What is this class about?
How does it apply to mechanical engineering?
What areas of engineering will we cover?
Remember those math classes?
Major Topic Covered

Module 1 - Introduction

ME3001 - Mechanical Engineering Analysis

Mechanical Engineering

Tennessee Technological University

Topic 1 - What is Analysis

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Topic 1 - **What is Analysis**

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What is this class about?

Define *Analysis*:
- detailed examination of the elements or structure of something, typically as a basis for discussion or interpretation.

- Analysis

- Design

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How does it apply to mechanical engineering?

This is not just another math class!

- we will study mathematical modeling of engineering systems and the theoretical and numerical solutions to non-linear equations, systems of linear equations, and ordinary and partial differential equations
- mathematical methods for solving mechanical engineering problems with modern computing tools
- we can solve the BIG problems!

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What areas of engineering will we cover?

- Statics and Mechanics
- Rigid Body Dynamics
- Fluid Dynamics
- Thermodynamics and Heat Transfer
- Vibrations

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We will be doing some *applied mathematics* in this class!

- Algebra and Arithmetic
- Matrix/Linear Algebra
- Calculus

- Ordinary and Partial Differential Equations
- The Fourier Series

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This class is different than a traditional mathematics class.

- By nature engineering problems are hard to solve on paper.
- So, will be using calculators but we will also be using...
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Modern Computing Tools

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1. Mathematical Modeling

2. Solutions to Non-Linear Equations

3. Solving Systems of Linear Equations

4. Numerical Integration and Curve Fitting

5. Ordinary Differential Equations

6. Partial Differential Equations

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1) Mathematical Modeling
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2) Solutions to Non-Linear Equations

- Rigid Body Dynamics
- Optimization and Design

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3) Solving Systems of Linear Equations

- Statics and Structural
- Equilibrium Equations

- The Eigenvalue Problem
- Mechanisms and Machines

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4) Numerical Integration and Curve Fitting

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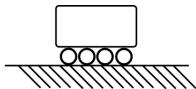What areas of engineering will we cover?
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5) Ordinary Differential Equations

- What is a Differential Equations? What about a system of them?

- What does it mean to solve a differential equation?

- A very simple example:

  ODE:

  Solution:

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6) Partial Differential Equations

- What is different about a Partial Differential Equation?

- What is different about the solution to a PDE?

- What does this allow us to do?