

CE3601

DESIGN OF STEEL STRUCTURAL ELEMENTS

L T P C

3 0 0 3

COURSE OBJECTIVE

- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections and to provide the students the tools necessary for designing structural systems such as rooftrusses and gantry girders as per provisions of current code (IS 800 - 2007) of practice.

UNIT I INTRODUCTION TO STRUCTURAL STEEL AND DESIGN OF CONNECTIONS 9

General -Types of Steel -Properties of structural steel - I.S. rolled sections - Concept of Limit State Design - Design of Simple and eccentric Bolted and welded connections - Types of failure and efficiency of joint – prying action - Introduction to HSFG bolts

UNIT II DESIGN OF TENSION AND COMPRESSION MEMBERS 9

Behaviour and Design of simple and built-up members subjected to tension - Shear lag effect-Design of lug angles - tension splice - Behaviour of short and long columns - Euler's column theory-Design of simple and built-up compression members with lacings and battens - Design of column bases - slab base and gusseted base

UNIT III DESIGN OF BEAMS 9

Design of laterally supported and unsupported beams - Design of built-up beams - Design of plate girders

UNIT IV INDUSTRIAL STRUCTURES 9

Design of roof trusses – loads on trusses – purlin design using angle and channel sections – truss design, Design of joints and end bearings–Design of gantry girder - Introduction to pre-engineered buildings

UNIT V PLASTIC ANALYSIS AND DESIGN 9

Introduction to plastic analysis - Theory of plastic Analysis - Design of continuous beams and portal frames using plastic design approach

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- CO1** Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths
- CO2** Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria
- CO3** Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams
- CO4** Identify and compute the design loads on Industrial structures, and gantry girder
- CO5** Find out ultimate load of steel beams and portal frames using plastic analysis

TEXT BOOKS

1. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010
2. Bhavikatti S.S, Design of Steel Structures, I.K International Publishing House, New Delhi, 2017.

REFERENCES

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
3. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014
4. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016

COs- PO's & PSO's MAPPING

PO/PSO	Course Outcome					Overall Correlation of CO s to POs
	CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)						
PO1	Knowledge of Engineering Sciences	2	2	2	3	2
PO2	Problem analysis	2	2	2	2	3
PO3	Design / development of solutions	3	3	3	3	3
PO4	Investigation				2	2
PO5	Modern Tool Usage		2	2	2	2
PO6	Engineer and Society			2		2
PO7	Environment and Sustainability	2		2		2
PO8	Ethics			2		2
PO9	Individual and Team work			2		2
PO10	Communication				1	1
PO11	Project Management and Finance		2	2	2	2
PO12	Life Long Learning	2	2	2	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)						
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues				3	3

CE3602

STRUCTURAL ANALYSIS II

**L T P C
3 0 0 3**

COURSE OBJECTIVE:

- To learn the method of drawing influence lines and its uses in various applications like beams, bridges and plane trusses and to analyse arches and suspension bridges

UNIT I INFLUENCE LINES FOR DETERMINATE STRUCTURES 9

Introduction to moving loads, Concept of Influence Lines, Influence lines for reactions in statically determinate structures –Influence lines for shear force and bending moment in beam section – Calculation of critical stress resultants due to concentrated and distributed moving loads - Influence lines for member forces in pin jointed plane frames.

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAMS 9

Muller Breslau's principle - Influence line for support reactions, shearing force and bending moments for indeterminate beams - propped cantilevers, fixed beams and continuous beams.

UNIT III ARCHES 9

Arches - Eddy's theorem - Types of arches – Analysis of three-hinged, two-hinged and fixed arches - Parabolic and circular arches - influence lines, rib shortening– Settlement and temperature effects.

UNIT IV SUSPENSION BRIDGES AND SPACE TRUSSES 9

Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders - Introduction to analysis of space trusses using method of tension coefficients.

UNIT V APPROXIMATE ANALYSIS OF FRAMES**9**

Approximate analysis for gravity loadings - substitute frame method for maximum moments in beams and columns - Approximate analysis for horizontal loads - portal method and cantilever method - assumptions - axial force, shearing force and bending moment diagrams.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Students will be able to ;

- CO1** Draw influence lines for statically determinate structures and calculate critical stress resultants.
- CO2** Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.
- CO3** Analyse three hinged, two hinged and fixed arches.
- CO4** Analyse the suspension bridges with stiffening girders
- CO5** Analyse rigid frames by approximate methods for gravity and horizontal loads.

TEXTBOOKS:

1. Bhavikatti,S.S, Structural Analysis, Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.

REFERENCES:

1. Negi.L.S and Jangid R.S ., Structural Analysis , Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co. Ltd., Third Edition, 2010.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.
4. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

COs- PO's & PSO's MAPPING

PO/PSO	Course Outcome					Overall Correlation of CO s to POs
	CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)						
PO1	Knowledge of Engineering Sciences	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3
PO3	Design / development of solutions	3	3	3	3	3
PO4	Investigation	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1
PO8	Ethics	1	1	1	1	1
PO9	Individual and Team work	3	3	3	3	3
PO10	Communication	2	2	2	2	2
PO11	Project Management and Finance	1	1	1	1	1
PO12	Life Long Learning	2	1	1	1	1
PROGRAM SPECIFIC OUTCOMES(PSO)						
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3

AG3601**ENGINEERING GEOLOGY****L T P C****3 0 0 3****COURSE OBJECTIVES:**

- This course will familiarize the students on the role and importance of geology in civil engineering, apart from learning the techniques of surface and subsurface investigations using geological, geophysical and geomechanical methods.

UNIT I PHYSICAL GEOLOGY AND GEOMORPHOLOGY**9**

Significance of Geology in Civil Engineering; Internal structure of the Earth; Weathering: types, engineering classification of weathered rocks and relevance to Civil Engineering; Fluvial, Marine, Glacial and Aeolian landforms and their importance in Civil Engineering; Plate tectonics and its relevance to earthquakes; Groundwater: types of aquifers, origin, movement and role of groundwater in Civil Engineering constructions.

UNIT II MINERALOGY AND PETROLOGY**9**

Physical and Chemical properties of common rock forming minerals: Quartz family, Feldspar family, Mica (Muscovite, Biotite & Vermiculite), Pyroxene (Augite & Hypersthene), Amphibole (Hornblende), Calcite, Gypsum and Clay minerals and their significance. Formation of Igneous, Metamorphic and Sedimentary rocks; Description of important rocks: Granite, Syenite, Dolerite, Basalt, Quartzite, Slate, Schist, Gneiss, Marble, Sandstone, Limestone, Shale and Conglomerate. Engineering properties of rocks: field and laboratory tests.

UNIT III STRUCTURAL GEOLOGY AND ROCK MECHANICS**9**

Attitudes of beds: Strike and Dip measurements and their relevance to civil engineering; Different types of folds, faults, joints and fractures in rocks and their significance in civil engineering constructions; Geomechanical properties of rocks: Rock Quality Designation (RQD), Rock Mass Rating (RMR) and Geological Strength Index (GSI) and their importance in various civil engineering projects.

UNIT IV GEOPROSPECTING**9**

Geological mapping techniques; Remote Sensing: Fundamentals and its role in geological mapping; Geophysical methods for subsurface investigations: Electrical, Seismic & Ground Penetrating Radar (GPR); Subsurface logging and their importance in civil engineering projects.

UNIT V GEOLOGICAL CONSIDERATIONS AND GEOHAZARDS**9**

Geological conditions necessary for designing and construction of important structures: Dams, Reservoirs, Tunnels, Road cuttings and Coastal protection; Landslides: Causes and mitigation; Earthquakes & Tsunamis: Causes and mitigation; Case studies for the above topics.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

On completion of this course, the students expected to be able to:

- CO1** Knowing the internal structure of earth and its relation to earthquakes. Landforms created by various geological agents and their importance in civil engineering.
- CO2** Getting knowledge on various minerals and rocks that can be used as construction materials and road aggregates. In addition, testing the suitability of rocks for foundation purposes.
- CO3** Studying various geological structures and their impact in engineering constructions. Further, learning the geomechanical properties of rocks and their significance in engineering projects.
- CO4** Gaining knowledge on the role of geological mapping, remote sensing and geophysics for surface and subsurface investigations. In addition, students will also gain knowledge on borehole logging techniques and their applications in civil engineering.
- CO5** Applying geological knowledge for designing and constructing major civil engineering structures, and also mitigating various geological hazards such as earthquakes, landslides and tsunamis.

TEXT BOOKS:

1. Parbin Singh, "A Textbook of Engineering and General Geology", S. K. Kataria and Sons, 2021.
2. Chenna Kesavulu, N. "Textbook of Engineering Geology", Macmillan India Ltd., 2018.

3. Venkat Reddy, D. "Engineering Geology", Vikas Publishing House Pvt. Lt, 2021.
4. Gokhale, K.V.G.K, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2019.
5. Varghese, P.C., "Engineering Geology for Civil Engineering", Prentice Hall of India Learning Private Limited, New Delhi, 2012.

REFERENCES:

1. Legget, "Geology and Engineering", McGraw Hill Book company, 1998 Blyth, "Geology for Engineers", ELBS 1995.
2. Krynine and Judd, "Principals of Engineering Geology and Geotechnics" Tata McGraw Hill, New Delhi, 2018.
3. Bell, F.G. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.

COs- PO's & PSO's MAPPING

PO/PSO	Course Outcome					Overall Correlation of CO s to POs
	CO1	CO2	CO3	CO4	CO5	
PO1 Knowledge of Engineering Sciences	2	2	2			2
PO2 Problem analysis			2	2	3	2
PO3 Design / development of solutions			3		3	3
PO4 Investigation		2	3	3	3	3
PO5 Modern Tool Usage		2		2		2
PO6 Individual and Team work		2	2		2	2
PO7 Communication					1	1
PO8 Engineer and Society	2			2	2	2
PO9 Ethics				2	2	2
PO10 Environment and Sustainability	2			2	2	2
PO11 Project Management and Finance				2	2	2
PO12 Life Long Learning				2	2	2
PSO1 Knowledge of Civil Engineering discipline		2		2	2	2
PSO2 Critical analysis of Civil Engineering problems and innovation				2	2	2
PSO3 Conceptualization and evaluation of engineering solutions to Civil Engineering Issues			2		2	2

NCC Credit Course Level 3*

NX3651 (ARMY WING) NCC Credit Course - III

L T P C
3 0 0 3

PERSONALITY DEVELOPMENT

PD 3 Group Discussion: Team Work 2

PD 4 Career Counselling, SSB Procedure & Interview Skills 3

PD 5 Public Speaking 4

BORDER & COASTAL AREAS

BCA 2 Security Setup and Border/Coastal management in the area 2

BCA 3 Security Challenges & Role of cadets in Border management 2

ARMED FORCES	3
AF 2 Modes of Entry to Army, CAPF, Police	3
COMMUNICATION	3
C 1 Introduction to Communication & Latest Trends	3
INFANTRY	3
INF 1 Organisation of Infantry Battalion & its weapons	3
MILITARY HISTORY	23
MH 1 Biographies of Renowned Generals	4
MH 2 War Heroes - PVC Awardees	4
MH 3 Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4 War Movies	6

TOTAL: 45 PERIODS

NCC Credit Course Level 3*		L T P C
(NAVAL WING) NCC Credit Course - III		
PERSONALITY DEVELOPMENT		3 0 0 3
PD 3 Group Discussion: Team Work		2
PD 4 Career Counselling, SSB Procedure & Interview Skills		3
PD 5 Public Speaking		4
BORDER & COASTAL AREAS		4
BCA 2 Security Setup and Border/Coastal management in the area		2
BCA 3 Security Challenges & Role of cadets in Border management		2
NAVAL ORIENTATION		6
NO 3 Modes of Entry - IN, ICG, Merchant Navy		3
AF 2 Naval Expeditions & Campaigns		3
NAVAL COMMUNICATION		2
NC 1 Introduction to Naval Communications		1
NC 2 Semaphore		1
NAVIGATION		2
N 1 Navigation of Ship - Basic Requirements		1
N 2 Chart Work		1
SEAMANSHIP		15
MH 1 Introduction to Anchor Work		2
MH 2 Rigging Capsule		6
MH 3 Boatwork - Parts of Boat		2
MH 4 Boat Pulling Instructions		2
MH 5 Whaler Sailing Instructions		3
FIRE FIGHTING FLOODING & DAMAGE CONTROL		4
FFDC 1 Fire Fighting		2
FFDC 2 Damage Control		2
SHIP MODELLING		3
SM Ship Modelling Capsule		3

TOTAL : 45 PERIODS

NCC Credit Course Level 3*

NX3653	(AIR FORCE WING) NCC Credit Course Level - III	L T P C
		3 0 0 3
PERSONALITY DEVELOPMENT		
PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4
BORDER & COASTAL AREAS		
BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2
AIRMANSHIP		
A 1	Airmanship	1
BASIC FLIGHT INSTRUMENTS		
FI 1	Basic Flight Instruments	3
AERO MODELLING		
AM 1	Aero Modelling Capsule	3
GENERAL SERVICE KNOWLEDGE		
GSK 4	Latest Trends & Acquisitions	2
AIR CAMPAIGNS		
AC 1	Air Campaigns	6
PRINCIPLES OF FLIGHT		
PF 1	Principles of Flight	3
PF 2	Forces acting on Aircraft	3
NAVIGATION		
NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3
AERO ENGINES		
E 1	Introduction and types of Aero Engine	3
E 2	Aircraft Controls	3

TOTAL : 45 PERIODS

CE3611	BUILDING DRAWING AND DETAILING LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE:

- To impart knowledge and skill relevant to Building drawing and Detailing lab using computer software

LIST OF EXPERIMENTS

1. Principles of planning and orientation
2. Buildings with load bearing walls and RCC roof (Plan , section , elevation)
3. Buildings with sloping roof
4. Buildings with Framed structures.

5. Building information modeling.
6. Reinforcement details of RCC structural elements (slab, beam and column)
7. Reinforcement details of footings (Isolated, stepped, combined footing)
8. Steel structures (Steel Connections detailing, beam to column connection, beam to beam connection – bolt & Weld, Roof truss & purlin)

TOTAL : 60 PERIODS

REFERENCES:

1. V.B.Sikka, "A course in Civil Engineering Drawing" S.K.Kataria & Sons Publishers, Seventh Edition, 2015.
2. D.N.Ghose, "Civil Engineering Drawing and Design" CBS Publishers & Distributors Pvt.Ltd., 2nd Edition, 2010.
3. National Building Code of India 2016 (NBC 2016)
4. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design (Third Edition), Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2017.
5. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016

COURSE OUTCOME

- On completion of the course, the student is expected to be able to
- CO1** Draft the plan, elevation and sectional view of the load bearing and framed buildings
CO2 Draw the structural detailing of RCC elements
CO3 Draw the structural detailing of RCC water tanks, footings and retaining walls
CO4 Draw the structural detailing of steel structures
CO5 Draft the structural detailing of Industrial structures

COs- PO's & PSO's MAPPING

PO/PSO	Course Outcome					Overall Correlation of CO s to POs
	CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)						
PO1	Knowledge of Engineering Sciences	3	3	3	3	3
PO2	Problem analysis	-	2	2	2	2
PO3	Design / development of solutions	-	-	-	-	-
PO4	Investigation	-	-	2	2	2
PO5	Modern Tool Usage	2	2	2	2	2
PO6	Engineer and Society	-	3	3	3	3
PO7	Environment and Sustainability	-	-	-	-	-
PO8	Ethics	1	2	2	1	2
PO9	Individual and Team work	-	3	3	3	3
PO10	Communication	-	2	2	2	2
PO11	Project Management and Finance	-	-	-	-	-
PO12	Life Long Learning	1	2	2	2	2
PROGRAM SPECIFIC OUTCOMES(PSO)						
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	-	2	2	2	2