Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BCE301 - APPLIED MECHANICS

Third Semester, 2017-18 (Odd Semester)

Course (catalog) description

To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders. To know the mechanism of load transfer in beams, the induced stress resultants and deformations. To understand the effect of torsion on shafts and springs. To analyze a complex two dimensional state of stress and plane trusses.

Compulsory/Elective course : Compulsory for Civil students

Credit/ Contact hours : 4 credits/ 60 hours

Course Coordinator : Ms. Rinu Isah R J, Assistant Professor, Department of Civil Engineering

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms.Hemapriya M	Second year Civil	Civil Block		meihemapriya@gmail.com	9.00 - 9.50 AM
Ms. Rinu Isah R J	Second year Civil	Civil Block		rinuisah@gmail.com	12.45 - 1.15 PM

Relationship to other courses:

Pre –requisites : BME202 Engineering Mechanics
Assumed knowledge : Basic knowledge about to design of various structural components.
Following courses : BCE401 Theory of Structures, BCE504 Reinforced Concrete Structures - I

Syllabus Contents

UNIT I SIMPLE STRESSES AND STRAINS **12 HOURS**

Tension, compression and shear stress - Hook's law - simple problems -compound bars - Relationship between elastic constants - Thermal stresses.

UNIT II PRINCIPAL STRESSES& TORSION **12 HOURS**

Combined stresses – Principles stress and principal planes – Mohr's circle - stresses in thin cylinders and shells. Theory of torsion – Strain energy in torsion – Torsion of circular shafts – shear stresses due to torsion of Closed and Open coiled helical springs.

UNIT III ANALYSIS OF PLANE TRUSSES **12 HOURS**

Stability and Equilibrium of plane frames, Perfect Frames, Types of trusses – Analysis of forces in truss members - Method of joints – Methods of sections – Tension coefficient method – Graphical method.

UNIT IV BEAMS & BENDING **12 HOURS**

Beams and support conditions - Types of supports - Shear force and bending moment – Dynamics for simply supported beams, cantilevers and overhanging beams with concentrated and / distributed loads. Theory of simple bending – bending stress distribution – shear stress distribution - leaf springs.

UNIT V STRAIN ENERGY **12 HOURS**

Strain energy due to axial force, bending moment, flexural and torsional shear – Resilience stresses due to impact and suddenly applied loads.

TEXT BOOKS:

1. Ramamurtham S & Narayanan R, Strength of Materials , Dhanpat Rai Publication 2008
2. Bansal R.K, Engineering Mechanics and Strength of Materials, Laxmi Publications (P) Ltd. New Delhi 2010

REFERENCE:

1. Egor P, Popov, Introduction of Mechanics of Solids,1998.
2. Ryder G.H. Strength of Materials, Macmillan India,2002.
3. Khurmi R.S, A Text Book of Engineering Mechanics S.Chand& Co, 2012.
4. Srinath L S, Advanced Mechanics of Solids, Tata McGraw Hill Co, 2009.
5. Jain O.P. &.Jain B.K, Theory and Analysis of Structures Vol I & II 2012,2011

Computer usage: Nil

Professional component

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

Broad area : Analysis of Structures

Test Schedule

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

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

Mapping of Instructional Objectives with Program Outcome

To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders. To know the mechanism of load transfer in beams, the induced stress resultants and deformations. To understand the effect of torsion on shafts and springs. To analyze a complex two dimensional state of stress and plane trusses	Correlates to program outcome		
	H	**M**	**L**
1.To apply the fundamental concepts of stress and strain in the design of various structural components and machines	a	C,d	i
2.To analyze and design shafts to transmit required power	a,e	b,c,d	i
3.To analyze about the force in member Truss with different methods	a	b,c,d	i
4.To determine the bending, shear stresses and deflection produced in a beam subjected to system of loads	a	C,d	i
5.To determine stresses due to impact and suddenly applied loads	a,e	c,d	i

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I SIMPLE STRESSES AND STRAINS			
1.	Tension	No	[T2, R4]
2.	compression	No	
3.	shear stress	No	
4.	Hook's law	No	
5.	simple problems	yes	
6.	compound bars	yes	
7.	Relationship between elastic constants	yes	
8.	Thermal stresses	yes	
UNIT II PRINCIPAL STRESSES& TORSION			
9.	Combined stresses	No	[T2, R1]
10.	Principles stress	yes	
11.	principal planes	yes	
12.	Mohr's circle	yes	
13.	stresses in thin cylinders	yes	
14.	stresses in thin shells	yes	
15.	Theory of torsion	No	
16.	Strain energy in torsion	yes	
17.	Torsion of circular shafts	No	
18.	shear stresses due to torsion of Closed coiled helical springs	yes	
19.	shear stresses due to torsion of Closed and Open coiled helical springs.	yes	
UNIT III ANALYSIS OF PLANE TRUSSES			
20.	Stability	No	[T1, T2, R4]
21.	Stability and Equilibrium of plane frames	yes	
22.	Stability and Equilibrium of Perfect Frames	yes	
23.	Types of trusses	No	
24.	Analysis of forces in truss members	yes	
25.	Analysis of forces in truss members	yes	
26.	Method of joints	yes	
27.	Methods of sections	yes	
28.	Tension coefficient method	yes	
29.	Graphical method	yes	
UNIT IV BEAMS & BENDING			
30.	Beams	No	[T1, T2, R2]
31.	support conditions	No	
32.	Types of supports	No	
33.	Shear force	No	
34.	bending moment	No	
35.	simply supported beams	No	
36.	Cantilevers beams	No	
37.	overhanging beams	No	
38.	shear stress distribution	No	

39.	Dynamics for simply supported beams with concentrated loads	yes	
40.	Cantilevers with concentrated loads	yes	
41.	overhanging beams with concentrated loads	yes	
42.	Dynamics for simply supported beams with distributed loads	yes	
43.	Cantilevers with distributed loads	yes	
44.	overhanging beams with distributed loads	yes	
45.	Theory of simple bending	yes	
46.	bending stress distribution	No	
47.	leaf springs	yes	
UNIT V STRAIN ENERGY			
48.	Strain energy	No	[T1, R2]
49.	axial force	No	
50.	bending moment	No	
51.	flexural	No	
52.	torsional shear	No	
53.	impact	No	
54.	Strain energy due to axial force	yes	
55.	Strain energy due to bending moment	yes	
56.	Strain energy due to flexural	yes	
57.	Strain energy due to torsional shear	yes	
58.	Resilience stresses	No	
59.	Resilience stresses due to impact loads.	yes	
60.	Resilience stresses due to suddenly applied loads.	yes	

Draft Lecture Schedule

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: Ms Rinu Isah R J Assistant Professor , Department of Civil **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
Ms.Rinu Isah R J	
Ms.Hemapriya M	

Course Coordinator **HOD/CIVIL**