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**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.

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

1. **Course Plan:**

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| **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 structures and statically indeterminate structures, applications to curved beam treated as straight beams. | Energy methods and applications | CH5 (TB) |
| 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) |

1. **Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| **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**