**MECH 358: Automatic Control Systems (3 Credits)**

The course introduces students to the dynamic characteristics of control components and systems. Stability and response of closed-loop systems and design of control systems are also covered. Emphasis is placed on operational characteristics of components and their effect on system design. Analysis and design of Control systems for Electrical, Mechanical, and Electromechanical systems. Computer simulation of system operation using MATLAB.

(Prerequisite MECH 220, CMPE 160, and MATH 252)

**Course Learning Outcomes:**

By the end of the course, students will be able to:

A1. Acquire critical knowledge and understanding of control system components.

A2. systems Analyze and design control systems, showcasing a comprehensive understanding of the underlying principles, methodologies, and tools employed in the development and optimization of these systems.

B1. Utilize a computerized software such as MATLAB to design open and closed loop control system.

B2. Design proportional, proportional-integral, proportional-derivative, and proportional-integral-derivative feedback control systems meeting specific system performance requirements.

B3. Investigate and critically evaluate different modes of controls for single and multiple degree of freedom systems using MATALB.

**Course Learning Resources:**

* Nise, N.S. Control Systems Engineering, 8th edition, John Wiley & Sons: 2014. ISBN-13: 978-1119-47422-7.
* Modern Control Engineering, by Katsuhiko Ogata, 5th edition, Pearson Education Limited, ISBN-10 ‏ : ‎ 1292025832, ISBN-13 ‏ : ‎ 978-1292025834
* MATLAB for Control Engineers, by Ogata Katsuhiko, Financial Times Prentice Hall; 1st edition, ISBN-10 ‏ : ‎ 0136150772, ISBN-13 ‏ : ‎ 978-0136150770.

**Course Content:**

1. Fundamentals of Controls
2. Laplace/Frequency Domain
3. Modelling of Mechanical Systems.
4. Modelling of Electrical and Modelling of Electro-mechanical Systems.
5. Time Response (Second Order System Response)
6. Block Diagram Models and Block Diagram Reduction
7. Stability and Routh Hurwitz Criterion
8. Root Locus Analysis Techniques
9. Frequency Response Analysis