BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus

INSTRUCTION DIVISION
FIRST SEMESTER 2015-16
<u>**Course Handout (Part II)**</u>

Date: 03/08/2015

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.	**: ME F211**
Course Name	**: Mechanics of Solids**
Instructor-in-charge	**: Murali Palla**
Tutorial Instructor	: Jitender S. Rathore, Sharad Shrivastava, Tufan C. Bera.

1. Course Description:

Fundamental principles of mechanics; Introduction to the mechanics of deformable bodies; Forces and Moments transmitted by slender members; Stress- Strain; Stress-Strain Temperature relations; Torsion; stresses and deflections due to bending; Stability of equilibrium; Static failure criteria, ductile and brittle material; Dynamic failure criteria.

2. Scope and Objective:

The subject of mechanics of solids deals with determination of strength, deformation and stability of structural and machine elements. The methods are based on Laws of Newtonian mechanics applied to bodies in static equilibrium. These laws are applied to simple situations with engineering judgment to arrive at results of significance to the designer.

At the end of the course the student will be in a position to design and analyze simple structural elements, which involve calculation of stress, strain and deformation. This is an essential feature in any design process.

3. Text Book:

1. Crandall, Dahl and Lardner, An Introduction to Mechanics of Solids, McGraw-Hill International edition, 1978.

4. Reference Books:

1. Mechanics of Materials, Gere and Timshenko. Latest Edition.
2. Mechanics of Materials; F. P. Beer, E. R. Johnston and J. T. DeWolf, Third Edition, 2002, McGraw-Hill International Edition.
3. Introduction to Solid Mechanics by I. H. Shames, 2nd Edition, 1980, Prentice Hall of India Private Ltd. New Delhi.
4. Engineering Mechanics of Solids by E. P. Popov, 2nd Edition, PHI, New Delhi.

5. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./Sec. # (Book)
1-3	Fundamental principles of mechanics	Introduction, principles of mechanics, concept of force & moment, equilibrium conditions, concept of two & three force members, free body diagram, friction, trusses	Ch. 1 (TB)
4-9	Introduction to mechanics of deformable bodies	Analysis of deformable bodies, uniaxial loading & deformation, statically determinate truss, hoop stresses in thin cylindrical shells, Castigliano's theorem.	Ch. 2 (TB)
10-14	Forces & moments transmitted by slender members	Introduction forces & moments acting on a section of a member, distributed loads & resultant of distributed loads, Differential equilibrium approach, Singularity functions	Ch. 3 (TB)
15-20	Stress & Strain	Introduction, stress, plane stress, equilibrium of an element in plane stress, Mohr circle representation of a plane stress, general state of stress. 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	Ch. 4 (TB)
21-25	Stress-Strain-Temperature relations	Introduction, tensile test, idealization of stress strain curve, elastic stress strain relation, Thermal strain, complete equations of elasticity, strain energy in a elastic body, criteria of initial yielding	Ch. 5 (TB)
26-30	Torsion	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, strain energy due to torsion, yielding in torsion & Numerical	Ch.6 (TB)
31-34	Stresses due to bending	Introduction, deformation in pure bending, stress-strain relations, equilibrium requirements, stresses & deformations in pure bending. Stresses due to shear force and bending moment, combined stresses, strain energy due to bending, yielding in bending	Ch. 7 (TB)

35-38	Deflections due to bending	Introduction, moment-curvature-relations, integration of moment-curvature relations, superposition Load-deflection differential equation,Energy Methods, Numerical problems	Ch. 8 (TB)
39-41	Stability of equilibrium buckling	Introduction, elastic stability, examples of instability, elastic stability of flexible columns	Ch. 9 (TB)

6. Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage	Date, Time &Venue	Nature of Component
1.	Mid sem. Exam.	1.5 Hrs	35%	**7/10 2:00 - 3:30 PM**	CB
2	Tutorial	--	20%		OB
3.	Compre. Exam.	3 Hrs	45%	**7/12 FN**	CB+OB

7. **Tutorial :** Will be announced in the class.
8. **Chamber Consultation Hour:** Will be announced by instructors individually in the class.
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 if student is out of station on the test date. **No make-up for tutorial tests.**
10. **Notices:** Notice, if any, concerning the course will be displayed on the Notice Board of Mechanical Engineering Department.

Instructor-in-charge
ME F211/ MF F211/ ES C 221