Course Type	Course Code	Name of the course	L	T	P	Credit
DC	CEC206	**Structural Analysis-I**	3	1	0	11

Course Objective

The main focus of this course is analysis of determinate structures. The problem type consists of beam, truss and frame structures. Basic idea about indeterminate structure will also be emphasized.

Learning Outcomes

After studying this course, students should be able to:
- Analyse various determinate structures.
- Calculate deflection of different structures.
- Acquire basic knowledge about indeterminate structures

Unit No.	Topics to be Covered	Lectures	Learning Outcome
1	**Introduction:** Revisit to estimation of support reactions and plotting SFD and BMD, Loading and modelling, Internal forces in statically determinate structures- plane and space trusses, beams, frames, simple, compound and complex trusses.	4	Introduction to methods and expected outcome of structural analysis
2	**Deflection by Elastic beam theory**: Double Integration Method, Conjugate beam and area moment theorems.	7	Estimation of deflection of determinate beams by elastic beam theory, advantages and limitations of these methods
3	**Strain energy method for slopes and deflections**: Introduction to strain energy method, Unit load method, Castigliano's Theorem, Deflection due to shear, torsion, temperature and fabrication error.	11	Idea of virtual load and virtual work, Calculating deflections of a statically determinate structure at point of application of load or at other points.
4	**Cables and Arches**: Analysis of cables and two hinged suspension bridges, Analysis of three hinged arches, Analysis of two hinged and fixed arches	6	Analysis of tension-based cables and compression-based arches
5	**Introduction to Indeterminate structures**: Static and kinematic indeterminacies, methods of analysis, Theory of least work, Consistent deformation method	7	Understanding stability and determinacy of structures, application of theorem of least work and Maxwell-Betti's reciprocal theorem, Understanding advantages and limitation of force based methods
6	**Plastic Analysis:** Shape factor, Plastic hinge, Methods of Plastic Analysis: Upper-bound and lower-bound theorems, Analysis of beams and frames.	7	Introduction to material and cross section behaviour beyond the elastic limit, Understanding the basis of plastic design and ultimate design.

Recommended Text Books:

1. Hibbeller, R. C., "Structural Analysis", 6th Edition, Pearson Education.

Recommended References:

1. Timoshenko, S.P., and Young, D.H., "Theory of Structures", McGraw Hill International Edition.
2. Utku,S., Norris,C.H. and J.B. Wilbur., "Elementary Structural Analysis", McGraw Hill Book Company.
3. Reddy, C. S., "Basic Structural Analysis", Tata McGraw Hill Publishing.