EE 361 Introduction to control systems (Required Course)

Code and Name: EE 361 Introduction to control systems
Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:
- Automatic control system, Farid Golnaraghi, Benjamin C. Kuo, Ninth Edition, WILEY, 2013.

Other References:
- Modern Control Systems, Richard C. Dorf and Robert H. Bishop, 12th Edition
- Website of National Instruments: http://www.ni.com/en-lb.html

Course Description:
Description of introduction to control systems course : Basic components of a control system, Mathematical foundation : Complex-variable concept, Laplace transform, Transfer function, Block Diagrams, Signal-flow graphs, State-variable analysis of linear dynamic systems, stability of linear control systems, Introduction to Modelling of Mechanical systems , DC Motors in control systems, PID Controllers, Root Loci of Discrete-data control system , time-domain analysis of control systems, frequency-domain analysis of control systems.

Pre-requisites: EE232, and EE341.
Co-requisites: None.

Course Learning Outcomes:
With relation to ABET Student Outcomes (SOs: 1-7)
1. Apply Bode and Polar plots techniques to draw the frequency response of control systems. (1)
2. Identify the poles and zero's locations and transient response. (1)
3. Apply the Routh Hurwitz method to determine the stability of Control systems. (1)
4. Apply graphical techniques for modelling control systems. (1)
5. Calculate various control system's steady state errors. (1)
6. Use the Root Locus method and design a PID controller. (2)
7. Use simulation tools for modelling Continuous Control System. (6)

Topics to be covered:
- Basic components of a control system, what is feedback, and what are its effects, Types of Feedback control systems.
- Mathematical Foundation: complex variable concept, frequency Domain plots, Introduction to differential equations.
- Laplace Transform, inverse Laplace transform, solutions of Differential equations with Laplace, transfer function.
- Stability of linear control system, BIBO, relationship between Roots and stability, Methods of determining Stability, Routh-Hurwitz Criterion, Routh`s Tabulation.
- Block Diagrams and Signal-Flow Graphs of Control systems.
- Modeling of Dynamic systems.
- Time domain Analysis of control systems.
- DC motor, Root Locus Analysis, PID Controllers, Frequency Domain Analysis.

Grading Policy:
The grading for the course are 60% coursework and 40% Final Exam. The coursework consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.