GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI

STATE PROJECT COORDINATION UNIT

(Established Under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	DESIGN OF STEEL STRUCTURES
Course Code	CE / 2020 / 006
Course Duration	120 Hours
Minimum Eligibility Criteria and Pre-requisites (if any)	Diploma/Graduates
Course Objectives	Training Module has been designed for the Participants to - Understand the limit state design of structural steel members subjected to tensile, Compressive, bending loads including connections. - Understand types of bolted connections. - Understand the design procedure for tension,compression members and the Code of practice IS 800 – 2007.
Course Outcomes	At the end of the training, participants will be able to - Analyse and design tension members and columns - Analyse and design beams - Analyse and design simple bolted and welded connections - Analyse and design plate girder
Expected Job Roles	• Steel Designer; Design Checker, Steel Detailer

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
CE / 2020 / 006	DESIGN OF STEEL STRUCTURES	Theory	70	10	20	3 Hours
		Practical	50	40	80	
		Total	120	50	100	

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**INTRODUCTION**	09	03
	Common steel structures-Properties of steel - Structural steel sections - Load combination-Limit State Design- Strength-Deflection Limits- Stability check.		
II	**CONNECTIONS IN STEEL STRUCTURES**	13	10
	Bolted connections -Classification of bolts - Advantages, Disadvantages of bolted connections - Types of bolted connections - Efficiency of joint - Welded connections - Advantages, Disadvantages of welded connections -Types of welded connections – Design stresses in welds- Eccentric connection- Combined Axial and Shear stress.		
III	**TENSION MEMBERS**	10	07
	Design strength of a tension members- Design procedures -- Design of tension splice - Lug angles.		
IV	**COMPRESSION MEMBERS**	12	10
	Bucklingclass of cross section - Types of compression members - Theory of columns - Basis of currentcodalprovision for compression member design - Slenderness ratio - Design of single section and compound section - Compression members - Design of laced and battened type columns - Design of column bases - Gusseted base.		
V	**BEAMS**	12	10
	Design of laterally supported and unsupported beams - Design of Built up sections - Design of bolted beam connections-Design of welded beam connections- Design of plate girders - Intermediate and bearing stiffeners - Flange and web splices.		
VI	**ROOF TRUSSES**	14	10
	Bracings -Types of roof trusses -Nomenclature of members of trusses - Pitch of trusses -Spacing of trusses – Purlins-Sheeting - Loads -Load combination -Loads on trusses - Analysis of trusses -Grouping of members -Design of members -Design of joints -End bearing.		
TOTAL THEORY AND PRACTICAL HOURS		70	50
TOTAL HOURS		120	

	PRACTICAL EXERCISES (50 HOURS)
SL.NO.	**List of Experiments**
1.	Draw types of rolled steel sections, identify the type of specimen and calculate load for given problem using limit state method.
2.	Do single lap joint and double lap joint and find the efficiency of joint for the given problem
3.	Do single cover butt joint and double cover butt joint and find strength of joint given for the Problem
4.	Identify type of welded joint specimen and design the weld connection for the given problem.
5.	Draw lug angle and design the section of tension member provided
6.	Identify the type of laced system provided and design laced column for the given figure
7.	Assemble the column and design the load carrying capacity of column in the given exercise
8.	Identify the type of gusset plate connection and design it
9.	Assemble the beam and design simply supported beam
10.	Identify type of roof truss given and determine the design of wind pressure for the given roof.

HARDWARE REQUIREMENT

SL. NO.	LIST OF TOOLS / EQUIPMENTS / MATERIALS
1.	Specimens of Rolled Steel Sections
2.	Specimens of Welded Joint
3.	Specimens of Roof Truss Model
4.	Specimens of Gusset Plate
5.	Bolts and Steel Plates for Lap Joint and Butt Joint
6.	Beam and Column Model for assembling
7.	Indian Standard Codes IS800:2007; IS875(Part 1 to Part 5):1987

SOFTWARE REQUIREMENT

SL. NO.	NAME OF THE SOFTWARE
1.	NIL

REFERENCE BOOKS

SL. NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1.	Design of Steel Structures By Limit State Method as per IS:800–2007	Bhavikatti. S.S.	IK International Publishing House Pvt. Ltd.,2009
2.	Steel Structure Design and Practice	Subramanian. N.	Oxford University Press
3.	Indian Standard Codes IS800:2007&IS875(Part 1 to Part 5):1987	---	----

ASSESSMENT AND CERTIFICATION

S.No	Criteria for Assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the CIICP Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 Word/Objective type questions).
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the CIICP Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in the End Theory and Practical examination.
6.	On successful completion of training, Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S. No.	Description	Maximum Marks
1.	THEORY EXAM	20
2.	PRACTICAL EXAM	
	a. ASSEMBLING / IDENTIFYING THE GIVEN STRUCTURE	20
	b. DESIGN PROCEDURE / CALCULATION	30
	c. RESULT / OUTPUT	10
	d. RECORD	20
	TOTAL	**100**

CE / 2020 / 006 – DESIGN OF STEEL STRUCTURES
(Maximum Marks: 20)

(N.B: Answer any **Twenty** Questions)   **20 x 1 = 20 Marks**

1. Steel is mainly an alloy of ……………

    a) Iron and Carbon   b) Sulphur and Zinc

    c) Zinc and Tin   d) Phosphorous and Tin

2. Which of the following is a disadvantage of steel?

    a) High Strength per Unit Mass   b) High Durability

    c) Susceptible to corrosion   d) Reusable

3. Poisson's Ratio of Steel is ………….

    a) 1.0   b) 0.1

    c) 0.3   d) 2.0

4. The joint which is provided by overlapping of one plate to other is ……………

    a) Butt Joint   b) Lap Joint

    c) Weld Joint   d) Bolt Joint

5. The efficiency of joint is denoted by symbol ……………

    a) S   b) η

    c) Fy   d) P

6. Which of the following is not advantage of welded connections?

    a) TheConnection Is Rigid.

    b) The Process Is Not Quicker

    c) Aesthetic appearance is good.

    d) Airtight and water tight

7. Which of the following weld is suitable for lap and t- joint?

    a) Fillet Weld   b) Plug Weld

    c) Slot Weld   d) Groove Weld

8. The length of end connections of heavily loaded tension members may be reduced by using …………..

    a) Lug Angle

    b) Obtuse Angle

    c) Acute Angle

    d) Log Angle

9. Tension splice is used when …………………

    a) Size of member not changes

    b) Size of member changes at different length

    c)Size of member changes at equal length

    d)None of above

10. What is a compression member?

    a) Structural Member Subjected To Tensile Force

    b) Structural Member Subjected To Bending Moment

    c) Structural Member Subjected To Compressive Force

    d) Structural Member Subjected To Torsion

11. The effective length of compression member is ………………

    a) Distance Between end Of Member

    b) Distance between End Point and Mid Point

    c) Distance Between Point Of Contra flexure

    d) Distance Between End Point And Centroid

12. Lug Angles are ……………

    a) Addition Angle Used To Reduce Joint Length

    b) Addition Angle Used To Increase Joint Length

    c) Addition Angle Used To Aesthetic View

    d) Addition Angle Used To Fire Resistance

13. How many types of column bases are used commonly?

    a)2   b)4

    c)3   d)7

14) What Is a Beam?

    a) Structural Member Subjected To Transverse Load

    b) Structural Member Subjected To Axial Load

    c) Structural Member Subjected To Transverse Load

    d) Structural Member Subjected To Transverse Load

15. Which of following aspects need not to be considered in beam design?

    a) Deflection

    b) Material

    c) Buckling

    d) Lateral Support

16. The design bending strength of laterally unsupported beams is governed by

    a) Torsion

    b) Bending

    c) Lateral Torsional Buckling

    d) Yield Stress

17) Flanges are designed for resisting

    a) Shear Force

    b) Axial Force

    c) Bending Moment

    d) Corrosion

18. The economical spacing of trusses is …………… of span.

   a) 1/3 To 1/10

   b)1/3 To 1/5

   c) 1/3 To 1/6

   d)1/2 To 1/5

19. The pitch of roof truss should be …………………..

   a) 1/4 To 1/6

   b)1/2 To1/4

   c)1/4 To 1/7

   d)1/4 To 1/8

20. What are Purlins?

   a) Beam Provided In Foundation

   b) Beam Provided On Plinth Level

   c) Beam Provided Over Trusses To Support Roofing

   d) Beam Provided On Plinth Level

21.Elastic Modulus of steel is…….

   a) $1.5 \times 10^9 N/mm^2$

   b) $2.0 \times 10^5 N/mm^2$

   c) $1.7 \times 10^5 N/mm^2$

   d) $1.5 \times 10^9 N/m^2$

22.Which Of Following Is disadvantages Of bolted Connections?

   a) Used for making end connection

   b) Hold down column bases

   c) Cost of materials is high

   d) Used as separators for purlins

23. Long compression members will …….

   a) Not buckle

   b) Buckle in elastically

   c) Buckle plastically

   d) Buckle elastically

24. Member used to carry wall loads over wall openings are called

   a) Purlin

   b) Rafter

   c) Girder

   d) Lintels

25. The number of joints in truss is denoted by letter …..

   a)S   b)t

   c)j   d)x