Theory of Structure - I
BEG265CI

YEAR-II   **SEMESTER-II**

Teaching Schedule Hours/ Week			Examination Scheme						Total Marks
			Final				Internal Assessments		
			Theory		Practical		Theory Marks	Practical Marks	
L	P	T	Duration	Marks	Duration	Marks			
3	2/2	3	3	80	-	-	20	25	125

Course Objective:

To familiarize the terminology and concept about the type of Determinatestructures andprovide the understanding of usefulanalysis methods under different loading conditions.

Course Contents:

1. Introduction   **(2hrs)**
         1.1 Types of structures
         1.2 Linearly elastic structures
         1.3 Non-linearity in structural behavior
         1.4 Methods of analysis

2. Strain Energy Method   **(4hrs)**
         2.1   Strain energy and complementary strain
         2.2 Strain energy due to gradually applied, suddenly applied and impact loads
         2.3 Strain energy due to bending, shear and torsion
         2.4 Displacement by method of Real work/strain energy
         2.5 Real work from bending
         2.6 Limitation of the method of real work

3. Virtual Work Method (5 hrs)
         3.1 Work and complementary work
         3.2 Direct and bending effects
         3.3 Deflection by unit load /virtual work methods
         3.4 Temperature effects, length adjustments and misfits
         3.5 Combination of different effects in statically determinate beams, frames and
             trusses

4. Deformation of Statically Determinate Beams, Frames and Trusses   (10 hrs)

4.1 Curvature, slope and deflection

4.2 Differential equation of the deflection curve.

4.3 Deflection by method of integration

4.4 Deflection by moment area method

5. Influence Lines forSimple Structures   (12 hrs)

5.1 Concept of influence lines

5.2   Influence line diagrams for reactions, bending moments and shear forces in beams

5.3   Influence Line Diagrams for the case of indirect load application (Panel loadings)

5.4   Calculation of reactions, bending moments and shear forces from the Influence line

5.5 Criterion for maximum reaction, shear force, bending moment in simple beams

5.6 Inflection diagram using train of loads

5.7Influence line diagrams for forces in members of plane trusses

5.8   Criterion for maximum axial force in a member of a plane truss

6. Statically Determinate Arches   (6 hrs)

6.1   Various types of arches

6.2Various types of three hinged structures - symmetrical and Unsymmetrical, supports at different levels, arches parabolic and circular

6.3   Support reactions, bending moments, normal and radial shear forces in circular and parabolicthree hinged arches

6.4 Introduction to influence line diagram forsupport reactions, shear forces, Bending moments and radial shear in three hinged arches

7. Cable Structure   (6hrs)

7.1 Cable and cables bridges

7.2 General Cable theorem

7.3 Cables under uniformly distributed load

7.4 Elements of simple suspension bridge

7.5 Suspension bridge with three-hinged stiffening girder

Laboratories:
   (i) Influence lines for beams.
   (ii) Analysis of plane frames.
   (iii) Influence line for horizontal thrust in a three-hinged arch
   (iv) Reaction on three-hinged arch under given system of loading.
   (v) Deflection of beam subjected to point load and Uniform1y distributed load.
   (vi) Experimental analysis of suspension bridge.

References:

- C. H. Norris, J. B. Wilbur & S. Utku, Elementary Structural .Analysis, 3rd Edition, McGraw Hill Company Limited, New York, 1977
- C. K. Wang, Intermediate Structural Analysis, Intemationa1 Student Edition, McGraw Hill Company Limited, 1989
- A. Darken, Kuznets, Structural Mechanics, Mir Publishers, Moscow
- C. B. Korea, V. V. Satyr, Experimental Methods in Structural Mechanics, Standard Publishers Distributors, Delhi, 1991