Birla Institute of Technology & Science, Pilani
Hyderabad Campus

ACADEMIC – GRADUATE STUDIES AND RESEARCH DIVISION
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
FIRST SEMESTER 2021-2022
Course Handout Part II

Date: 12/08/2021

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

Course No. : *CE G617*
Course Title: Advanced Structural Analysis
Instructor-in-charge: Prof. P N Rao

Description : Flexibility Method; stiffness method; beam curved in plan; two dimensional and three dimensional analysis of structures; shear deformations, shear wall analysis; interactive software development for analysis of structures

1. Scope and objectives of the course:

Scope: This course aims to demonstrate some efficient techniques and tools for analysis and design of framed structures with primary focus on using matrix methods. The basic objective of this course is to impart the fundamental concepts of matrix methods of structural analysis and their implementation in development of computer programs for computer aided structural analysis of structures. This course will also demonstrate the analysis of advanced structures like curved beams, shear walls, and infinite beams and beams on elastic foundations.
Course Outcomes: At the end of this course, the students will develop an ability to:

1. Use matrix methods and computer aided analysis techniques to design framed structures.
2. Analyse the force components and deformation components of curved beams.
3. Analyse the force components and deformation components of shear walls.
4. Analyse the force components and deformation components of infinite beams and beams on elastic foundations.

Student Learning Outcomes (SLOs) assessed in this course – **(a), (b), (c), (e), (f), (j),** and **(k).**

2. Textbook(s):

Text Book (TB)
Weaver, W., Jr. & Gere, J.M., "Matrix Analysis of Framed Structures", 3rd Ed. Springer

Science & Business Media, 2012.

Reference Books (RB)

1. Ghali A. and Neville A.M. Structural Analysis, A unified classical and Matrix approach. Chapman and Hall, London 6th Edition. 2009
2. Stavridis, L.T., Structural systems: behaviour and design, 1st Edition, Thomas Telford 2010.
3. Vazirani, V. N., Ratwani, M. M., and Duggal, S. K., "Analysis of Structures", Vol. II, Khanna Publishers, 13th Reprint, 2016.
4. Boresi, A.P., Schmidt, R.J. and Sidebottom, O.M., 2009, "Advanced mechanics of materials" (Vol. 6). New York: Wiley.

Lecture wise Course Plan

CO	Lec. No.	Topics Covered	Learning Objectives	Reference to TB, RB	SLO*
1	1-4	Flexibility Matrix	Study the fundamentals of flexibility matrix method of analysis of structures; Analyze beams, trusses, 2-D and 3-D plane frames using this technique.	Ch. 2 (TB 1)	**(a), (b), (k)**
	5 - 15	Stiffness Matrix: Fundamentals	Study the fundamentals of stiffness matrix method of analysis of structures; Analyze beams, trusses, 2-D and 3-D plane frames using this technique; Analyze and interpret the modifications in stiffness matrix of structural elements due to thermal stresses, axial stresses, oblique supports, and non-prismatic members	Ch. 3 - 5 (TB 1)	**(a), (b), (k)**
2	16 - 21	Curved Beams	Analyze the various forces, moments, deflections, and slopes in beams curved in the longitudinal plane.	Ch. 9 (RB 4), Ch. 20 (RB 3)	**(a), (b), (k)**
3	22 - 25	Shear Walls	Analyze the various forces, moments, deflections, and slopes in shear walls using the stiffness matrix method.	Ch. 14 (RB 1)	**(a), (b), (k)**
4	26 - 33	Infinite Beams & beams on elastic foundations	Analyze the various forces, moments, deflections, and slopes in infinite beams, beams on elastic foundations, and semi-finite beams.	Ch. 11 (RB 4)	**(a), (b), (k)**
	34 - 42	Computer-Aided Analysis and Design	Determine and recommend engineering analyses and designs based on the type of structures and applied loads, while adhering to a professional and ethical code.	Ch. 5 (TB 1), Appendix (RB 2)	**(a), (c), (e), (f), (j)**

***Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Evaluation Scheme

S. No.	Evaluation component	Duration	Weightage	Date and Time	CB/OB
1.	Mid Semester	90 minutes.	30%	TBA	OB
3.	Project	-	15%	continuous	OB
4.	Assignments		15%	continuous	OB
5.	Comprehensive Exam	120 minutes.	40%	TBA	OB

Chamber Consultation Hour: will be announced later.

Notices: All Notice concerning the course will be displayed throughGoogle classroom.

Make up policy: Makeup will be given only to the genuine cases with prior permission.

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

Instructor-in-charge
CE G617