

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**  
**INSTRUCTION DIVISION**  
**SECOND SEMESTER 2020-2021**  
**Course Handout (Part - II)**

Date: 18/01/2021

In addition to part I (General Handout for all course appended to the time table) this portion gives further specific details regarding the course.

Course No. : **CE F241**  
Course Title : **ANALYSIS OF STRUCTURES**  
Instructor-in-charge : **ANSHUMAN**  
Instructor : **S N Patel**  
Tutorial Instructor : **Anshuman, S N Patel**

### 1. COURSE DESCRIPTION:

Bending moment and Shear force Diagrams for Determinate beams and Frames and Three hinged arches, analysis of cables; member forces and deflection in determinate trusses; determination of static and kinematic indeterminacy of structures; work and energy principles; analysis of fixed beams, continuous beams, indeterminate frames and indeterminate trusses; slope deflection and moment distribution methods, Maxwell's reciprocal theorems, rolling loads and influence lines, Muller Breslau's principles, two hinged and fixed arches, analysis of multistory frames, introduction to stiffness and flexibility methods.

### 2. Scope Description of the Course:

The Prime responsibility of a structural engineer is to ensure that structures transmit the service loads safely and efficiently to its foundation. In performing this primary function, in the structure internal forces (i.e. bending moment and shear force in beams and, axial force and bending moment in columns) gets develop along with the displacements. For the serviceability requirement of the structure the displacements must be within limit. The objective of the structural analysis is to determine these internal forces and corresponding displacement of the structure.

### 3. Text Book:

Hibbler, R. C., Structural Analysis, Sixth Edition, Pearson Education, New Delhi, 2008.

### Reference Book:

Kenneth M. Leet, Fundamentals of Structural Analysis, 2/e, Tata Mc Hill, New Delhi.

### 4. Course Plan:

S. No.	Learning Objective	Lec. Nos.	Topics to be covered	Ref. to Chap
1.	<b>Basic Concepts</b> of Structural analysis	3	Classification of structures, types of loads load combinations, idealization of structures, principle of superposition, Equations of equilibrium, stability, degree of static and kinematic indeterminacy of beams and frames, stability of structures, application of equations of equilibrium	TB-1 & 2
<b>Analysis of Statically Determinate Structures:</b>				
2.	Analysis of <b>statically Determinate Beams and Frames</b>	4	Internal forces, sign convention, free body diagram, Bending moment and Shear force diagrams for determinate beams and Frames.	TB-4
3.	Analysis of <b>Statically Determinate Trusses</b>	4	Types of trusses, assumptions for design, classification of coplanar trusses, external and internal stability of trusses, analysis of 2-D trusses	TB-3

				using method of joints and method of sections, zero force members, analysis of compound trusses, analysis of complex trusses	
4.	<b>Influence lines</b> for <b>Statically Determinate</b> Structures		3	Influences line for determinate beams and trusses, Maximum and absolute bending moment and shear force due to series of moving loads	TB-6
5.	Determination of <b>Deflections and Slopes</b> in Beams and Trusses		5	Deflection of beams using (i) elastic beam theory, (ii) double integration, (iii) Moment-area, (iv) conjugate beam, (v) energy principals, principle of virtual work, Castigliano's theorem, determination of deflection of trusses, beams and frames using virtual work method and Castigliano's theorem	TB-8
6.	Analysis of <b>Cables and Arches</b>		3	Characteristics of cables, analysis of cables subjected to concentrated loads and uniformly distributed loads, types of arches, analysis of three-hinged arches	TB-5
<b>Analysis of Statically Indeterminate Structures:</b>					
7.	Analysis of Statically Indeterminate Structures by <b>Force method</b>		6	Advantages & disadvantages and Methods of analysis of statically indeterminate structures, concept of force method, Maxwell Reciprocal theorem and Betti's law, Analysis of beams, Frames and trusses using force method, Analysis of beams using three moment equations, Influence lines for statically indeterminate beams	TB-9
8.	Analysis of Statically Indeterminate Structures by <b>Displacement method</b>	<b>Slope Deflection Method</b>	4	Concept of displacement method, slope deflection equations, analysis of beams and frames (with and without side sway) using slope deflection method	TB-10
9.		<b>Moment Distribution Method</b>	4	Concept of Moment Distribution Method, analysis of beams and frames (with and without side sway) using Moment Distribution method	TB-11
10.	<b>Approximate analysis</b> of statically Indeterminate structures		3	Approximate analysis of Indeterminate Trusses, beams and portal frames, Analysis of building frames subjected to lateral loads using Portal and cantilever methods	TB-7
11.	Introduction to <b>Matrix Methods</b> of Structural Analysis		3	Stiffness matrix for bar and beam elements, Analysis of Truss, beam and Frame structures using the Stiffness method	TB-13

#### 5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Mid-Sem Test	90 min.	35%	TBA	OB
Tutorials	50 min.	20%	W-1	OB
Comprehensive Examination	3 Hrs.	45%	13/05 FN 8:00 –11:00 Hrs	OB

**6. Chamber Consultation:** To be announced in the class.

**7. Notices:** All notices concerning to the course will be displayed on Nalanda/Google Class Room.

**8. Make-up Policy:** Make will be granted with prior permission to genuine cases.

**Instructor-in-charge**  
**CE C241**