BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout Part II

Date:01/08/2016

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 F312**
Course Title : **Advanced Mechanics of Solids**
Instructor-in-charge : Dr.G.R.Sabareesh
Instructor : Dr.G.R.Sabareesh, Mr.KarthikTeja

Bulletin wise contents: Generalized Hooke's law; Energy methods; Torsionof non-circular members; Shear center and Asymmetrical bending; Curved beams; Thick cylinders; Plates and shells; Contact stress.

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 SolidsME 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. A chapter with a brief study on **Contact Stress**is also included.

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&2	Review of elementary Mechanics of Materials and methods of analysis, failure analysis & properties of material	Introduction & review of elementary mechanics of solids	CH1(TB)
3 to 6	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)
7 to 10	Principle of potential energy, Castigliano's theorem, Deflections in statically determinate structures and statically indeterminate structures, applications to curved	Energy methods and applications	CH5 (TB)

Lect. No.	*Learning Objectives*	*Topics to be Coursed*	*Chap/Sec*
	beam treated as straight beams.		
11 to 16	Torsion of Prismatic bar of circular cross section, Example problems, Saint-Venant's Seminiverse method, Linear Elastic solutions, Torsion of Rectangular cross section members, hollow thin wall torsion members, Numerical solution of torsion problems	Non-circular members subjected to torsion	CH6 (TB)
17 to 20	Non-symmetrical loading bending and deflection of straight beams. Deflections in standard channel sections	Asymmetrical bending	CH7 (TB)
21 to 25	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)
26 to 32	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).	Curved beams	CH9 (TB)
33 to 38	Stress – Stain – Temperature relation for thick walled cylinders and composite cylinders. Analysis of open and closed cylinders	Thick walled cylinders	CH11(TB)
39 to 42	Geometry of contact surface, methods of computing contact stress, deflection of bodies in point contact and line contact with normal load.	Contact stress	CH17(TB)

5. Evaluation Scheme:

EC No	Evaluation Component	Duration (min.)	Weightage (%)	Date & time	Nature of component
1	Test - 1	60	15	8/9, 8.30-9.30 AM	**CB**
2	Test - 2	60	15	25/10, 8.30-9.30 AM	**CB**
3	*Tutorial tests	10	15	Tutorial hour as announced in Timetable**(CB)**	
4	Home Assignments/Term paper		20		**OB**
5	Comprehensive Exam	180	35	12/12 AN	**CB**

* **Surprise tutorial** tests of 10 minutes duration each will be conducted during the tutorials or regular classes and these will be evaluated for ten marks each.

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

7. Notices: All the notices will be displayed in CMS or Mechanical Engineering notice board only. 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 tutorial surprise tests.

Dr.G.R.Sabareesh

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