BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
WILP Division

FIRST SEMESTER 2025-26
COURSE HANDOUT

Date: 25.07.2025

In addition to Part I (General Handout for all courses appended to the Timetable), this portion gives further specific details regarding the course.

Course No. : **BCIK ZC215**
Course Title : **ANALYSIS OF STRUCTURES**
Instructor In-charge : **MD RUSHDIE IBNE ISLAM**
Instructor : **NA**

1. Course Description

Static and kinematic Indeterminacy, Energy principles; Force Methods of analysis: strain energy method, consistent deformation method, Displacement Methods of analysis: Slope deflection method, Moment distribution method; Introduction to Matrix Methods of structural analysis: Flexibility and Stiffness Methods, Influence Line Diagrams; Analysis of Moving/Rolling loads (for determinate structures), Introduction to approximate analysis of frames and trusses, Analysis of Three-hinged, two hinged and fixed Arches, Analysis of indeterminate trusses.

2. Scope and Objectives

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, external reactions at the supports and displacement of the structure.

3. Prescribed Textbook

T1.- Hibbler, R. C., Structural Analysis, Sixth Edition, 10th Ed. (in SI Units), Pearson Edu., New Delhi, 2022.

4. Reference Books

R1.- Kenneth, M. Leet, Chia-Ming Uang, and Anne M Gilvert, Fundamentals of Structural Analysis, 3rd Ed., McGraw Hill Education, New Delhi, 2017.
R2.- Aslam Kassimali, Structural Analysis, 5th Ed. Cengage, Learning, 2015.
R3.- C. K. Wang, Intermediate Structural Analysis, McGraw-Hill Education, 2017.

5. Course Plan

Module Number	Lecture session	Reference	Learning Outcome

1.	Classification of structures, types of loads load combinations, types of structures	T1 – Chap. 1	Types of Structures and Loads
2.	Idealization of structures, principle of superposition, equations of equilibrium, degree of static indeterminacy and Stability of beams, frames, and Trusses	T1 – Chap. 2	Basics of Structural analysis
3.	Types of trusses, assumptions for design, classification of coplanar trusses, external and internal stability of trusses, analysis of 2-D trusses using method of joints and method of sections, zero force members, analysis of compound trusses, analysis of complex trusses	T1 – Chap. 3	Analysis of Statically Determinate Trusses
4.	Internal forces, sign convention, free body diagram, Bending moment and Shear force diagrams for determinate beams and Frames.	T1 – Chap. 4	Analysis of Statically Determinate Beams and Frames
5.	Characteristics of cables, analysis of cables subjected to concentrated loads and uniformly distributed loads, types of arches, analysis of three-hinged arches	T1 – Chap. 5	Analysis of Cables and Arches
6.	Influences line for determinate beams and trusses, Maximum and absolute bending moment and shear force due to series of moving loads	T1 – Chap. 6	Influence lines for Statically Determinate Beams and Trusses
7.	Deflection and slope of beams and Rigid frames using (i) elastic beam theory, (ii) double integration, (iii) Moment - area method, (iv) conjugate beam method	T1 – Chap. 7	Deflections and Slopes in Beams
8.	Principle of virtual work and strain energy, Application of principal of virtual work for calculating Deflections beams and trusses, Castigliano's theorem and its application in determining deflection of structures	T1 – Chap. 8	Deflections and slopes in structures using the Energy Methods
9.	Statically determinate vs. statically indeterminate Structures, Advantages & disadvantages of	T1 – Chap. 9	Methods of analyzing

	indeterminate structures, Classification of Methods of analyzing indeterminate structures; types of Force and displacement methods, Force Methods vs Displacement Methods		Indeterminate structures
10.	Concept of force method, Maxwell's Reciprocal theorem and Betti's law, Analysis of indeterminate beams and frames, analysis of symmetric structures, Influence lines for statically indeterminate beams and qualitative influence lines for frames	T1 – Chap. 10	Analysis of Statically Indeterminate Beams, Frames and Trusses using Force Method
11.	Concept of slope-deflection method, development of slope-deflection equations, analysis of beams and frames (with and without side sway) using slope deflection method	T1 – Chap. 11	Slope Deflection Method
12.	Concept of Moment-Distribution Method, analysis of beams and frames (with and without side sway) using Moment Distribution method	T1 – Chap, 12	Moment Distribution Method

6. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of component (Close Book/ Open Book)**
Mid-Semester Examination	As per schedule.	30	<TEST_1>	Close Book/ Open Book
Comprehensive Examination	As per schedule	40	<TEST_C>	Close Book/ Open Book
Quizzes (3 numbers)	7 days	15	Spread over the semester	Open Book
Assignments	10 days	15	Spread over the semester	Open Book

7. Chamber Consultation Hour: To be announced during the lecture.

8. Notices: Notices concerning this course will be displayed online through WILP.

9. Make-up Policy: If the student is unable to appear for the Examination due to genuine exigencies, the student must refer to the procedure for applying for Make-up Examination. No make up for the assignments.

10. Note (if any):

Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

(MD RUSHDIE IBNE ISLAM)
Instructor In charge
BCIK ZC215