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| Department of Civil Engineering | LP: CE16604  Rev. No: 01  Date: 13-12-2019 |
| B.E/B.Tech/M.E/M.Tech : B.E Civil Engineering Regulation: 2016  PG Specialisation : NA  Sub. Code / Sub. Name : CE16604 Design of Steel and Timber Structures  Unit : I Introduction of timber and steel structures |

Unit Syllabus: Overview on timber structures – Study of properties and strength of natural and laminated timber – Allowable stresses in compression, tension and flexure as per IS Code – Applications – connection types – Design philosophies for timber structures –Properties of steel – steel table – Structural steel sections, availability and applications –Design Philosophies - Limit State Design Concepts – Loads on Structures – IS 800 :2007 codal provisions

Objective: To impart knowledge on basic concepts of limit state design and steel connections and basics of timber design

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| Session  No \* | Topics to be covered | Ref | Teaching Aids |
| 1 | Introduction to timber structures – applications, examples | 6 | PPT |
| 2 | Study of properties and strength of natural and laminated timber | 6 | PPT |
| 3 | Allowable stresses in compression, tension and flexure as per IS Code | 6 | PPT |
| 4 | Applications – connection types | 6 | PPT |
| 5 | Design philosophies for timber structures | 6 | PPT |
| 6 | Introduction to steel structures – Common steel structures, merits and demerits of steel structures, campus visit | 4(pg 131-260) | PPT |
| 7 | properties of structural steel, types of steel sections, hot rolled steel | 5(pg 1-5) | PPT, models |
| 8 | considerations in steel design, loads and combinations, structural analysis | 5(pg 1-5) | PPT |
| 9 | Design philosophies, Limit State Design Concepts, updates in latest code (IS800-2007) | 2, 4(pg 82-126) | PPT |
| **Content beyond syllabus covered (if any):**  Campus visit for steel structures | | | |

\* Session duration: 50 minutes

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| Sub. Code / Sub. Name: CE16604 Design of Steel and Timber Structures  Unit : II Connections and Tension Members |

###### Unit Syllabus : Introduction to connections – types based on rigidity –Merits and limitations of riveted, welded and bolted connections – Design of bolted and welded joints – Eccentric connections – Efficiency of joints – Introduction to tension members – Net area – Net effective sections for angles and Tee in tension – analysis and design of tension members – Use of lug angles – Concept of shear lag – splice connection.

Objective: To impart knowledge about design concepts of connections and tension members.

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| Session  No \* | Topics to be covered | Ref | Teaching Aids |
| 10 | Metal joining methods using rivets, welding, bolting – classification, fabrication, illustrations, terminologies, merits and demerits of each, Design of riveted connections(incl numericals) | 4(pg 324-342) | PPT, Chalk and board |
| 11 | Bolted connections – IS 800-2007 specifications, assumption and principles in the design, possible failure modes and the design criteria for them (incl numericals) | 2, 4(pg 324-345) | PPT |
| 12 | Bolted connections – design of joints (incl numericals), design for eccentric connections (incl numericals) | 2, 4(pg 374-390) | Chalk and board |
| 13 | Bolted connections – efficiency of joints (incl numericals) | 2, 4(pg 324-345) | PPT |
| 14 | Welded connections – specifications in IS800-2007, design stresses (incl numericals) | 2, 4(pg 437-473) | PPT |
| 15 | Introduction on tension members, types of sections used as tension member, gross area and net area, net effective sections for angles and tees, IS800-2007 provisions | 2, 4(pg 560-580) | PPT |
| 16 | Design of tension member with connections – simple and compound member (incl numericals) | 2, 4(pg 580-581) | Chalk and board |
| 17 | Lug angles – use, numericals | 2, 4(pg 581-583) | PPT, Chalk and board |
| 18 | Design of tension splice (incl numericals), Concept of shear lag with illustrations | 2, 4(pg 583-584) | PPT, Chalk and board |
| **Content beyond syllabus covered (if any):** | | | |

\* Session duration: 50 mins

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| Sub. Code / Sub. Name: CE16604 Design of Steel and Timber Structures  Unit : III Compression Memebers |

Unit Syllabus : Types of compression members – Theory of columns – buckling curves – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base – splice connections.

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| Session  No \* | Topics to be covered | Ref | Teaching Aids |
| 19 | Introduction on compression members, types, theory of columns | 4(pg 683-710) | PPT |
| 20 | IS800-2007 codal provision for compression member design, terminologies, buckling, slenderness ratio, buckling curves | 2 | PPT |
| 21 | Analysis of columns – load carrying capacity of simple and compound member (incl numericals) | 2, 5(pg 114-121) | Chalk and board |
| 22 | Design of compression members – procedure, effective length, buckling class | 2, 4(pg 716-735) | PPT |
| 23 | Design of laced columns - numericals | 2, 5(pg 128-131) | Chalk and board |
| 24 | Design of battened columns - numericals | 2, 5(pg 128-131) | Chalk and board |
| 25 | Column splices – Applications and design (incl numericals) | 2 | PPT |
| 26 | Column bases – Applications and design (incl numericals) | 2, 4(pg 754-758) | Chalk and board |
| 27 | Gusseted base – Applications and design (incl numericals) | 2 | Chalk and board |
| **Content beyond syllabus covered (if any):** | | | |

\* Session duration: 50 mins

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| Sub. Code / Sub. Name: CE66 CE16604 Design of Steel and Timber Structures  Unit : IV Flexural Members |

Unit Syllabus : Review of elastic bending theory – plastic analysis of beams – plate buckling theory – classification of cross sections – Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders.

Objective: To impart knowledge about design concepts of beams

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| Session  No \* | Topics to be covered | Ref | Teaching Aids |
| 28 | Revision of elastic bending theory | Strength of materials | Chalk and board |
| 29 | Plastic moment carrying capacity of a section and plastic analysos | 5(pg 157-166) | PPT |
| 30 | Introduction to plate buckling theory and use of classification of sections | 2 | PPT |
| 31 | Types of beams, cross sections, design procedure | 2, 4(pg 807- 810) | PPT |
| 32 | Design of laterally supported beams (incl numericals) | 2, 5(pg 167-172) | Chalk and board |
| 33 | Design of laterally unsupported beams (incl numericals) | 2, 4(pg 841-855) | Chalk and board |
| 34 | Built up beams, Beams subjected to uniaxial bending | 2, 4(pg 875-877) | PPT |
| 35 | Built up beams, Beams subjected to biaxial bending | 2, 4(pg 875-877) | PPT |
| 36 | Plate girders – elements, design procedure | 2, 5(pg 199-226) | PPT |
| **Content beyond syllabus covered (if any):** | | | |

\* Session duration: 50 mins

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| Sub. Code / Sub. Name: CE16604 Design of Steel and Timber Structures  Unit : V Industrial Structures |

Unit Syllabus : Wind loads and analysis of structure– structural configurations – Roof trusses – Design of purlin and elements of truss– Design of gantry girder – Design considerations for chimney and water tank.

Objective: To impart knowledge about design procedures for some of the industrial structures.

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| Session  No \* | Topics to be covered | Ref | Teaching Aids |
| 37 | Industrial structures – general overview, classifications, illustrations, elements | 4(pg 1129-1173) | PPT |
| 38 | Roof trusses – applications, elements, design loads | 5(pg227-229) | PPT |
| 39 | Wind load – codal provisions IS875, numerical on wind pressure calculation | 3, 5(pg 231-238) | PPT |
| 40 | Numericals on wind pressure calculation | 3, 5(pg 240-243) | Chalk and board |
| 41 | Design of purlins and elements of truss | 2, 5(pg239-240) | Chalk and board |
| 42 | Gantry Girders – applications, terminologies, specifications, design | 4(Pg 1016-1051) | PPT |
| 43 | Design considerations for steel chimney and codal provisons | 4(Pg 1016-1051) | PPT |
| 44 | Design considerations for steel water tank | 4 | PPT |
| 45 | Analysis using STADD Pro for steel frame |  | PPT |
| **Content beyond syllabus covered (if any):**  Analysis using STADD Pro for steel frame | | | |

**\* Session duration: 50 mins**

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| Sub Code / Sub Name: CE16604 Design of Steel and Timber Structures |

**REFERENCES:**

1. “Teaching Resources for Structural Steel Design – Vol. I & II”, INSDAG, Kolkatta.
2. IS 800-2007 Indian Standard - General Construction in Steel – code of practice (3rd Revision)
3. IS875 (Part 3)
4. Subramanian, N., “Design of Steel Structures”, Oxford Publishing House, 2010.
5. Shah,V.L., Venna Gore, “Limit State Design of Steel Structures”, Structures Publication, 2009
6. IS 883 : 1994

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|  | Prepared by | Approved by |
| Signature |  |  |
| Name | Ruby Freya | P Venkateswara Rao |
| Designation | Assistant Professor, Department of Civil Engineering | Professor and Head in charge, Department of Civil Engineering |
| Date | 13-12-2019 |  |
| Remarks \*: | | |
| Remarks \*: | | |

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD