BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
SECOND SEMESTER 2021-2022
Course Handout Part II

Date:16/01/2023

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. : **ME F218**
Course Title : **Advanced Mechanics of Solids**
Instructor-in-charge : Dr. Brajesh Kumar Panigrahi
Bulletin wise contents: 3D stress, strain, and generalized Hooke's law, energy methods, torsion of noncircular members, shear center and asymmetrical bending, curved beams, and thick cylinders.;

1. Scope and Objective of the Course:

The course deals with analysis of some advanced topics in Mechanics of Solids, beyond what is covered in the basic course of Mechanics of Solids ME F 211.

2. Course Description:

The course work starts with **Generalized Hooke's law** and **Three Dimensional Stress Strain Relations**. Then a detailed discussion of energy methods for solving **indeterminate problems** is included. Theory related to **non-circular** members subjected to **torsion** is treated. Theories of **Asymmetrical Bending**, **Shear Centre**, **Curved Beams** and **Thick Cylinders** are dealt with in later chapters.

3. **Text books:**

T1: "Advanced Mechanics of Materials" - Arthur P., Boresi and R.J. Schmidt, John Wiley, 6th Edition, 2003.

Reference books:

R1: "Advanced Mechanics& Solids" - L.S. Srinath, Tata McGraw-Hill Publishing Co. 2nd Edition, 2003
R2: "Advanced Mechanics of Solids" – Otto T. Bruhns, Springer Verlag, 2003
R3: "Advanced Mechanics of Materials" – R. Davis Cook and Warren C. Young, Prentice Hall 2nd Edition, 1998.

4. **Course Plan**

Lect. No.	*Learning Objectives*	*Topics to be Coursed*	*Chap/Sec*
1	Review of elementary Mechanics of Materials and methods of analysis, failure analysis & properties of material	Introduction & review of elementary mechanics of solids	CH1(TB)
2 to 5	Three dimensional stress strain relations and tensor representation. Generalized Hooke's law. Hook's law for Anisotropic elasticity, Isotropic elasticity and Orthotropic materials	Theories of stress strain & Generalized Hooke's Law	CH2 (TB) & CH3 (TB)
6 to 9	Principle of potential energy, Castigliano's theorem, Deflections in statically determinate structures and statically indeterminate structures, applications to curved beam treated as straight beams.	Energy methods and applications	CH5 (TB)
10 to 15	Torsion of Prismatic bar of circular cross section,	Non-circular	CH6 (TB)

Lect. No.	*Learning Objectives*	*Topics to be Coursed*	*Chap/Sec*
	Example problems, Saint-Venant'sSeminiverse method, Linear Elastic solutions, Torsion of Rectangular cross section members, hollow thin wall torsion members, Numerical solution of torsion problems	members subjected to torsion	
16 to 19	Non-symmetrical loading bending and deflection of straight beams. Deflections in standard channel sections	Asymmetrical bending	CH7 (TB)
20 to 24	Shear in Thin walled beams, Shear flow in thin-walled beam cross sections,Shear center for channel sections and Shear center for composite beams.	Shear Centre	CH8 (TB)
25 to 28	Location of neutral axis, radial stress, correction of circumferential stress and deflections of curved beams. Curved beams of standard sections: I & T. Analysis of statically indeterminate curved beams (closed ring) and thick cylinders	Curved beams & Thick walled cylinders	CH9 (TB) & CH11(TB)

5. Evaluation Scheme:

EC No	Evaluation Component	Duration (min.)	Weightage (%)	Date & time	Nature of component
1	Midsemester Exam	90	30	17/03 2.00 - 3.30PM	**CB**
2	Tutorials		15	Throughout the semester	**OB**
3	Quiz		15	Will be conducted by IC during anytime in the class/tutorial hours	**OB**
4	Comprehensive Exam	180	40	18/05 FN	**CB**

6. Consultation Hour: To be announced in the class.

7. Notices: All the notices will be displayed in CMS. Besides this, students are advised to visit regularly **CMS** (institute's web based course management system) for latest updates.

8. Make-up policy: Make-up shall be given only to the genuine cases with prior intimation. No makeup is allowed for tutorials and quiz.

9. 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
ME F218