Fall 2024

ME 305-001: Intro to System Dynamics

Ian Fischer

COURSE NUMBER	**ME 305**
COURSE TITLE	**Introduction to System Dynamics**
COURSE STRUCTURE	(3-0-3) (lecture hr/wk - lab hr/wk – course credits)
COURSE COORDINATOR	Z. Ji
COURSE DESCRIPTION	Principles of dynamic system modeling and response with emphasis on mechanical, electrical, and fluid systems. Application of computer simulation techniques.
PREREQUISITE(S)	Mech 236 – Dynamics ME 231 – Kinematics Math 222 – Differential Equations
COREQUISITE(S)	None
REQUIRED, ELECTIVE OR SELECTED ELECTIVE	Required
REQUIRED MATERIALS	1. Katsuhiko Ogata, System Dynamics, 4th Ed., Pearson Prentice-Hall, 2004, ISBN: 0-13-142462-9 2. Software: MATLAB
Supplemental materials (not Required)	None
COMPUTER USAGE	MATLAB software

COURSE LEARNING OUTCOMES/ EXPECTED PERFORMANCE CRITERIA:

Course Learning Outcomes	SOs*	Expected Performance Criteria
1 develop models of mechanical, electrical/electromechanical and fluid systems.	1	**Exam Question** (80% of the students will earn a grade of 70% or better on this question)
2. analyze dynamic systems through the application of the Laplace transforms, block diagrams, and transfer functions.	1	**Exam Question** (80% of the students will earn a grade of 70% or better on this question)
3. determine transient and steady state response of dynamic systems.	1	**Exam Question** (80% of the students will earn a grade of 70% or better on this question)
4. calculate frequency response and use the results for vibration isolation	1, 2	**Exam Question** (80% of the students will earn a

			grade of 70% or better on this question)
	5. perform basic calculation related to automatic controllers and system response specification.	1, 2	**Exam Question** (80% of the students will earn a grade of 70% or better on this question)
	6. use computer software (MATLAB) in analyzing dynamics systems and control systems	1	**Homework Problems** (80% of the students will earn a grade of 80% or better on these problems)

CLASS TOPICS

1. Complex Algebra, Linear Algebra, Laplace Transforms, Inverse Laplace Transforms.
2. Linear Differential Equations.
3. Modeling of Mechanical Systems.
4. Block Diagrams, Transfer Functions.
5. Electrical Systems, Electromechanical Systems.
6. Transient Response Analysis.
7. Impulse Response.
8. Analysis in Frequency Domain, Frequency Response, Vibration Isolation.
9. Feedback Control Systems and Automatic Controllers.
10. System Response Analysis and Specification.

STUDENT OUTCOMES (SCALE: 1-3)

1	2	3	4	5	6	7
3	2					

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes