Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2023-2024
Course Handout Part II

Date: 11-08-2023

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : CE F211
Course Title : Mechanics of Solids

Instructor-in-Charge : RAGHU PISKA

1. Course Description:

Fundamental principles of mechanics; Introduction to the mechanics of deformable bodies; Thermal stresses, equilibrium of forces, analysis of determinate trusses, bending moment and shear force diagrams for determinate beams and frames, flexural and shear stresses in beams, combined stresses, stresses and strains on inclined planes, Introduction to energy methods, stresses in thin cylindrical shells, suspension cables, Forces and Moments transmitted by slender members; Stress- Strain; Stress-Strain Temperature relations; Torsion; stresses and deflections due to bending; Failure theories, Buckling of columns using Euler's Theory.

2. Scope and Objective of the Course:

Mechanics of solids deals with study of the mechanical behavior of structural and machine elements. The methods are based on Laws of Newtonian mechanics, applied to bodies in static equilibrium. The mechanical study of materials gives insights for the efficient design of different structural elements.

At the end of the course the student will be in a position to design and analyze simple structural elements such as truss element, beam, which involve calculation of stress, strain and deformation.

3. Text Books:

1. Mechanics of materials by R.C. Hibbeler, 10th edition, Pearson publication

4. Reference Books:

1. Engineering Mechanics of Solids, Egor P. Popov, 2nd Edition, 1998, PHI, India.
2.Mechanics of Materials; F. P. Beer, E. R. Johnston, J. T. DeWolf and D. F. Mazurek, Fifth Edition, 2011, McGraw-Hill Education Pvt. Ltd., India.
3. Mechanics of Materials, James M. Gere, 6th Edition, 2006, Thomson Books/Cole, USA.

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Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1-3	Introduction, principles of mechanics, concept of force & moment, equilibrium conditions, concept of two & three force members, free body diagram, concept of stress and strain	Ch. 1-3 (TB)	Fundamental principles of mechanics
4-6	Numerical problems	Ch.1-3 (TB)	Fundamental principles of mechanics

Module No.	Lecture Session	Reference	Learning outcomes
7-10	Analysis of deformable bodies, uniaxial loading & deformation, statically determinate truss, thermal stress	Ch. 4 (TB)	Introduction to mechanics of deformable bodies
11-12	Numerical problems	Ch.4 (TB)	Introduction to mechanics of deformable bodies
12-14	Bending moment and shear forces in beams and frames	Ch. 6 (TB)	Forces & moments transmitted by slender members
14-15	Differential equilibrium approach, Singularity functions	Ch. 6 (TB)	Forces & moments transmitted by slender members
16-17	Numerical problems	Ch.6 (TB)	Forces & moments transmitted by slender members
18-20	Flexural and shear stresses in beams	Ch. 6 (TB)	Types of stresses in beams
21-23	Analysis of deformations, strain components, relation between strain & displacement, strain component associated with arbitrary set of axis, Mohr circle representation of plane strain, general state of strain, Mohr circle	Ch. 9-10 (TB)	Stress & Strain
24-26	Numerical problems	Ch.9-10 (TB)	Stress & Strain
26-28	Thermal strain, complete equations of	Ch. 4	Stress-Strain-Temperature relations

	elasticity, strain energy in a elastic body, criteria of initial yielding and numerical problems	(TB)	
29	Numerical problems	Ch.4 (TB)	Stress-Strain-Temperature relations
30-31	Introduction, geometry of deformation of a twisted circular shaft, stress strain relations, equilibrium requirements, stresses & deformations in twisted elastic circular shaft, torsion of elastic hollow circular shaft, combined stresses	Ch.5 (TB)	Torsion
32	Numerical problems	Ch.5 (TB)	Torsion
33-36	Slope and deflection calculation in beams due to bending and energy methods	Ch.12	Deflections due to bending
37	Numerical problems	Ch. 12	Deflections due to bending
38-39	Stresses in thin cylindrical shells and suspension cables	Ch. 8 (TB)	Analysis of cylindrical shells
40-42	Failure theories and buckling of columns	Ch. 13 (TB)	Buckling of columns and failure theories

6. Evaluation Scheme:

Sl. No.	Evaluation Component	Duration	Weightage	Date, Time &Venue	Nature of Component
1.	Mid-semester	1.5 hrs	30%	14/10 - 2.00 - 3.30PM	CB
2.	Assignments (including class assignments)	—	10%		—
3	Surprise quizzes		15%		OB
3.	Compre. Exam.	3 hrs	45%	21/12 FN	OB

7. Chamber Consultation Hour: Monday, Tuesday and Friday 4:30 PM

8. Notices: Notice, if any, concerning the course will be displayed on the Google classroom.

9. Make-up Policy: Make-up will be granted only to genuine cases. For cases related to illness, proper documentary evidence is essential. **Prior permission** is necessary for all makeup requests. **No make up for tutorial tests.**

10. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
Course No. CE F211