Module 1 - Introduction

ME3001 - Mechanical Engineering Analysis

Mechanical Engineering

Tennessee Technological University

Topic 1 - What is Analysis

Topic 1 - What is Analysis

- 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

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

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!

What areas of engineering will we cover?

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

Remember those math classes?

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

Remember those math classes?

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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Major Topic Covered

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

Major Topic Covered

1) Mathematical Modeling

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Major Topic Covered

2) Solutions to Non-Linear Equations

- Rigid Body Dynamics
- Optimization and Design

Major Topic Covered

3) Solving Systems of Linear Equations

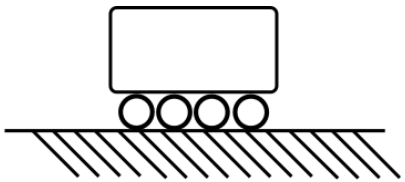
- Statics and Structural
- Equilibrium Equations
- The Eigenvalue Problem
- Mechanisms and Machines

Major Topic Covered

4) Numerical Integration and Curve Fitting

Major Topic Covered

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:

Major Topic Covered

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?