
   D. Solution of Difference Equations
   E. Inverse z Transforms

III. Sampling:
   A. Ideal Sampler
   B. Practical Sampler
   C. Sampled Control Systems
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D. Data Reconstruction
E. A/D and D/A (brief)
F. Alias Filter Design

IV. Time Response:
A. System Time Response
B. Characteristic Equation
C. Analog s-plane/Digital z-plane Mapping
D. Steady-State Accuracy

V. Stability Analysis
A. Introduction
B. Bilinear Transformation

VI. Frequency Response

VII. Robustness

VIII. Classical Controller Design
A. Lead & Lag Compensators
B. PID

IX. State Variable Model
A. Matrix Algebra
B. Continuous-Time
C. Discrete-Time

X. Modern Digital Controller Design
A. Pole Placement Design
B. State Estimation
C. Observer Design
   1. Full-Order
   2. Reduced-Order
D. Controllability and Observability
E. Integral State Feedback

XI. Optimal Control (brief)
A. LQR
B. H infinity

XII. Fuzzy Logic
A. Concepts
B. Design
C. Software

Evaluation of Student Performance:
1. Written exams
2. Written homework
3. Reports and Presentations