

## ME 3015 System Dynamics and Control (Required)

**Catalog Description:** ME 3015 System Dynamics and Control (4-0-4)  
Prerequisites: MATH 2403 Differential Equations, ME 2016 Computing Techniques, ME 2202 Dynamics of Rigid Bodies, and ECE 3710 Circuits and Electronics  
Dynamic modeling and response of systems with mechanical, hydraulic, thermal and/or electrical elements. Linear feedback control systems design and analysis in time and frequency domains.

**Textbook:** Ogata, K., System Dynamics, 4th Edition, Prentice-Hall, 2004.

### Topics:

1. Mathematical Background
2. Modeling of Mechanical Systems
3. Model Representation and Response
4. Vibration Analysis of Mechanical Systems
5. Modeling of Electrical, Hydraulic & Thermal Systems
6. Modeling of Mixed Systems
7. Basic Feedback Control Systems
8. Time Response Analysis of Linear Dynamic Systems
9. Root-Locus Technique
10. Frequency Response Analysis and Design of Feedback Systems.

### Course Outcomes:

Outcome 1: To teach students basic mathematical and computational tools for modeling and analysis of dynamic systems.

- 1.1 Students will demonstrate understanding of various mathematical models, such as transfer function and state-space, for dynamic systems.
- 1.2 Students will demonstrate the ability to simulate the transient and steady-state response of dynamic systems.

Outcome 2: To train students to identify, model, analyze, design, and simulate dynamic systems in various engineering disciplines using a unified approach.

- 2.1 Students will demonstrate that they can analyze transient, steady-state, and frequency response of linear dynamic systems.
- 2.2 Students will demonstrate an ability to mathematically model systems in various engineering disciplines including mixed systems.
- 2.3 Students will be able to design basic control compensation using time and frequency domain techniques.

**Correlation between Course Outcomes and Program Educational Outcomes:**

| ME 3015            |   |   |   |   |   |   |   |   |   |   |   |   |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|
|                    | Mechanical Engineering Program Educational Outcomes |   |   |   |   |   |   |   |   |   |   |   |
| Course Outcomes    | a   | b | c | d | e | f | g | h | i | j | k | l |
| Course Outcome 1.1 | X   |   |   |   |   |   |   |   |   |   |   |   |
| Course Outcome 1.2 |   |   |   |   |   |   |   |   |   |   | X |   |
| Course Outcome 2.1 |   |   |   |   |   |   |   |   |   |   |   | X |
| Course Outcome 2.2 |   |   |   |   | X |   |   |   |   |   |   | X |
| Course Outcome 2.3 |   |   |   |   | X |   |   |   |   |   |   | X |