MERI College of Engineering & Technology
(MERI-CET)

Session: 2018-2019 **Course: B.Tech**
Department: CIVIL engineering **Semester: 3rd**
Subject: Structural Analysis-I, CE-201-F **Faculty name: Vaibhav Chawla**

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FOCAL POINTS

1. The main objective in the very beginning classes of this subject is to provide basis knowledge regarding this subject.
2. After that we will move to our university syllabus. We will start from section one.
3. Laboratory Experiments will be conducted regularly (one lab per week).
4. Group discussion will be organized to remove hesitation of students.
5. Website links will be provided to student for getting recently developed fundamentals related to subject.
6. Regular class tests will be conducted to check the performance of students.
7. We will finish the entire syllabus within designed time duration, so that we may get time for revision work.
8. All the sections of syllabus will be given equal and maximum
9. Class room as well as power point presentations will be taken from students regularly.
10. Student Doubts will be cleared by managing some extra classes.
11. Stress will be given on practical and field knowledge , which will be the master success key for student.

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TEACHING METHODOLOGY

COURSE OBJECTIVE

A complete study about all the properties of soil and every law involved in it ,is called soil mechanics. The main objective of this subject is to provide knowledge about formation of soil ,its properties and ho it bears load ,which is applied directly on soil surface.

METHODOLOGY

The Procedure will be lectures, presentations, Tutorials, Tests, assignments of class work and Practicle Labs.

ACHIEVEMENT

At the end of semester, students will have a detailed knowledge of Soil , its basic properties and different forces acting on the soil.

EVALUATION

Besides the semester end – examination, the students will be continuously assessed during the course on the following basis

i. Mid Term Examinations 30 Marks
ii. Internal Assessment 20 Marks (Assignments +Attendance)

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SYLLABUS AS PER MDU

SECTION-A

Unit- I Introduction to structural analysis, Definition of determinate and indeterminate structure, degree of freedom, concept of stress and strains , Mohr' circle of stress and strain, principle stress and strain examples. Stress- strain relationship hook's law, examples, composite sections

SECTION-B

Unit –II Concept of bending stresses, flexural formula, stress- strain diagram for beam, shear stress in beam, shear stresses in beam with different crosssection.
Concept of torsion, torsion in circular shaft, torsion equation, shear stress in shaft due to torsion examples

SECTION-C

Unit- III Theory of column, slenderness ratio, end connections, short column, Euler's critical buckling load, eccentric loaded short column, cylinder column subjected to eccentric loading, examples

SECTION-D

Unit- IV Introduction to bending moment and shear force diagram in beam
introduction to slope and deflection in beam by differential equation, moment- area method and conjugate beam method, principle of virtual work, Maxwell law of reciprocal deflection, Willot-Mohr diagram

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Name of the Faculty : Mr Vaibhav Chawla

Discipline : Civil Engineering

Semester : 3rd

Subject : Structural Analysis-I, CE-201-F

Lesson Plan Duration : 15 Weeks (From August 2018 to November 30)

Work load (Lectures/Practical)

Per week (in hours) : Lectures-04, Practicals-02

WEEK	THEORY		PRACTICAL	
	LECTURE DAY	TOPIC (including assignment /test)	PRACTICAL DAY	TOPIC
1ST	1st	Introduction to structural Analysis, Definition of Structure	1st	A practical knowledge for beam and columns or visual classification of columns and beams
	2nd	Definition of determinate and indeterminate structures, Degree of freedom		
	3rd	Stress and Strain concept		
	4th	Mohr's circle of stress and strain		
2ND	5th	Principal stress and principal strain	2nd	Concept of Bending of beams visually in LAB
	6th	Stress strain relationship and hook's law, Composite section		
	7th	Numerical problems on this unit		
	8th	**TEST OF THIS UNIT (SECTION-A)**		
3rd	9th	**Two days classes on projects given to students**	3rd	Verification of reciprocal theorem of deflection using a simply supported beam
	10th			
	11th	Introduction to the bending stress and its concept		
	12th	Determination of flexural formula		
4th	13th	Stress strain diagrams	4th	Verification of moment area theorem for slopes
	14th	Diagrams for beams and columns		
	15th	Concept of torsion		
	16th	Torsion in circular shaft		
5th	17th	Torsion equation	5th	Verification of moment area
	18th	Shear stress in shaft due to torsion		

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	19th	Numerical problems on this unit		theorem for deflection of the beam
	20th	**TEST OF THIS UNIT (SECTION-B)**		
6th	**21st**	**Two days classes on projects given to students**	**6th**	Deflections of a truss- horizontal deflections of various joints of pin jointed truss
	22nd			
	23rd	Introduction to the columns and theory of columns, slenderness ratio		
	24th	End conditions of the columns, Short columns		
7th	**25th**	Euler's critical buckling load	**7th**	
	26th			
	27th	Eccentric loaded short columns		
	28th			
8th	**29th**	Cylinder column subject to eccentric loading	**8th**	Deflections of a truss- vertical deflections of various joints of pin jointed truss
	30th			
	31st	Numerical problem on this unit		
	32nd			
9th	**33rd**	**TEST OF THIS UNIT (SECTION-C)**	**9th**	Elastic displacement (vertical & horizontal of curved members)
	34th	**Two days classes on projects given to the students**		
	35th			
	36th	Introduction to bending moment and shear force		
10th	**37th**	Bending moment And shear force diagrams	**10th**	Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust
	38th	Numerical of shear force and bending moment diagram		
	39th	Slope in beam by differential equations		
	40th	Deflection in beam by differential equations		
11th	**41st**	Numerical on Slope and deflection in beam by differential equation	**11th**	Experimental and analytical study of behaviour of struts with various end conditions
	42nd			
	43rd	Moment-Area method		
	44th			
12th	**45th**	Numerical on Moment area method	**12th**	To determine elastic properties of a beam
	46th	Conjugate beam method,		

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	47th	Numerical on conjugate beam method		
	48th	Principle of virtual work		
13th	**49th**	Maxwell law of reciprocal deflection	**13th**	Uniaxial tension test for steel (plain & deformed bars)
	50th			
	51st	Numerical of Maxwell law, Willot-Mohr Diagram		
	52nd			
14th	**53rd**		**14th**	
	54th	Numerical on this unit		
	55th	**TEST OF THIS UNIT (SECTION-D)**		
	56th	ONE DAY WILL BE GIVEN TO THE PROJECTS OF STUDENTS		
15th		**PRE-UNIVERSITY EXAMINATION**	**15th**	**PRE-UNIVERSITY EXAMINATION**

TEXT BOOKS AND REFERENCES:

1. Strength of Materials Part-I, S.Timoshenko,Affiliated East-West

Press,N.Delhi

2. Mechanics of Materials, Popov Nagarjan & Lu, Prentice Hall of

India,N.Delhi

3. Mechanics of Solids, Prasad,V.S. Gakgotia Pub.,N.Delhi.
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4. Elementary Structural Analysis, Jain,A.K.,Nem Chand & Bros,Roorkee. 5. Elementary Struictural Analysis, Wibur & Nooris, McGraw Hill Book Co.,Newyork.

6. Structural Analysis, Bhavikatti,S.S.,Vikas Pub.House, N.Delhi.

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ASSIGNMENTS

Assignment – 1

Q1 What do you meant by structural analysis. Explain briefly.

Q2 Define determinate and indeterminate structure

Q3 Draw and explain stress and strain curve.

Q4 Draw the simple stress and strain curve for some common materials.

Q5 Explain the following:

-Yield stress

- Repture stress

Q6 Explain hooks law and principle of superposition.

Q7 What do you understand by degree of static inderminacy ?

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Assignment – 2

Q1Derive deflection for uniformly tapered circular bar.

Q2 Derive elongation under its self weight.

Q3 State principle for stress distribution .

Q4 Derive a torsion equation for a circular shaft.

Q5 what do you understand by degree of kinematic indeterminacy.

Q6 Draw stress-strain digram for mild steel and explain Hook' law.

Q7 Explain prediction of load.

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Assignment – 3

Q1: Compute strain energy using load deflection diagram.

Q2: Compute strain energy for free hanging prismatic bar with an axial load.

Q3: Write assumptions of eular's theory.

Q4: Write limitations of eular's theory

Q5 Define the shear force, bending moment and point of conteraflexure.

Q6 Define the conjugate beam theorems.

Q7 Define the principle of virtual work.

Assignment – 4

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Q1-Determine the diameter of a solid shaft which will transmit 300kn at 250rpm the maximum shear stress should not exceed 30n/mm2 and twist should not be more than 10 in a shaft length 2m. take G=1x105 N/MM2?

Q2-the stiffness of a closed coil helical spring at mean diameter 20cm is made of 3cm dia rod and has 16 turns. A wt of 3 KN is droped on the spring find the height by which the wt. should be dropped before striking the spring so that the spring may be compressed by 18 cm, Take C = 8x104 N/MM2?

Q3- what do you mean by strength of a shaft?

Q4-Define torsional rigidity of the solid circular shaft.

Q5-distinguish between closed coil helical spring and open coil helical spring,

Q6-what is meant by composite shaft.

Q7-what is called twisting moment.

Assignment – 5

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Q1-A rod of 150cm long and diameter 2 cm is subjected to an axial pull of 20kn. If the modulus of elasticity of the material of the rod is 2x105 N/MM2. Determine 1.stress 2. Strain 3. The elongation of the rod.

Q2-The extension in a rectangular steel bar of length 400mm and thickness 10mm is found to 0.21mm.the bar tapers uniformly in width from 100mm to 50mm. if E for the bar is 2x105N/M2. Determine The axial load on the bar A. stress B strain C elongation of the rod.

Q3- A rod of 250cm long and diameter 3 cm is subjected to an axial pull of 30kn. If the modulus of elasticity of the material of the rod is 2x105 N/MM2. Determine 1.stress 2. Strain 3. The elongation of the rod**.**

Q4 –find the youngs modulus of a rod of diameter 30mm and of length 300mm which is subjected to a tensile load of 60kn and the extension of the rod is 0.4mm.

Q5- the extension in a rectangular steel bar of length 400mm and thickness 3mm is found to be 0.21mm the bar tapers uniformly in width from 20mm to 60mm E for the bar is 2x105 N/MM2. determine the axial load on the bar.

Q6- The ultimate stress for a hollow steel column which carries an axial load of 2 MN is 500 N/MM2.if the external diameter of the column is 250mm,determine the internal diameter take FOS 4.0.