

LESSON PLAN

B.Tech Civil Engineering-III Semester July -2015

Course Code	CE1004
Course Title	MECHANICS OF SOLIDS
Prerequisites	NIL
Category	P- STRUCTURAL ENGINEERING

Instructional objectives

Instructional objectives no.	Instructional objectives
1	Resolution of forces and to comprehend free body diagrams; determination of stresses and strains.
2	To analyse the state of stress (two and three dimensional) and evaluate the principal stresses and principal planes by analytical and graphical treatment.
3	Determination of centre of gravity for plane areas and solids; determination of the moment of inertia of plane areas and mass moment of area of solids.
4	To study the behaviour of determinate beams and examine the internal forces, stresses induced and learn the theory of torsion and stresses developed in solid, hollow shafts and helical springs.
5	To analyse and determine the internal forces in pin jointed plane trusses by various methods.

Student outcomes

Student outcome number	Student outcomes
(a)	An ability to apply knowledge of mathematics, science, and engineering
(e)	An ability to identify, formulate, and solve engineering problems
(k)	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Lecture No	Topic covered	Instructional objectives	Student outcome	Reference
1, 2	Introduction – concept of force characteristics of scalar and vector-concurrent forces – non concurrent forces and parallel forces – coplanar forces – triangular law of forces – equilibrium of particles	1	a,e,k	1,5,6
3, 4	Rigid body and deformable solids – external and internal forces – transmissibility of forces – moment of couple – Varignon's theorem – free body diagram	1	a,e,k	1,5,6
5,6	Resultant of force system – problem - equilibrium conditions – beams with different end conditions, finding reactions – principle of virtual work, equivalent force system	1	a,e,k	1,2,3,4,5
7,8	Shear stress – lateral strain – Poisson's ratio – problems on finding E, dl area etc and analysis cross section of varying along length etc – change in length of tapering section, Factor of safety and problems	1	a,e,k	1,2,3,4
9,10	Change in length of rectangular tapering bar and problems – principles of super position – Compound bars	1	a,e,k	1,2,3,4
11,12	Relation between elastic constants and connected problem	1	a,e,k	1,2,3,4
13,14	Composite sections and their load carrying capacity problems	1	a,e,k	1,2,3,4
15	Temperature stress and thermal stress problems	1	a,e,k	1,2,3,4
16,17	Areas and volumes – theorem of Pappus and Guldinus – centroid of various sections	3	a,e,k	1,5
18,19,20,21	Radius of gyration – parallel axis and perpendicular axis theorem – moment of inertia of various sections.	3	a,e,k	1,3,4,5
22,23	Mass moment of inertia of thin plates and simple solids	3	a,e,k	1,3,4,5
24,25	problems	3	a,e,k	1,3,4,5
26,27	Beams – types of supports – types of load – shear force and bending	4	a,e,k	1,2,3,4

	moment in beams			
28,29	Cantilevers, simply supported and over hanging beams with different types of loading	4	a,e,k	1,2,3,4
30,31	Relationship between bending moment and shear force – theory of simple bending	4	a,e,k	1,2,3,4
32,33,34,35	Bending stress and shear stress distribution for various cross sections – analysis of stresses – load carrying capacity.	4	a,e,k	1,2,3,4
36,37	Proportioning of sections – shear flow – beams of uniform strength	4	a,e,k	1,2,3,4
38,39,40	Theory of pure torsion – stress and deformation in circular solid and hallow shafts – power transmitted by shafts - stresses in helical springs – deflection of springs	4	a,e,k	1,2,3,4
41,42,43	Analysis of state of stress – two dimensional – stresses on inclined planes – combined stresses	2	a,e,k	1,3,4
44,45	Principle stresses and principal planes - Mohr' s circle of stress	2	a,e,k	1,3,4
46,47,48	Analysis of statically determinate plane trusses – stability and equilibrium of frames – types of trusses	5	a,e,k	1,3,4
49,50,51,52	Frames – perfect, imperfect redundant frames – analysis of forces in truss members	5	a,e,k	1,3,4
53,54,55	Method of joints – method of sections – tension co- efficient method – graphical method	5	a,e,k	1,3,4
56,57,58	State of stress in three dimensions spherical and deviatric components of stress tensors	2	a,e,k	7,8
59,60	Determination of principle stress and principle planes – Mohr's circle of stresses	2	a,e,k	7,8

TEXT BOOKS

1. Punmia.B.C, Ashok Kumar Jain, Arun Kumar Jain, “Mechanics of Materials”, Laxmi Publications (P) Ltd., 2003.
2. Timoshenko.S.P and Gere.J.M, “Mechanics of Materials”, A&C, Black 2 Ed. 1990.

REFERENCE BOOKS

3. Rajput .R. K, “Strength of Materials: Mechanics of Solids”, Edition 4, S. Chand Limited, New Delhi, 2007.
4. Ramamrutham .S, Narayan .R, “Strength Of Material”s, Dhanpat Rai Publishing Company (P) Limited, 2008.
5. Rajasekaran .S,” Engineering Mechanics : Statics And Dynamics”, 3E, Vikas Publishing House Pvt Limited, 2009.
6. Beer and Johnson, “Mechanics for Engineers, Statics and Dynamics”, Mc Graw Hill Book Company, 1987
7. Chandramouli .P.N, “Continuum Mechanics”, Yes Dee Publishing pvt ltd Chennai, 2014.
8. Srinath.L.N., Advanced Mechanics of Solids, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1994.

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