



ENGINEERING MECHANICS - STATICS AND DYNAMICS

PROF. ANUBHAB ROY

Department of Applied Mechanics
IIT Madras

INTENDED AUDIENCE : Interested Learners

COURSE OUTLINE : Static and dynamical mechanical systems are the heart of all engineering today. The static systems range from bridges, load bearing members of roofs to fasteners and bolts. Dynamical systems are also ubiquitous in the form of machines which convert electrical energy to mechanical energy. Understanding the equations governing these static and dynamical systems is at the heart of this course. During this course, we will touch upon the theoretical tools that we have available to us in order to be able to analyse these systems. The world around us is full of engineered systems, such as machines, automobiles, bridges and buildings. The objective of this course is to present the basic principles of dynamics and help develop proficiency in applying these principles to formulate and solve dynamics problems. We will also study applications of dynamics concepts to modeling engineered machines.

ABOUT INSTRUCTOR :

Prof. Anubhab Roy, IIT Madras

COURSE PLAN :

Week 1:

Introduction to the course
Newton's laws
Equilibrium

Week 2:

Example 1 - Statics
Example 2 - Rigid Body Systems
Example 3 - Rigid Body Systems

Week 3:

Structural Systems with rigid bodies
Types of 1-D Structural Elements
Axial members

Week 4:

Analysis of the truss system
Stability of Structural systems
Beams - Example 1

Week 5:

Beams - BMD and SFD
Beams - Loading, Shear and Bending Moment Relations
Static Friction

Week 6:

Friction - Solving Problems
Particle Kinematics - 1
Particle Kinematics - 2 (Example)

Week 7:

Particle Kinematics - Curvilinear Coordinates
Rigid Body Kinematics
Rotational Motion (Example 1)

Week 8:

Rotational Motion (Example 2)
Dynamics (Introduction)
Dynamics -Example 1

Week 9:

Dynamics -Example 2
Dynamics -Example 3
Dynamics -Example 4

Week 10:

Center of Percussion - Example
Impulse/Momentum - Example 1
Impulse/Momentum - Example 2

Week 11:

Impulse/Momentum - Example 3
Impulse/Momentum - Example 4
Work Energy Methods - Example 1

Week 12:

Work Energy Methods - Example 2
Work Energy Methods - Example 3