Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020

Course Handout Part II

01-08-2019

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 : **PAVAN KUMAR P**

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

1. **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.

2. **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.

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

4. **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.

5. **Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
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)
3-9	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)
10-15	Principle of potential energy, Castigliano's theorem, Deflections in statically determinate	Energy methods and applications	CH5 (TB)

	structures and statically indeterminate structures, applications to curved beam treated as straight beams.		
16-21	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	Non-circular members subjected to torsion	CH6 (TB)
21-23	Non-symmetrical loading bending and deflection of straight beams. Deflections in standard channel sections	Asymmetrical bending	CH7 (TB)
24-27	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 Center	CH78 (TB)
28-32	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)
33-35	Stress – Stain – Temperature relation for thick walled cylinders and composite cylinders. Analysis of open and closed cylinders	Thick walled cylinders	CH11(TB)
36-38	Stress resultants, strain-displacement relations in flat plates and shells	Plates and shells	CH13(TB)
39-42	Geometry of contact surface, methods of computing contact stress, deflection of bodies in point contact and line contact with normal load.	Contact stresses	CH13(TB)

6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid semester test	90 min	25%	3/10, 1.30 -- 3.00 PM	Closed book
*Tutorial tests	1 hr	20%		Open book
Home Assignments/Term paper/Quiz	-	10%		Open book
Comprehensive Examination	3 hrs	45%	10/12 FN	Closed book

* **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. 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.

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.

Dr. Pavan Kumar P
ME F312