

Module 1 - Introduction

ME3050 - Dynamics Modeling and Controls

May 29, 2020

Topic 1 - What is System Dynamics?

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- Welcome Back!
- Definition of *Dynamics*
- Modeling and Analysis
- Model Based Design

Welcome to New Video topics

Welcome Back!

- Things are going to be different but we will still learn!
- These new outlines should help keep me/us on track.
- The material will be organized in ~ 10 min videos, and you can watch them at anytime.

Definition of Dynamics

Dynamics is ...

system dynamics is the study of **modeling** and **analysis** of dynamical systems as a function of time.

Dynamics vs System Dynamics

Dynamics: find state of object at a _____

System Dynamics: find state of system as a _____

→ Leads to use of differential equations. $m\ddot{x} + c\dot{x} + kx = f(t)$

What is Mathematical Modeling?

A mathematical model is

- Model Simplification
- Force and Loading Analysis with FBDs
- Fundamental Laws Lead to Equations of Motion
- Newton's Second Law and Conservation of Energy

What is Analysis?

Analysis is

- Study Model to find System Response
- Time-Domain analysis: examine system response in time to various inputs and initial conditions
- Frequency-Domain analysis: examine system response when subject to sinusoidal inputs

Model Based Design

Model-Based Design (MBD) is a mathematical and visual method of addressing problems associated with designing complex control, signal processing and communication systems. It is used in many motion control, industrial equipment, aerospace, and automotive applications... [Wikipedia](#)



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