Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IIIrd year
CE31502 DESIGN OF STEEL STRUCTURES
Semester: VI

Unit – 1: Structural Steel Products & Connections (8 Hours)

Lec	Topics
1	Introduction to structural steel design, steel as a construction material
2	Types of structural steel products (angles, channels, I-sections, plates, etc.) & designations
3	Riveted connections – types, lap & butt joints, assumptions
4	Failure of rivets & riveted joints, rivet values, efficiency of joints
5	Bolted connections – types, assumptions, failure modes
6	Welded connections – butt welds & fillet welds, design of simple welded joints
7	Eccentrically loaded connections, bracket & flange plate connections
8	Beam–beam, beam–column connections, splice connections, moment resisting connections (with sketches)

Unit – 2: Tension Members, Compression Members & Roof Trusses (8 Hours)

Lec	Topics
9	Tension members – types of sections & permissible stresses
10	Net sectional area, design of axially loaded tension members
11	Members subjected to combined tension & bending
12	Compression members – sectional shapes & slenderness ratio
13	Permissible stresses, members under axial compression
14	Compression members subjected to combined bending & axial load
15	Roof trusses – types, advantages & loadings (dead, live & wind)
16	Truss analysis, purlin design, bracing, design of truss members & connections

Unit – 3: Flexural Members & Plastic Analysis (7 Hours)

Lec	Topics
17	Flexural members – sections used & permissible stresses
18	Design of steel beams
19	Lateral buckling of beams
20	Web buckling, web crippling & use of stiffeners
21	Plastic analysis – lower bound & upper bound theorems
22	Static & kinematic methods, mechanism method
23	Combined mechanisms, collapse loads, plastic design of beams & frames

Unit – 4: Columns & Steel Foundations (7 Hours)

Lec	Topics
24	Columns as compression members – behavior & failure
25	Importance of slenderness ratio in column design
26	Design of columns using single sections
27	Design of built-up columns
28	Lacing systems – design of lacing bars
29	Battened columns – design considerations
30	Steel column bases – slab base, gusseted base & grillage foundations

Unit – 5: Built-Up Girders (6 Hours)

Lec	Topics
31	Introduction to built-up girders
32	Design of riveted plate girders
33	Design of welded plate girders
34	Curtailment of flange plates
35	Vertical & horizontal stiffeners – design
36	Bearing stiffeners & their connections

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Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE 31505: STRUCTURAL ANALYSIS-II
Semester: VI

Unit – 1: Indeterminate Arches (7 Hours)

Lec	Topics
1	Introduction to indeterminate arches & classification
2	Two-hinged arches – analysis by unit load method
3	Two-hinged arches – column analogy method
4	Influence lines for horizontal thrust
5	Influence lines for radial shear & normal thrust
6	Fixed arches – development of elastic centre method
7	Effect of rib shortening, temperature changes & lack of fit

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Unit – 2: Conventional Methods of Analysis (9 Hours)

Lec	Topics
8	Slope-deflection method – assumptions & equations
9	Application to fixed & continuous beams
10	Portal frames with vertical legs
11	Portal frames with inclined legs
12	Moment distribution method – concept & development
13	Application to beams & simple portal frames
14	Multibay and multistorey frames, gable frames
15	Kani's method – development & assumptions
16	Applications of Kani's method to frames

Unit – 3: Matrix & Column Analogy Methods (7 Hours)

Lec	Topics
17	Introduction to matrix algebra & structural matrices
18	Flexibility & stiffness coefficients
19	Direct stiffness method – formulation
20	Energy approach & flexibility method
21	Analysis of beams using stiffness method
22	Analysis of frames using stiffness method
23	Column analogy method – development & applications

Unit – 4: Influence Lines for Indeterminate Structures (6 Hours)

Lec	Topics
24	Reciprocal theorem & influence coefficients
25	Muller–Breslau's theorem
26	Influence lines for reactions & moments in continuous beams
27	Influence lines for fixed beams & arches
28	Influence lines for portal frames
29	Maxwell–Betti's theorem & Begg's deformation method

Unit – 5: Plastic Analysis & Introduction to FEM (7 Hours)

Lec	Topics
30	Stress–strain behavior of steel
31	Plastic bending & plastic hinge formation
32	Redistribution of moments & collapse mechanisms
33	Static method of plastic analysis
34	Kinematic method of plastic analysis

Lec	Topics
35	Plastic analysis of beams & frames
36	Introduction to Finite Element Method – steps & comparison

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Lesson Plan
B. Tech IInd year
CE31506 CONSTRUCTION TECHNOLOGY-II
Semester: VI

SECTION – A: Estimating, Costing & Valuation (20 Hours)

Unit A1: Estimating – Basics & Codes (6 Hours)

Lec	Topics
1	Estimating: definition, purpose & importance
2	Types of estimates & data required for estimates
3	Items of work & description of items
4	Units of measurement of items of work
5	IS 1200 – principles of measurement (Building works)
6	Examples & problems based on IS 1200

Unit A2: Approximate Estimates (4 Hours)

Lec	Topics
7	Approximate estimates – definition & purpose
8	Methods of approximate estimating for buildings
9	Approximate estimates for irrigation, water supply & highways
10	Numerical problems on approximate estimates

Unit A3: Detailed Estimates & BOQ (4 Hours)

Lec	Topics
11	Detailed estimate – working out quantities
12	Methods of taking out quantities
13	Abstracting quantities & Bill of Quantities
14	Provisional items, prime cost, contingencies & establishment charges

Unit A4: Specifications, Rate Analysis & Valuation (6 Hours)

Lec	Topics
15	Specifications – types & importance
16	Detailed specifications of common items
17	Analysis of rates – material, labour & overheads
18	Prime cost & day work
19	Valuation of property – value & depreciation
20	Methods of valuation, rent fixation & present-day cost

SECTION – B: Management of Works (8 Hours)

Lec	Topics
21	Tender: tender notice, types & procedure
22	Acceptance of tender & contract documents
23	Types of contracts
24	Departmental execution of works
25	Muster rolls, piece work agreement & work order
26	Stock, stores, tools & plants
27	Execution & supervision of works
28	Reports, cost control records & site management practices

SECTION – C: Planning & Scheduling (8 Hours)

Lec	Topics
29	Systems approach & optimization techniques
30	Introduction to CPM & PERT
31	Network diagrams & scheduling

Lec	Topics
32	Time estimates & critical path
33	Financial scheduling
34	Material scheduling
35	Tools & plants scheduling, network compression & updating
36	Application of computers in planning & project management

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Lesson Plan
B. Tech IInd year
CE31507: GEOTECHNICAL ENGINEERING – I
Semester: VI

Unit – 1: Soil Formation, Structure & Classification (7 Hours)

Lec	Topics
1	Introduction to Soil Mechanics – definition & scope
2	Factors of soil formation & soil morphology
3	Pedological classification of soils
4	Soil structure & clay minerals – general concepts
5	Structure & properties of Kaolinite and Illite
6	Structure & properties of Montmorillonite
7	Soil classification systems – particle size, textural, Unified & AASHTO, IS soil classification

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Unit – 2: Index Properties of Soil (8 Hours)

Lec	Topics
8	Basic soil properties – density, unit weight
9	Void ratio, porosity & moisture content
10	Grain size analysis – dry sieve analysis
11	Wet sieve analysis & sedimentation analysis
12	Soil consistency & Atterberg limits
13	Liquid limit, plastic limit & shrinkage limit
14	Index properties – plasticity index, liquidity index
15	Flow index, toughness index, activity ratio & numericals

Unit – 3: Soil Water & Seepage (7 Hours)

Lec	Topics
16	Types of soil water – hygroscopic, capillary & gravitational
17	Permeability of soils & Darcy's law
18	Laboratory determination of permeability
19	Factors affecting permeability
20	Seepage through soils & flow nets
21	Effective stress – total, neutral & effective pressure
22	Quick sand phenomenon & engineering significance

Unit – 4: Compaction & Consolidation (7 Hours)

Lec	Topics
23	Compaction – definition & importance
24	Moisture–density relationship
25	Factors affecting compaction & field control
26	Compressibility of soil
27	Terzaghi's one-dimensional consolidation theory
28	Pressure–void ratio relationship
29	Primary & secondary consolidation, numericals

Unit – 5: Stress Distribution in Soil (7 Hours)

Lec	Topics
30	Boussinesq's theory – assumptions
31	Stress distribution due to point (concentrated) load
32	Stress due to line load
33	Stress distribution under uniformly loaded circular area

Lec	Topics
34	Pressure bulbs & contact pressure
35	Newmark's chart – theory & applications
36	Numerical problems on stress distribution

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Lesson Plan
B. Tech IInd year
CE 31703: WATER AND WASTEWATER TREATMENT TECHNOLOGIES
Semester: VI

Unit – 1: Water Purification & Sedimentation (8 Hours)

Lec	Topics
1	Public attitude & national significance of water quality
2	History of water treatment & relation between health and water quality
3	Water quality criteria for drinking water, water-borne diseases
4	Necessity of treatment & introduction to sedimentation
5	Plain sedimentation – theory & sedimentation basin design principles
6	Design parameters: detention period, overflow rate, flow velocity, surface area
7	Rectangular & circular settling basins, inlet & outlet devices, baffles
8	Sludge storage & removal, tube settlers, sludge blanket clarifiers

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Unit – 2: Coagulation & Filtration (8 Hours)

Lec	Topics
9	Theory of coagulation & destabilization of colloids
10	Common coagulants, polyelectrolytes & other chemicals
11	Practical considerations in coagulation, feeding devices
12	Jar test – procedure, floc observation & settling periods
13	Theory of filtration
14	Slow sand filters & rapid sand gravity filters – description & comparison
15	Design of slow & rapid sand filters, media characteristics
16	Backwashing, rate controllers, multimedia & mixed media filters

Unit – 3: Disinfection of Water (7 Hours)

Lec	Topics
17	Purpose & methods of disinfection
18	Chlorination – forms of chlorine & chlorine demand
19	Residual chlorine, dosage & effectiveness
20	Break point chlorination – theory
21	Super chlorination, dechlorination, pre & double chlorination
22	Chlorine–ammonia treatment, effect of pH & compounds formed
23	Other disinfection methods: ozone, UV, metals, iodine, bromine, chlorine dioxide, algaecides

Unit – 4: Wastewater Treatment – Primary & Secondary (7 Hours)

Lec	Topics
24	Introduction to wastewater treatment & disposal
25	Necessity & extent of treatment
26	Primary treatment works – screens & grit chambers
27	Grease & oil removal, sedimentation
28	Coagulation & flocculation in wastewater treatment
29	Secondary treatment – trickling filters: principles & types
30	Design factors of trickling filters & humus tanks

Unit – 5: Activated Sludge & Sludge Disposal (6 Hours)

Lec	Topics
31	Activated sludge process – flow diagram & principles
32	Aeration tanks, final sedimentation tank & recirculation
33	Anaerobic digestion of sewage sludge

Lec	Topics
34	Methane generation & design principles of digesters
35	Drying of sludge & ultimate disposal
36	Disposal of sewage on land & in water

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