



INSTRUCTION DIVISION
FIRST SEMESTER 2016-17
Course Handout (Part II)

Date: 02/08/2016

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 G641
Course Title : Theory of Elasticity & Plasticity
Instructor-in-Charge : J S RATHORE

1. Course Description: The course has wide ranging application in Civil Engineering structures, Machine tool structures, metal forming, and cold working. The studies deal with the determination of stresses and displacements in common structural forms- plates, beams, shells etc. subjected to external forces. The course covers basic theory of elasticity, 2-D and 3-d problems of elasticity, Theories of plastic flow, Flow of ideally plastic and strain hardening metals, and theory of metal forming processes.

2. Scope & Objective: The course is for higher degree students to prepare them in applying the theory on some problems of practical and design interest. The students will be able to appreciate underlying meaning of material and structural behavior under complex loading conditions. Students are also encouraged to do assignments using the ANSYS/ABAQUS package to solve problems of elasticity and plasticity to compare the analytical solutions.

3. Text Books:

T1 Timoshenko S. P. & Goodier J. N., *Theory of Elasticity*, 3rd Edition, Mc-Graw Hill, 1982.

T2 J. Chakrabarty, *Theory of Plasticity*, Mc-Graw Hill Book Company, Singapore, 1987.

4. Reference Books:

R1 M. Filonenko-Borodich, *Theory of Elasticity*, Foreign Language Publishing House, Moscow.

R2 PDS Varma, *Theory of Elasticity*, Vikas Publishing House Private Limited, New Delhi, 1997.

R3 Alexander Mendelson *Plasticity-Theory & application*, The Macmillan Company, New York, 1968.

5. Course Plan:

Lec. No. (s)	Learning Objectives	Topics to be covered	Reference * Chap./Sec. # (Book)
1-2	Introduction to Theory of Elasticity & Plasticity	Plane strain and Plane stress of theory of elasticity, Plasticity, Methods of analysis	Ch 1-2 T1
2-13	2-D elasticity	Bending of beams, application of Fourier series.	Ch 3 T1





Lec. No. (s)	Learning Objectives	Topics to be covered	Reference * Chap./Sec. # (Book)
	problems in Rectangular coordinates		
14-21	2-D elasticity problems in Polar Coordinates	General Equation, Pure bending, Rotating Disk, Edge dislocation, Effect of circular hole	Ch 4 T1
22-24	3-D elasticity Problems	Principal stresses, Stress invariants, Homogeneous deformation, strain at a point	Ch 7 T1
25-30	Torsion problems of elasticity	Torsion in straight bars of any cross section, Elliptic cross section, other solutions, Membrane analogy, Narrow rectangular cross section, General solution, torsion of rolled profiles, hollow shafts, thin tubes, screw dislocations	Ch 9 T1
31-34	Physics of Plasticity	Constitutive relations, Problems contained plastic deformation, True stress-strain curve, strain rate effects, idealization, Yield criteria, plastic stress-strain relations	Ch 2-5 of T2, R3
35-40	Steady state problems in plane strain	Symmetrical extrusion, Unsymmetrical extrusion, multi-hole extrusion, Sheet drawing, Cold rolling, mechanics of hot rolling	Ch 7 and 8 R3

6. Evaluation Scheme:

Evaluation Component	Duration (Min)	Weightage (%)	Date & Time	Remarks
Mid-sem	90	25	5/10 4:00 - 5:30 PM	CB
Seminar	--	15		OB
Project	--	20		OB
Compre. Exam	180	40	7/12 AN	OB+CB

- Chamber Consultation Hour:** Room No. 2202-C. Time will be announced later on.
- Notices:** will be displayed in Mechanical engineering notice board only.
- 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.

Instructor-in-charge
ME G641

