Miami Dade College

Course Competencies Template - Form 112

GENERAL INFORMATION	
Name: Dr. Diane King	Phone #: 77021
Course Prefix/Number: EET4730C	Course Title: Feedback Control Systems
Number of Credits: 4	
Degree Type	☐ B.A. ☐ B.S. ☒ B.A.S ☐ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 02-26-2008	Effective Year/Term: 2009-2
☒ New Course Competency	☐ Revised Course Competency
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☐ No	
The above course links to the following Learning Outcomes: ☐ Communication ☒ Numbers / Data ☒ Critical thinking ☒ Information Literacy ☐ Cultural / Global Perspective	☐ Social Responsibility ☒ Ethical Issues ☒ Computer / Technology Usage ☒ Aesthetic / Creative Activities ☐ Environmental Responsibility
Course Description (limit to 50 words or less, **<u>must</u> correspond with course description on Form 102**): This is an upper division course designed to introduce students to the analysis of networks and control systems. Students learn about stability and compensation considerations, using root locus, the Nichols chart, and Bode plots; simulation techniques; and how to apply these principles to build and test control systems. Prerequisite: EET3158C. Laboratory fee. (2 hr. lecture; 4 hr. lab)	
Prerequisite(s): EET3158C	Co requisite(s):

Course Competencies:

Competency 1: The student will demonstrate an understanding of how to build basic principles from classical to modern by:

1. Distinguishing between the frequency and time domain.
2. Applying classical methods to control systems.
3. Defining fundamental notions of controllability and observability of state variable feedback.
4. Explaining advances in robust control theory.
5. Using Ackermann's' formula for pole placement in the design process.

Competency 2: The student will demonstrate an understanding of how to design for real-world applications by:

1. Identifying appropriate applications for designs such as insulin delivery control, low-pass filter, printer belt driver, Mars rover vehicle, and Hubble Space Telescope pointing control.

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2. Analyzing and modifying scripts to satisfy design requirements.
3. Compensating for varying factors in control systems.

Competency 3: The student will demonstrate an understanding of system models by:

1. Creating mathematical models of physical systems in input-output or transfer function form.
2. Comparing the transfer function of variable dynamic concepts.
3. Designing and developing dynamic systems that comprise automatic control systems.
4. Calculating and positioning mass in the hydraulic actuator.

Competency 4: The student will demonstrate an understanding of the characteristics of feedback control systems and how to apply them by:

1. Explaining modern control engineering practice, including the use of control design strategies for improving manufacturing processes.
2. Describing sequential design (e.g., Disk Drive Read system), including how and where it is used in feedback control systems.
3. Discussing techniques to improve the efficiency of energy use in feedback control systems.
4. Applying parameter variations open and closed loop control systems.
5. Analyzing and interpreting system errors.
6. Reducing the effect of unwanted input signals or disturbances on the output signal.

Competency 5: The student will demonstrate an understanding of how feedback control systems perform by:

1. Testing input signals and the performance of second order systems.
2. Identifying the s-root locations and transient response.
3. Employing non-unity feedback to modify steady-state errors.
4. Testing strategies for system performance using MATLAB and Simulink.
5. Applying the appropriate level of linear control to create appropriate system responses.
6. Establishing the correlation between system performance and performance specifications.

Competency 6: The student will demonstrate an understanding of stability of linear feedback systems by:

1. Defining the concept of stability of linear feedback systems.
2. Defining the Routh-Hurwitz Stability Criterion.
3. Applying the Routh-Hurwitz method to build sequential logic into control systems, e.g., a tracked vehicle turning control.

Competency 7: The student will demonstrate ability to use the root locus method by:

1. Defining the Root Locus method and discussing how it is applied to parameter design.
2. Balancing sensitivity in three-term PID controllers by applying the Root Locus method.
3. Adjusting and modifying system parameters to achieve the desired performance.
4. Calculating and analyzing root locus parameters to derive steady state response.

Competency 8: The student will demonstrate ability to use bode plots in the design and analysis of feedback control systems by:

1. Defining frequency response plots and their use in Feedback Control System Design.
2. Drawing Bode Plots for several types of feedback control systems.
3. Synthesizing Magnitude and Phase plots.
4. Analyzing a case study of a control system based on Bode Plots.
5. Synthesizing a Nichols chart based on the magnitude and phase plots generated by analyzing several feedback control systems.