

Academic Course Description

<p>BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Civil Engineering</p> <p>BCE501 - STRUCTURAL ANALYSIS – I Fifth Semester, 2017-18 (Odd Semester)</p>

Course (catalog) description

To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of structures.

Compulsory/Elective course : Compulsory for Civil students

Credit/ Contact hours : 4 credits / 60 hours

Course Coordinator : Dr.S.J.Mohan

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Dr.S.J.Mohan	Third year Civil	Civil Block		mohansjm@yahoo.com	9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites : Basic Structural Design

Assumed knowledge : Concepts of structural analysis and the classical methods

Following courses : NIL

Syllabus Contents

UNIT I INDETERMINATE ANALYSIS 12

Indeterminate Structures: Introduction to static and kinematic Indeterminacy- two and three dimensional pin jointed and rigid jointed structures-space trusses-Energy method-application to indeterminate pin jointed trusses-temperature effect-beams curved in plan.

UNIT II SLOPE DEFLECTION METHOD 12

Slope deflection method: Analysis of continuous beams and portal frames with single storey.

UNIT III MOMENT DISTRIBUTION METHOD 12

Moment distribution method: Stiffness and distribution factors-carry over factor-analysis of continuous beams -single storied portal frames.

UNIT IV ROLLING LOADS 12

Rolling loads: Single concentrated loads - two concentrated loads-uniformly distributed loads-curves of maximum SFD and BMD – equivalent. UDL

UNIT V INFLUENCE LINE DIAGRAMS 12

Influence line for statically determinate beams for bending moment and shear force- absolute maximum BM-concentrated and UDL-Influence line for forces in members for statically determinate truss parallel chord truss.

TEXT BOOK:

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications, New Delhi, 2003.

REFERENCE:

1. Bhavai Katti, S.S, Structural Analysis – Vol. 1 & Vol. 2, Vikas Publishing Pvt Ltd., New Delhi, 2008
2. Analysis of Indeterminate Structures – C.K. Wang, Tata McGraw-Hill, 1992.
3. Negi L.S. Jangid & R

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area: Concepts of structural analysis and the classical methods

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1 st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2 nd week	Session 15 to 28	2 Periods
3	Model Test	October 2 nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

H: high correlation, M: medium correlation, L: low correlation

	Correlates to program outcome		
	H	M	L
To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of structures.			
1. Analyze the pin jointed plane frames using energy and consistent deformation method	a,e,	b,d	
2. Analyze indeterminate structures using various classical methods.	b	e	
3. Determine absolute maximum bending moment and shear force in beams due to moving loads.	a,e		
4. Find the maximum moment, shear and stresses produced in arches due to external loads temperature effects and support settlements.	a	d	
5. To find the influence line diagram for determinate structures.		e	

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I INDETERMINATE ANALYSIS			
1.	Introduction to static and kinematic Indeterminacy	Yes	[T1, R2]
2.	Two dimensional rigid jointed structures	Yes	
3.	Two dimensional pin jointed structures	Yes	
4.	Three dimensional pin jointed	Yes	
5.	Three dimensional rigid jointed structures	Yes	
6.	Space trusses	Yes	
7.	Energy method	Yes	
8.	Application to indeterminate pin jointed trusses	Yes	
9.	Application to indeterminate pin jointed trusses	Yes	
10.	Pin jointed trusses	Yes	
11.	Temperature effect-beams curved in plan	Yes	
12.	Temperature effect-beams curved in plan	Yes	
UNIT II SLOPE DEFLECTION METHOD			
13.	Slope deflection method	Yes	[T1, T2 & R3]
14.	Analysis of continuous beams	Yes	
15.	Analysis of continuous beams	Yes	
16.	Analysis of continuous beams	Yes	
17.	Analysis of continuous beams	Yes	
18.	Analysis of continuous beams	Yes	
19.	Portal frames with single storey.	Yes	
20.	Portal frames with single storey.	Yes	
21.	Portal frames with single storey.	Yes	
22.	Portal frames with single storey.	Yes	
23.	Portal frames with single storey.	Yes	
24.	Portal frames with single storey.	Yes	
UNIT III MOMENT DISTRIBUTION METHOD			
25.	Moment distribution method	Yes	[T1, T2 & R3]
26.	Stiffness and distribution factors	Yes	
27.	Carry over factor	Yes	
28.	Analysis of continuous beams	Yes	
29.	Analysis of continuous beams	Yes	
30.	Analysis of continuous beams	Yes	
31.	Analysis of continuous beams	Yes	
32.	single storied portal frames	Yes	
33.	single storied portal frames	Yes	
34.	single storied portal frames	Yes	
35.	single storied portal frames	Yes	
36.	single storied portal frames	Yes	
UNIT IV ROLLING LOADS			
37.	Rolling loads	Yes	[T1, T2 & R3]
38.	Single concentrated loads	Yes	
39.	Single concentrated loads	Yes	

40.	Two concentrated loads	Yes	
41.	Two concentrated loads	Yes	
42.	Uniformly distributed loads	Yes	
43.	Uniformly distributed loads	Yes	
44.	Curves of maximum SFD and BMD	Yes	
45.	Curves of maximum SFD and BMD	Yes	
46.	Curves of maximum SFD and BMD	Yes	
47.	Equivalent. UDL	Yes	
48.	Equivalent. UDL	Yes	
UNIT V INFLUENCE LINE DIAGRAMS			
49.	Influence line for statically determinate beams for bending moment and shear force- absolute maximum BM	Yes	[T1, T2 & R3]
50.	Influence line for statically determinate beams for bending moment and shear force- absolute maximum BM	Yes	
51.	Influence line for statically determinate beams for bending moment and shear force- absolute maximum BM	Yes	
52.	Concentrated and UDL	Yes	
53.	Concentrated and UDL	Yes	
54.	Concentrated and UDL	Yes	
55.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	
56.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	
57.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	
58.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	
59.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	
60.	Influence line for forces in members for statically determinate truss parallel chord truss	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

Prepared by: Dr.S.J.Mohan, Professor , Department of Civil Engineering

Dated :

Addendum**ABET Outcomes expected of graduates of B.Tech / Civil / program by the time that they graduate:**

- 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 hardware and software 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.

Program Educational Objectives**PEO1: PREPARATION**

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

Course Teacher	Signature
Dr.S.J.Mohan	

Course Coordinator

HOD/CIVIL