Lecture 1

APL104

Note Title 8/3/2022

Solid Mechanics

Instructors: Prof. Ajeet Kumar, Prof. Rajdip Nayek

TAs:

Course website:

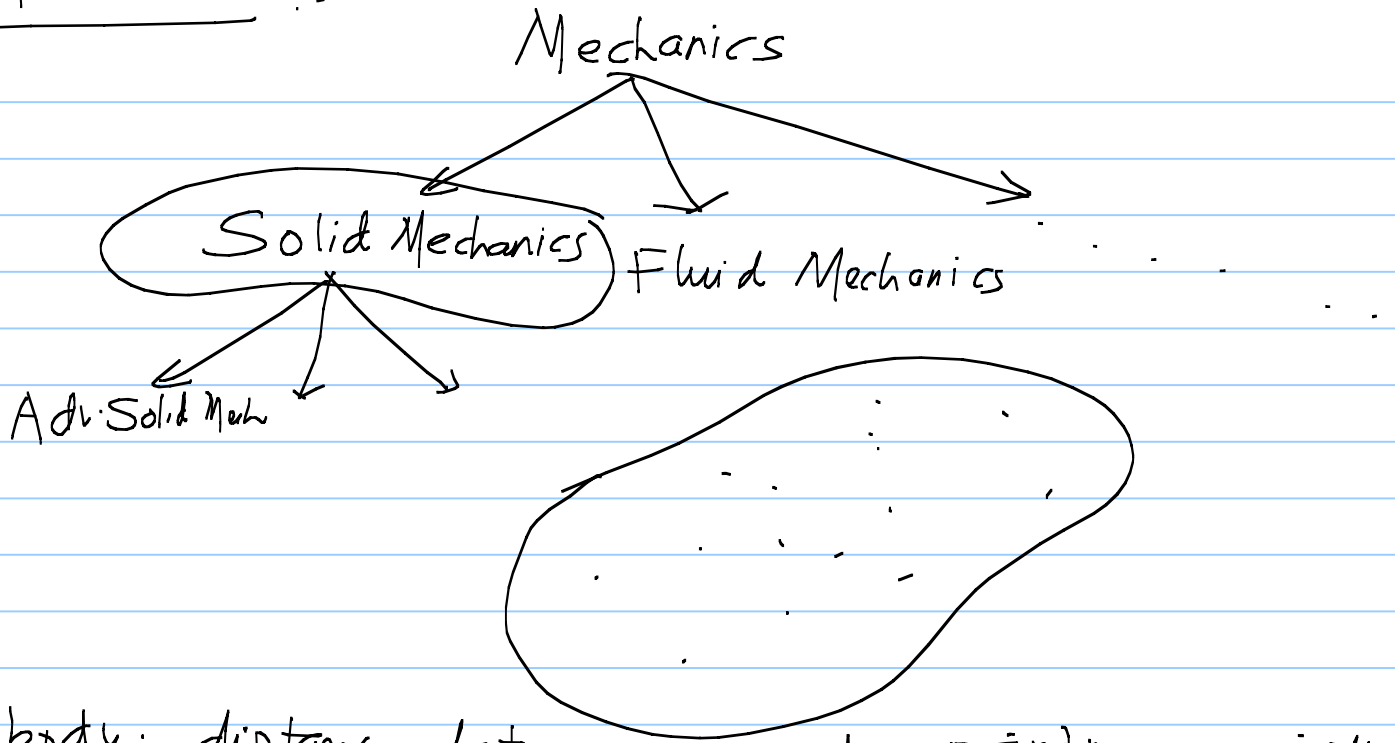
Minor - 30%
Major - 40%
2 quizzes: 10×2
Attendance: 10% (>80%)

Reference book

- Advanced Mechanics of Solids (LS Srinath)
- Strength of Materials (Timoshenko) → Father of Solid Mech.

→ If it is not more than 80%, you will fail

Solid Mechanics :



rigid body: distance between any two points remain the same!

Mathematical preliminaries

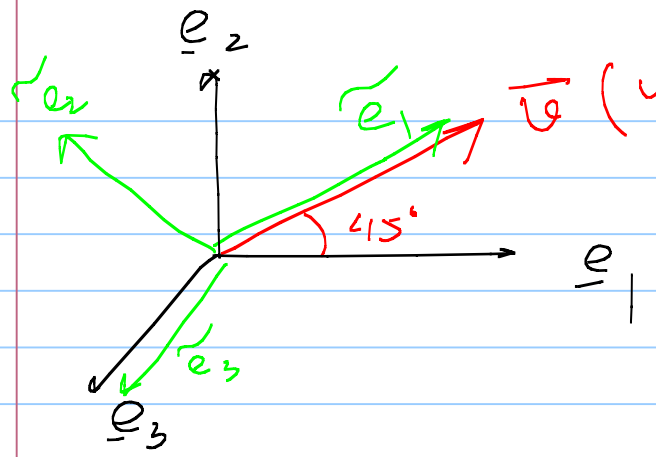
Vectors: A vector has magnitude and direction

$$\vec{v} = (\vec{v} \cdot \hat{e}_1)\,\hat{e}_1 + (\vec{v} \cdot \hat{e}_2)\,\hat{e}_2 + (\vec{v} \cdot \hat{e}_3)\,\hat{e}_3$$

v_1 v_2 v_3

$$\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix}$$

→ A vector is independent of the coordinate system whereas its components (its column form) are dependent on the coordinate system.



$\vec{v}$ (unit vector) lying in $\underline{e}_1$-$\underline{e}_2$ plane

$$\left[\vec{v}\right]_{(\underline{e}_1 - \underline{e}_2 - \underline{e}_3)} = \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \\ 0 \end{bmatrix}$$

$$\left[\vec{v}\right]_{(\tilde{e}_1 - \tilde{e}_2 - \tilde{e}_3)} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$