MECHANICS OF MATERIALS

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IIT Madras

TYPE OF COURSE : Rerun | Core | UG
COURSE DURATION : 12 weeks (26 Jul’ 21 - 15 Oct’ 21)
EXAM DATE : 23 Oct 2021

PRE-REQUISITES : Engineering Mechanics, Basic Calculus

INTENDED AUDIENCE : Any Interested learners

COURSE OUTLINE :
This first course in mechanics of deformable bodies introduces the four concepts – Force, stress, strain, displacement – and the four equations that connect them, namely equilibrium equations, constitutive relation, compatibility condition and strain displacement relation. Systematic procedure to solve problems of engineering interest is outlined. In particular, force and displacement relation of structural elements subjected to uniaxial stress, bending, twisting and inflation is studied. Estimation of possible modes of failure of these structural elements and the failure load is outlined.

ABOUT INSTRUCTOR :
Saravanan U is a professor in the department of civil engineering at IIT Madras. He regularly teaches this mechanics of materials course to undergraduate students in their third semester. He has authored a NPTEL web course on advanced solid mechanics. He is passionate about students learning solid mechanics in the correct way. His research focus is on the foundations of continuum mechanics and its applications. He is the recipient of young faculty recognition award (2017) from IIT Madras and Mathematics research impact centric award (2018) from Science and Engineering Research Board.

COURSE PLAN :
Week 1: Mathematical Preliminaries
Week 2: Concept of Force, Displacement and stress
Week 3: Transformation of stress and equilibrium equation
Week 4: Concept of strain
Week 5: Governing equations in mechanics
Week 6: Displacement due to uniaxial loading, temperature and bending
Week 7: Stresses and deflection in homogeneous beams loaded about one principal axis
Week 8: Stresses and deflection in beams loaded about principal axis
Week 9: Stresses and deflection in beams not loaded about principal axis
Week 10: Stresses and displacement due to torsion
Week 11: Pressure vessels and Failure criteria
Week 12: Buckling