

ME2113 – Advanced Strength of Materials – December 2013 to April 2014 Session Plan

Session No.	TITLE/DETAILS OF CHAPTER	REFERENCES
Stess-Strain-Plane Stress-Plane strain etc		
1	Introduction – course overview & review of material from basic course – equilibrium, compatibility, force-deformation, Stress at a point – Definition, notation, related properties	T1 pages 1-6, R1 2.1, T1 1.1, 1.2, 1.3
2	Plane Stress – coordinate transformation, principal stresses, maximum shear stress, associated directions	T1 1.3, 1.4, Notes
3	Plane stress – contd – analytical method – sample problems	T1 1.4 contd, Notes
4	Plane stress – Mohr's circle for plane stress problems, Strain – Definition, normal and shear strain, coordinate transformation	T1 1.4 contd, T1 1.6, 1.7, Notes
5	Strain – determination of principal strains	T1 1.7 Contd, Notes
6	Equilibrium (in differential form), compatibility, stress-strain relations, generalized Hooke's law	T1 1.5, 1.9, 2.3, 2.4, Notes
7	St. Venant's principle, Airy's stress function (Intro)	Notes
8	Airy's stress function – background, application	Notes
9	Review/Buffer	
Unsymmetrical bending of beams		
10	Bending of beams – review	R1 7.1-7.5
11	Unsymmetrical bending – definition, moment of inertia (second moment of area), product moment of inertia, principal moments of inertia	T1 6.1, 6.2
12	Principal moments of inertia – sample problems	
13	Unsymmetrical bending – determination of stresses in beams	T1 6.2
14	Unsymmetrical bending – determination of stresses – contd	T1 6.2 Contd
15	Unsymmetrical bending – determination of deflections	T1 6.3
16	Unsymmetrical bending – sample problems	T1 6.1 – 6.3
17	Unsymmetrical bending – sample problems	
18	Review/Buffer	
Shear Stresses in Beams, Shear centre, Curved Flexural Members		
19	Shear stress in beams – review	Notes
20	Shear stress – sample problem	T1 7.1, Notes
21	Shear centre – definition, determination	T1 7.2, 7.3, Notes
22	Shear Center – contd	T1 7.2, 7.3, Notes
23	Curved beams – definition, governing equation for bending	T1 8.1, 8.2, Notes
24	Contd – sample problems	T1 8.2, Notes

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25	Contd – sample problems	T1 8.2, Notes
26	Contd – crane hooks – sample problems	T1 8.2, Notes
27	Contd – chain links and closed ring	T1 8.6
Plates		
28	Plates – rectangular, circular – definition, notation, types of loading	T1 10.1, Notes
29	Rectangular plates – derivation of governing equation for bending	Notes
30	Rectangular plates – derivation contd.;	Notes
31	Rectangular plates – stresses due to various types of loading and boundary conditions	T1 10.7, 10.8, Notes
32	Contd	T1 10.7, 10.8, Notes
33	Circular plates – derivation of governing equation for bending	T1 10.9, Notes
34	Circular plates – derivation (contd),	
35	Determination of displacements, stresses	T1 10.9, Notes
36	Buckling of plates	Notes
Torsion, Stresses due to Rotation, and Contact Stresses		
37	Torsion – review, circular section	T1 5.1, Notes
38	Torsion – rectangular section	T1 5.5, Notes
39	St Venant's theory, membrane analogy, Prandtl stress function	T1 5.2, 5.4, Notes
40	Stress due to rotation	Notes
41	Radial and tangential stresses in solid disc	Notes
42	Contd – sample problems	Notes
43	Contact stress – definition – point contact & line contact, method of computation	T1 14.1-3, Notes
44	Contact stresses – contd -	T1 14.5, 6, 8, Notes
45	Review	

Test 1 – During week of 17/2/2014, Test 2 – During week of 15/4/2014 (dates will be confirmed later)

Text Books

T1. Arthur Boresi & Omar Sidebottom, "Advanced Mechanics of Materials," John Wiley & Sons, 1985


Reference Books


R1. Stephan H Crandal, Norman C Dahl, Thomas J Lardner, "An Introduction to the Mechanics of Solids," 2nd edition, McGraw Hill, 1978

R2. S. P. Timoshenko and Goodier, "Theory of Elasticity," McGraw Hill 1994

R3. S. P. Timoshenko and S. Woinowsky-Krieger, "Theory of Plates and Shells," McGraw Hill, 1959

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