Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IIIrd year
CE31006 ENVIRONMENTAL ENGINEERING
Semester: V

Unit – 1: Quantity & Quality of Water, Sources & Intakes (8 Hours)

Lec	Topics
1	Introduction to water supply engineering & importance
2	Quantity of water – population forecasting methods, limitations & field practice
3	Water demands – types, factors affecting demand
4	Fluctuation in demand (daily, hourly, seasonal) & design period
5	Quality of water – objectives, impurities, sources & effects
6	Water-borne diseases, standards of drinking water
7	Examination of water – physical, chemical, bacteriological & sanitary significance
8	Sources of water (ground & surface), impounding reservoirs, safe yield of wells, types of intakes

---

Unit – 2: Water Transmission & Pipe Materials (7 Hours)

Lec	Topics
9	Water transmission systems – introduction
10	Materials & classes of pipes – CI, spun CI, MS pipes
11	Asbestos cement, RCC & prestressed concrete pipes
12	Pipe joints – bell & spigot, flanged, rubber gasket & special joints
13	Service pipes, connections, sizes & fittings
14	Corrosion in pipes – galvanic, biochemical & biological
15	Stress corrosion & corrosion control measures

Unit – 3: Distribution System (7 Hours)

Lec	Topics
16	Types of distribution systems & layout
17	Design considerations of water distribution systems
18	Hazen–Williams formula & applications
19	Analysis of hydraulic pressures & flow
20	Equivalent pipe method – series & parallel pipes
21	Location of mains, fittings, valves & accessories
22	Leak detection, water audit & introduction to SCADA

Unit – 4: Quality of Wastewater (6 Hours)

Lec	Topics
23	Introduction to wastewater & its characteristics
24	Physical characteristics – solids, colour, temperature
25	Chemical characteristics – pH, chlorides, nitrogen forms
26	Organic pollution parameters – BOD, COD, TOC
27	Microbiological characteristics & toxic substances
28	Significance of wastewater quality in treatment design

Unit – 5: Design of Sewerage Systems (8 Hours)

Lec	Topics
29	Sewerage systems – types & components
30	Quantity of sewage, infiltration & design period
31	Factors affecting sewer design
32	Self-cleansing velocity & maximum permissible velocity
33	Shapes, minimum size, slope & alignment of sewers
34	Use of Manning’s formula & partial flow in sewers

Lec	Topics
35	Design of sewers using flow charts
36	Manholes, ventilating shafts & pumping of sewage

Prof. and Head
CE-AMD

Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE31003 DESIGN OF RCC STRUCTURES
Semester: V

Unit – 1: Working Stress Method & Detailing (8 Hours)

Lec	Topics
1	Introduction to RCC, working stress concept, design philosophy
2	Working Stress Design Method – assumptions & permissible stresses
3	Stress distribution, transformed section & neutral axis
4	Analysis of singly reinforced rectangular beam section
5	Design of singly reinforced rectangular beam section
6	Doubly reinforced rectangular beam – analysis & design
7	T & inverted L beams – analysis & design (WSM), use of design aids
8	Reinforcement detailing – curtailment, spacing, cover, bar diameter, IS provisions

---

Unit – 2: Limit State Method – Beams, Shear, Bond & Torsion (10 Hours)

Lec	Topics
9	Limit State Method – concept, safety & serviceability
10	Characteristic strength, partial safety factors
11	Limit state of serviceability – deflection & cracking
12	LSM assumptions, stress–strain curve of concrete & steel
13	Analysis of singly reinforced rectangular beam (LSM)
14	Design of singly & doubly reinforced beams
15	Design of T and inverted L beams using LSM & design aids
16	Shear behaviour of RC beams & design of shear reinforcement
17	Bond stress – nature of bond & development length
18	Torsion in RC beams – behaviour & design by LSM

Unit – 3: Slabs & Staircases (7 Hours)

Lec	Topics
19	Introduction to slabs – load transfer & design philosophy
20	One-way simply supported & continuous slabs – design
21	Two-way slabs spanning in two directions
22	Slabs carrying concentrated loads & load distribution
23	Permissible shear stress in slabs & reinforcement detailing
24	Staircases – types, loading & effective span

Lec	Topics
25	Design of inclined & cantilever staircases

Unit – 4: Columns & Footings (7 Hours)

Lec	Topics
26	Compression members – classification & behaviour
27	Design of short axially loaded columns
28	Design of long columns & slenderness effects
29	Helical columns & eccentrically loaded columns
30	Footings – types & design principles
31	Design of isolated column footing
32	Combined footings – rectangular, trapezoidal & strip footing

Unit – 5: Retaining Walls (4 Hours)

Lec	Topics
33	Retaining walls – types & earth pressure theories
34	Structural behaviour & stability checks
35	Design of cantilever retaining wall
36	Counterfort retaining wall – design & detailing

Prof. and Head
CE-AMD

Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE31007: STRUCTURAL ANALYSIS I
Semester: V

Unit – 1: Indeterminacy, Deflections & Force Method (9 Hours)

Lec	Topics
1	Types of structures, classification of loads and supports
2	Static & kinematic indeterminacy of beams, trusses & frames
3	Displacement due to real work – basic concepts
4	Deflection of beams by Unit Load Method
5	Deflection of trusses by Unit Load Method
6	Displacement due to lack of fit
7	Displacement due to temperature variation
8	Displacement due to support movements
9	Method of Consistent Deformation (Force Method), flexibility coefficients

---

Unit – 2: Least Work Method (6 Hours)

Lec	Topics
10	Principle of Least Work – theory & assumptions
11	Analysis of redundant beams (up to 2° indeterminacy)
12	Analysis of redundant trusses
13	Analysis of redundant frames
14	Effect of temperature changes
15	Effect of lack of fit & support settlement

Unit – 3: Fixed & Continuous Beams (8 Hours)

Lec	Topics
16	Fixed beams – concept, end moments
17	Fixed beams under different loading conditions
18	Beams of varying cross-sections
19	Partially fixed beams
20	Effect of settlement of supports on fixed beams
21	Continuous beams – introduction
22	Three-moment theorem – derivation
23	Continuous beams (uniform & varying section), effect of support settlement

---

Unit – 4: Influence Lines & Moving Loads (6 Hours)

Lec	Topics
24	Influence line diagrams – concept & applications
25	Influence lines for statically determinate beams
26	Influence lines for trusses
27	Influence lines for arches
28	Rolling loads on bridges
29	Absolute maximum shear force & bending moment

Unit – 5: Arches, Cables & Suspension Bridges (7 Hours)

Lec	Topics
30	Three-hinged arches – introduction
31	Horizontal thrust in three-hinged arches
32	Radial shear, normal thrust & BMD
33	Influence line diagrams for arches
34	Cables – shapes, forces & influence lines
35	Suspension bridges – basic theory
36	Two-hinge & three-hinge stiffened suspension bridges

Prof. and Head
CE-AMD

Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE31010: WATER RESOURCES ENGINEERING
Semester: V

Unit – 1: Introduction to Irrigation & Water Resources (6 Hours)

Lec	Topics
1	Occurrence of natural water, hydrologic distribution
2	Sources of water – surface & sub-surface, quality & quantity comparison
3	Irrigation engineering: definition, need, scope & types of irrigation
4	Methods of water application (surface, sprinkler, drip)
5	Soil–water–plant relationship, duty, delta & base period
6	Irrigation water quality, crop rotation & assessment of irrigation requirement

---

Unit – 2: Canal Systems & Channel Design (8 Hours)

Lec	Topics
7	Irrigation schemes – direct & storage schemes
8	Canal systems – classification, planning & layout
9	Design of canals – regime concept
10	Tractive force method of channel design
11	Channel losses – seepage & evaporation
12	Canal lining – advantages, materials, design of lined channels
13	Water logging – causes, effects & remedial measures
14	Salinity, land reclamation & drainage systems

Unit – 3: Storage, Diversion Works & Canal Structures (8 Hours)

Lec	Topics
15	Storage & diversion schemes – elements & components

Lec	Topics
16	Types & classification of dams
17	Gravity dams – forces & basic design concepts
18	Earth dams – components & failure modes
19	Weirs – types & functions
20	Spillways & energy dissipation devices
21	Canal regulation structures: head regulator, cross regulator, falls
22	Escapes, outlets, reservoir planning, safe yield & life of reservoir

---

Unit – 4: Hydrology & Ground Water (7 Hours)

Lec	Topics
23	Hydrology – definition & hydrological cycle
24	Precipitation, evaporation, infiltration
25	Runoff estimation, empirical formulae
26	Rainfall–runoff relationships
27	Hydrometry – stream gauging methods
28	Rating curves
29	Groundwater hydrology – well hydraulics, groundwater flow equations, artificial recharge

---

Unit – 5: Hydrographs & Flood Estimation (7 Hours)

Lec	Topics
30	Hydrographs & hyetographs – concepts
31	Components & analysis of hydrographs
32	Unit hydrograph – principles
33	Construction of unit hydrograph
34	Synthetic unit hydrograph

Lec Topics

35 Summation hydrograph

36 Design storm & design flood estimation using unit hydrograph

Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE31201: ADVANCE HIGHWAY AND AIRPORT ENGINEERING
Semester: V

Section A – Highway Engineering (24 Hours)

Unit – 1: Highway Materials (8 Hours)

Lec	Topics
1	Introduction to Highway Engineering, role & importance
2	Soil as highway material – desirable properties & classification
3	CBR test, G.I. modulus & modulus of subgrade reaction
4	Aggregates – properties, classification & tests
5	Bitumen – types, grading & tests
6	Bituminous mixes – requirements & design concepts
7	Concrete mixes – design principles
8	Concrete mix design methods: IRC-44, Road Note-4, ACI & IS guidelines

---

Unit – 2: Pavement Design (10 Hours)

Lec	Topics
9	Pavement structures & components
10	Wheel load configuration & pavement behaviour under repeated loading
11	Factors affecting pavement design
12	Flexible pavement design – GI & CBR methods
13	California R-Value, Triaxial & McLeod methods
14	Burmister method & IRC method
15	Rigid pavements – stresses due to wheel load
16	Temperature stresses & Westergaard analysis

Lec	Topics
17	Joints in rigid pavements – types, filling & sealing
18	Design of reinforcement, dowel bars, tie bars & pumping of concrete

---

Unit – 3: Pavement Construction & Evaluation (6 Hours)

Lec	Topics
19	Earth roads, gravel roads & soil-stabilized roads
20	WBM roads – construction procedure
21	Bituminous roads – prime, tack & seal coats
22	Surface dressing, grouted macadam, premix methods
23	Cement concrete pavement slab construction
24	Pavement evaluation & strengthening, overlay design using Benkelman Beam

---

Section B – Airport Engineering (12 Hours)

Unit – 4: Airport Planning & Aircraft Characteristics (6 Hours)

Lec	Topics
25	Airport planning – regional planning & site selection
26	Topographical & geological considerations
27	Air traffic characteristics & airport development
28	Aircraft characteristics – size, capacity, speed & components
29	Aircraft weights & turning radius
30	Airport obstructions – zoning laws, imaginary surfaces & approach zones

---

Unit – 5: Airport Layout, Pavements & Visual Aids (6 Hours)

Lec	Topics
31	Runway orientation & wind rose diagram

Lec	Topics
32	Basic runway length & corrections
33	Airport classification, geometric design & capacity
34	Taxiway design, exit taxiways, holding aprons
35	Airport pavement design – flexible & rigid pavements, LCN system
36	Visual aids – markings, lighting, drainage (overview)

Prof. and Head
CE-AMD