

## Academic Course Description

<p style="margin: 0;">BHARATH UNIVERSITY</p> <p style="margin: 0;">Faculty of Engineering and Technology</p> <p style="margin: 0;">Department of Civil Engineering</p> <p style="margin: 0;"><b>BCE703- DESIGN OF STEEL STRUCTURES</b></p> <p style="margin: 0;"><b>Seventh Semester, 2017 -18 (Odd Semester)</b></p>
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### Course (catalog) description

The purpose of this course is to develop an in-depth knowledge in the area of design of steel structure with the latest code of practice as per the Indian Standard. On completion of this course student gain good confidence in designing major steel structures like bridge plate girders, industrial structures like gantry girders, water tanks, support structures, high rise chimneys and pre-engineered thin walled structures.

**Compulsory/Elective course** : Compulsory for Civil students

Credit / Contact hours : 4 credits / 60 hours

Course Coordinator : Dr.S.J.Mohan, Professor

**Instructors** :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Dr.S.J.Mohan,	Final year Civil	Civil Block		mohansjm@yahoo.com	2.30 – 3.30 PM

### Relationship to other courses:

Pre –requisites : BCE404 - BASIC STRUCTURAL DESIGN

Assumed knowledge : Basic knowledge in STRUCTURAL DESIGNAL

Following courses : -Nil-

### Syllabus Contents

#### UNIT I PLATE GIRDER

12

Design of plate girders – web and flange design – curtailment of flange plates – Design of stiffeners and splices – Design of gantry girder.

#### UNIT II COLUMNS SUBJECTED TO COMBINED BENDING AND AXIAL LOADS

12

Design of simple and built up columns subject to combined bending and axial loads - design of column base and connections to foundation.

#### UNIT III LIGHT GAUGE STEEL SECTIONS

12

Behavior – Design of flexural and compression members – Design of self supporting steel chimneys.

#### UNIT IV STEEL WATER TANKS

12

Design of overhead rectangular, cylindrical and pressed steel tanks including the design of staging and foundations.

#### UNIT V PLASTIC THEORY

12

Shape factor – plastic hinge – plastic moment – plastic analysis of beams - design of beams.

**TEXT BOOKS:**

1. Gambhir. M.L., “Fundamentals of Structural Steel Design”, McGraw Hill Education • India Pvt. Ltd., 2013
2. Shiyekar. M.R., “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd., • Learning Pvt. Ltd., 2nd Edition, 2013.
3. Subramanian.N, “Design of Steel Structures”, Oxford University Press, New Delhi, • 2013.

**REFERENCES:**

1. Narayanan.R.et.al. “Teaching Resource on Structural Steel Design”, INSDAG, Ministry • of Steel Publications, 2002
2. Duggal. S.K, “Limit State Design of Steel Structures”, Tata McGraw Hill Publishing • Company, 2005
3. Bhavikatti.S.S, “Design of Steel Structures” By Limit State Method as per IS:800–2007, • IK International Publishing House Pvt. Ltd., 2009
4. Shah.V.L. and Veena Gore, “Limit State Design of Steel Structures”, IS 800–2007 • Structures Publications, 2009.
5. IS800 :2007, General Construction In Steel – Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

**Computer usage:** Planning, marking Auto Cad

**Professional component**

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

**Broad area:** Measuring | Leveling | Set outs | Marking

**Test Schedule**

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

## Mapping of Instructional Objectives with Program Outcome

This Course is to introduce the principles of various design methods and applications to Civil Engineering projects.	Correlates to program outcome		
	H	M	L
1. Theory of plate girders, design concepts design problems in civil engineering applications. Importance of stiffeners, plate girder stiffeners, bearing stiffeners and their design. Problems in plate girders.	a,e,	b,d	
2. Theory of columns, design problems in column design, built up section for columns. Industrial columns like laced, battened and column exposed to axial and biaxial moment.	b	e	
3. Introduction to light gauge steel sections, design of basic structural elements like beams and columns.	a,e		
4. Design requirement for steel water tanks, staging, pressed steel water tanks and Chimney design.	a	d	
5. Requirements for the formation plastic hinge in a section, plastic moment of resistance, shape factor, hinge formation in structural members and the mechanism.		e	

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

### Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
<b>UNIT I PLATE GIRDER</b>			
1.	Definition beams and its response to external loads	No	[T1, R2]
2.	Design of steel beams	Yes	
3.	Problems	Yes	
4.	Problems	Yes	
5.	Theory of plate girder, sectional classification, web stiffeners	No	
6.	Design of plate girders	Yes	
7.	Design of stiffeners in heavy shear zone	Yes	
8.	Problems	Yes	
9.	Bolted and welded plate girders	Yes	
10.	Problems	Yes	
11.	Design of bearing stiffeners	Yes	
12.	Problems		
<b>UNIT II COLUMNS SUBJECTED TO COMBINED BENDING AND AXIAL LOADS</b>			
13.	Theory of columns (short, intermediate and long).	No	[T2, R4]
14.	Axially loaded column design	Yes	
15.	Problems	Yes	
16.	Problems	Yes	
17.	Built up section column design	Yes	
18.	Problems	Yes	
19.	Problems	Yes	
20.	Built up members (laced)	Yes	
21.	Problems	Yes	
22.	Built up members (battened)	Yes	
23.	Column with biaxial moment design	Yes	
24.	Problems	Yes	
<b>UNIT III LIGHT GAUGE STEEL SECTIONS</b>			
25.	Stiffened and un-stiffened compression elements	No	[T1, R3]
26.	problems	Yes	
27.	problems	Yes	
28.	problems	Yes	
29.	Determination of permissible stress in stiffened and un-stiffened elements	Yes	
30.	Problems	Yes	
31.	Design of beams using light gauge sections	Yes	
32.	Problems	Yes	

33.	Calculation of shape factors for compression members	Yes	
34.	Problem	Yes	
35.	Design of compression members	Yes	
36.	Problems	Yes	
<b>UNIT IV STEEL WATER TANKS</b>			
37.	Load calculation in rectangular water tanks	Yes	[R1]
38.	Problems	Yes	
39.	Design of stiffeners	Yes	
40.	Problems	Yes	
41.	Design of circular water tanks	Yes	
42.	Problems	Yes	
43.	Design of pressed water tanks	Yes	
44.	problems	Yes	
45.	Wind load calculation and Design of staging	Yes	
46.	problems	Yes	
47.	Design of foundation	Yes	
48.	Problems	Yes	
<b>UNIT V PLASTIC THEORY</b>			
49.	Shape factor calculation	Yes	[T1, R3]
50.	problems	Yes	
51.	For rolled steel section (shape factor)	Yes	
52.	Problems	Yes	
53.	Calculation of plastic moment of resistance	yes	
54.	For rectangular section	Yes	
55.	For circular section	Yes	
56.	Analysis by plastic hinge analysis	yes	
57.	Continuous beam	Yes	
58.	Fixed beams	Yes	
59.	Beam design using plastic theory	Yes	
60.	problem	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%

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

**Dated :**

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**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.

<b>Course Teacher</b>	<b>Signature</b>
Dr. S.J.Mohan	

**Course Coordinator**

**HOD/CIVIL**