Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BCE 401 THEORY OF STRUCTURES

Fourth Semester, 2016-17 (Even Semester)

Course (catalog) description

To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam. To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

Compulsory/Elective course : Compulsory for Civil students

Credit / Contact hours : 4 credits / 45 hour

Course Coordinator : Mr. K. Sathishkumar, Assistant Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr. K. Sathishkumar	Second year Civil	Civil Block			9.50 – 10.40 AM
Ms.M.Buvaneshwari	Second year Civil	Civil Block			2.20 – 3.10 PM

Relationship to other courses:

Pre –requisites **:** BCE 301 Applied Mechanics
Assumed knowledge : -
Following courses : BCE501 Structural analysis 1

Syllabus Contents

UNIT I ENERGY THEOREM **12**

Conservative and non-conservative systems – Strain energy and complimentary energy – Principle of virtual displacement and virtual forces, castigliano's first theorem, Engesser's theorem, castigliano's second theorem, Maxwell's theorem

UNIT II DEFLECTION OF BEAM **12**

Determination of deflection and slope – Double integration method – Macaulay's method-Area moment method-conjugate beam method, strain energy and dummy unit load approaches.

UNIT III STATICALLY INDETERMINATE BEAMS **12**

Axially load members - composite bars – Beams: Propped, fixed and continuous beams - Theorem of three moments-calculations of reactions, Bending Moment and Shear forces - shear force and bending moment diagrams.

UNIT IV THEORY OF COLUMNS **12**

Axial load - combined bending and axial – Euler's formula for long struts-practical applications –Rankine's Gordon's formula – beam columns.

UNIT V THICK CYLINDERS **12**

Lame's equation - shrink fit- compound cylinders – wire wound cylinders. deflection of trusses -Castigliano's Theorem, dummy unit load method, Williotmohr's diagram.

TEXT BOOKS:

1. Gupta S.P, Pandit G.S, Gupta R. , Theory of Structures, Vol.I&II .Tata McGraw HillCo,1981

REFERENCE:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. Beer and Johnson. Mechanics of Materials, S.I Metric Edition, McGraw Hill Co, 2002
3. Punmia B.C.Theory of Structures (SMTS) Vol 1&II, Laxmi publishing Pvt Ltd, NewDelhi, 2004.
4. Jain O.P. and.Jain B.K., Theory and analysis of structures, Mechanics of Materials Nem Chand & Brothers, Roorkee, 2001

Computer usage: Nil

Professional component

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

Broad area:

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**
1. To study about different materials used in masonry	a,c	d	-
2. To analyse the steel structures.	c	a,d	-
3. To design of trusses and their members.	c	a,d	-
4. To carry out the analysis of simple beams	a,c	d	-
5. To study about different loading conditions on trusses	a,c	d	-

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I ENERGY THEOREM			
1.	Conservative and Systems	YES	T1/R3
2.	non-conservative systems	YES	
3.	Strain energy	YES	
4.	complimentary energy	YES	
5.	Principle of virtual displacement	YES	
6.	Principle of virtual forces	YES	
7.	castigliano's first theorem	YES	
8.	Derivations	YES	
9.	Engesser's theorem	YES	
10.	Derivations	YES	
11.	castigliano's second theorem	YES	
12.	Derivations	YES	
13.	Maxwell's theorem	YES	
UNIT II DEFLECTION OF BEAM			
14.	Determination of deflection	YES	T1/R1
15.	Determination of slope		
16.	Double integration method	YES	
17.	Macaulay's method	YES	
18.	Derivations	YES	
19.	Area moment method	YES	
20.	Derivations	YES	
21.	conjugate beam method	YES	
22.	Derivations	YES	
23.	strain energy	YES	
24.	dummy unit load approaches	YES	
25.	Detailed explanations	YES	
UNIT III STATICALLY INDETERMINATE BEAMS			
26.	Axially load members	YES	T1/R1
27.	composite bars	YES	
28.	Propped and fixed beams	YES	
29.	Derivations	YES	
30.	continuous beams	YES	
31.	Theorem of three moments	YES	
32.	Derivations	YES	
33.	calculations of reactions	YES	
34.	shear force and bending moment diagrams	YES	
UNIT IV THEORY OF COLUMNS			
35.	Axial loaded columns	YES	T1/R1
36.	Eccentrically loaded columns	YES	
37.	Laterally loaded columns	YES	
38.	Types of columns	YES	
39.	Both ends fixed derivation	YES	
40.	Both ends are hinged	YES	
41.	One end fixed and other end hinged	YES	
42.	One end fixed and other end free	YES	
43.	Formula applications	YES	
44.	combined bending and axial	YES	
45.	Euler's formula	YES	

46.	long struts		
47.	practical applications	YES	
48.	Rankine's Gordon's formula	YES	
49.	Problem solving	YES	
50.	beam columns	YES	
UNIT V THICK CYLINDERS			
51.	Lame's equation	YES	T1/R1
52.	Formula applications	YES	
53.	shrink fit compound cylinders	YES	
54.	wire wound cylinders	YES	
55.	deflection of trusses	YES	
56.	Derivations	YES	
57.	Castigliano's Theorem	YES	
58.	dummy unit load method	YES	
59.	Derivations	YES	
60.	Williotmohr's diagram	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
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.

Evaluation Strategies

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

Prepared by: Mr. K. Sathishkumar , Assistant Professor , Department of Civil **Dated :**

BCE401- THEORY OF STRUCTURES

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.

BCE401- THEORY OF STRUCTURES

Course Teacher	Signature
Mr. K. Sathishkumar	
Ms.M.Buvaneshwari	

Course Coordinator **HOD/Civil**