Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BEC601 STRUCTURAL ANALYSIS – II
Sixth Semester, 2016-17 (Even Semester)

Course (catalog) description

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

Compulsory/Elective course : Compulsory for Civil students

Credit / Contact hours : 4 credits / 60 hours

Course Coordinator : Ms. M .V. Shruthi, Assistant Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
K.Sathishkumar	III YEAR C& D	Civil block			9.00 - 9.50 AM
Bhunashwari	III YEAR A & B	Civil block			12.45 - 1.15 PM

Relationship to other courses:

Pre –requisites : STRUCTURAL ANALYSIS – I

Assumed knowledge : Basic knowledge in analysis of structures

Following courses : BEC 703 design of steel structures

Syllabus Contents

UNIT I ILD FOR INDETERMINATE STRUCTURES 12 Hours

Influence line for statically indeterminate structures – Maxwell Betti theorem - Muller – Breslau Principle and its application to determine the influence lines of reactions. SF and BM at a section of continuous beams – qualitative influence lines for horizontal thrust reaction and moments for continuous beams, portal and arches.

UNIT II ARCHES & CABLES 12 Hours

Arches and suspension Cables : Three hinged and two hinged arches-parabolic and circular arches – influence lines for three and two hinged arches for horizontal thrust, SF and BM at any section - length of cable, maximum tension - types supports – forces in towers.

UNIT III PLASTIC THEORY 12 Hours

Plastic Theory: Plastic moment of resistance - plastic modulus – shape factor – plastic hinges – determination of collapse load for continuous beams and portals.

UNIT IV STIFFNESS METHOD 12 Hours

Matrix Method of Structural Analysis: Stiffness methods-development of stiffness method -stiffness matrix for continuous beams and portals application to simple pin jointed trusses, continuous beams, portal frames.

UNIT V FLEXIBILITY METHOD 12 Hours

Matrix method of Structural Analysis: Flexibility method – statically determinate and indeterminate (up to 2 degrees only) structures- formation of flexibility matrix - simple problems on Continuous beams, Portal frame.

TEXT BOOKS:

1. S.S.Bhavikati. Structural Analysis Vol.-I & II. Vikas Publishing House pvt ltd, 2009

REFERENCE:

1. William Weaver, Computer Programs for structural Analysis, VNR Publishers, 2006
2. Rubinstein M.F, Matrix Computer Analysis of Structures, Prentice Hall, Englewood cliffs, 1990
3. Arya AS. and Jain." Theory and Analysis of Structures", Nem Chand & Bros, Dec 1992
4. Pandit G S and Gupta S P,"Matrix methods in structural analysis", Tata McGraw Hill Publishing Company Limited, 2007

Computer usage: software strap,staad pro

Professional component

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

Broad area : structural analysis

Test Schedule

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

Mapping of Instructional Objectives with Program Outcome

	Correlates to program outcome		
	H	**M**	**L**
CO1 Analyze Space Truss using tension Coefficient method	d	c	
CO2 Analyze cable suspension bridges	d	c	
CO3 Perform plastic analysis of indeterminate beams and frames	d	c	
CO4 Analyze structures by using matrix flexibility and stiffness methods	d	c	
CO5 Implement basic concepts of finite element analysis	d	c	

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I ILD FOR INDETERMINATE STRUCTURES			
1.	Influence line for statically indeterminate structures –	No	[T1,R1 & R3]
2.	Maxwell Betti theorem	No	
3.	Muller – Breslau Principle	yes	
4.	Application to determine the influence lines of reactions.	yes	
5.	Problems on Muller – Breslau Principle	yes	
6.	SF and BM at a section of continuous beams	yes	
7.	qualitative influence lines for horizontal thrust reaction and moments for continuous beams	yes	
8.	Problems on continuous beams	Yes	
9.	qualitative influence lines for portal frames	Yes	
10.	Problems on portal frames	Yes	
11.	qualitative influence lines for arches	Yes	
12.	Problems on arches	yes	
13	Introduction to Arches and suspension Cables	No	[T1,R1 & R3]
14	Three hinged and two hinged arches	yes	
15	Problems on Three hinged arches	Yes	
16	Problems on Two hinged arches	Yes	
17	Introduction to parabolic and circular arches	Yes	
18	Problems on parabolic arches	Yes	
19	Problems on circular arches	yes	
20	Influence lines for three hinged arches for horizontal thrust, SF and BM at any section	Yes	
21	Influence lines for two hinged arches for horizontal thrust, SF and BM at any section	Yes	
22	length of cable, maximum tension in cable	Yes	
23	Problems on cables	Yes	
24	Types of supports – forces in towers.	no	
25	Introduction to Plastic Theory	No	[T1,R1 & R3]
26	Plastic moment of resistance	No	
27	Plastic modulus	No	
28	shape factor for rectangular section	No	
29	Shape factor for circular, I sections	No	
30	plastic hinges	no	
31	Introduction to collapse loads	no	
32	collapse loads mechanism	No	
33	Problems on collapse loads	Yes	
34	determination of collapse load for continuous beams	Yes	
35	determination of collapse load for frames	Yes	
36	determination of collapse load for truss	Yes	
37	Introduction to Matrix Method	No	
38	Introduction to Structural Analysis Stiffness	No	

	methods		
39	Analysis steps of Stiffness matrix methods	No	
40	development of stiffness method	No	
41	development of equilibrium equations	No	[T1,R2 & R4]
42	stiffness matrix for continuous beams	Yes	
43	Problems on continuous beams	Yes	
44	Problems on over hanging beams	Yes	
45	stiffness matrix for portal frames	Yes	
46	Problems on portal frames	Yes	
47	stiffness matrix for pin jointed trusses	Yes	
48	Problems on pin jointed trusses	yes	
49	Introduction to Matrix method	No	
50	Introduction to Structural Analysis: Flexibility method	No	
51	Analysis steps of Flexibility method	No	
52	development of Flexibility method		[T1,R2 & R4]
53	statically determinate structures	No	
54	statically indeterminate structures	No	
55	Flexibility matrix for continuous beams	No	
56	Problems on continuous beams	yes	
57	Flexibility matrix for portal frames	No	
58	Problems on portal frames	Yes	
59	Flexibility matrix for trusses	No	
60	Problems on trusses	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%
Attendance	-	10%
Assignment	-	5%
Final exam	-	70%

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
k.sathishkumar	
Bhunashwari	

Course Coordinator

HOD/CIVIL