Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE-21512
CONSTRUCTION TECHNOLOGY-I
Semester: IV

UNIT–1: Stone Masonry (4 Hours)

Lecture	Topics
L1	Introduction to masonry, terms & definitions
L2	Types of stone masonry – Rubble & Ashlar
L3	Tools, plants & equipment used in stone masonry
L4	Defects in stones, stone masonry details at doors, windows & cornices

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UNIT–2: Brick Masonry (5 Hours)

Lecture	Topics
L5	Bricks – characteristics, classification & tests
L6	Mortars used in brick masonry
L7	Bonds in brick masonry – English, Flemish, etc.
L8	Composite walls, cavity walls
L9	Hollow block construction & reinforced brick work

UNIT–3: Concrete Construction (9 Hours)

Cast-in-Situ RCC Construction (6 Hours)

Lecture	Topics
L10	Introduction to RCC & in-situ construction
L11	Formwork – materials, types & design principles
L12	Reinforcement – detailing, placing & cover

Lecture	Topics
L13	Mixing, placing, compaction & curing of concrete
L14	RCC construction of slabs & beams
L15	RCC construction of columns & footings

Precast & Prestressed Construction (3 Hours)

Lecture	Topics
L16	Introduction to precast concrete construction
L17	Prestressed concrete – principles & methods
L18	Joints in precast construction & applications

UNIT–4: Steel & Timber Construction (6 Hours)

Steel Construction (3 Hours)

Lecture	Topics
L19	Introduction to steel structures
L20	Structural connections – bolting & riveting
L21	Welding, fabrication & erection of steel structures

Timber Construction (3 Hours)

Lecture	Topics
L22	Properties & classification of timber
L23	Timber joints & fastenings
L24	Timber structural components & trusses

UNIT–5: Construction of Structures (4 Hours)

Lecture	Topics
L25	Load bearing, framed & composite construction
L26	Types of foundations

Lecture	Topics
L27	Arches, lintels & bridging elements
L28	Retaining walls & prefabricated construction

UNIT–6: Floors & Roofs (4 Hours)

Floors (2 Hours)

Lecture	Topics
L29	Types of floors – ground, basement & storey
L30	Floor finishes – types & selection

Roofs (2 Hours)

Lecture	Topics
L31	Roof types, layout & structural components
L32	Roof coverings, drainage & ceilings

UNIT–7: Stairs, Openings & Building Components (3 Hours)

Lecture	Topics
L33	Stairs – types, layout & construction
L34	Ramps, ladders, lifts & escalators
L35	Doors, windows & ventilators – types & functions

UNIT–8: Finishes & Construction Equipment (1 Hour)

Lecture	Topics
L36	Finishes, dampness & remedial measures, construction equipment overview

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Department of Civil Engineering and Applied Mechanics
Lesson Plan
B. Tech IInd year
CE21514: TRANSPORTATION ENGINEERING
Semester: IV

UNIT–1: Highways (8 Hours)

Lecture	Topics
L1	Introduction to Highway Engineering, classification of roads
L2	Road patterns and brief history of road development
L3	Road development plans of India (Nagpur, Bombay, Lucknow)
L4	Present status of roads in India
L5	Highway alignment – basic principles
L6	Factors controlling highway alignment
L7	Use of aerial photography in highway planning
L8	Application of remote sensing in highway engineering

UNIT–2: Geometric Design (10 Hours)

Lecture	Topics
L9	Introduction to geometric design of highways
L10	Typical cross-sections of urban and rural roads
L11	Road cross-section elements – width, shoulders, medians
L12	Camber – types and design
L13	Design speed and sight distance
L14	Stopping sight distance and passing sight distance
L15	Horizontal curves – types and basic concepts
L16	Super elevation and extra widening
L17	Transition curves and design of horizontal alignment

Lecture	Topics
L18	Vertical curves and vertical alignment

UNIT–3: Traffic Engineering (8 Hours)

Lecture	Topics
L19	Introduction to traffic engineering and road user characteristics
L20	Vehicle characteristics and traffic studies
L21	Speed, volume, origin–destination and parking studies
L22	Traffic capacity and level of service
L23	Traffic accidents – causes and prevention
L24	Traffic signs, signals and road markings
L25	Traffic signals – warrants, design and operation
L26	Traffic management, intersections, rotary design, street lighting

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UNIT–4: Railway Engineering (6 Hours)

Lecture	Topics
L27	Introduction and history of railway engineering
L28	Permanent way – components, gauges, sleepers, ballast
L29	Rails – types, rail fastenings, wear and creep
L30	Railway geometry – gradients, curves and super elevation
L31	Points and crossings – design of turnouts and junctions
L32	Signalling and interlocking, track circuits, station yards

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UNIT–5: Dock & Harbour Engineering (4 Hours)

Lecture	Topics
L33	Introduction to dock and harbour engineering

Lecture	Topics
L34	Harbour planning, selection of site and classification
L35	Harbour structures – breakwaters, groins, seawalls
L36	Port facilities – piers, wharfs, berths, container ports & layout

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Lesson Plan
B. Tech IInd year
CE21518: ENGINEERING GEOLOGY
Semester: IV

Unit 1: General Geology (8 Hours)

Lecture	Topics
L1	Introduction to Engineering Geology, scope & disciplines
L2	Importance of geology in Civil Engineering
L3	Earth: surface features & internal structure
L4	Geomorphological processes & classification
L5	Weathering of rocks (types & engineering significance)
L6	Geological action of running water
L7	Geological action of wind & underground water
LL8	Introduction to Mineralogy (physical properties & identification)

Unit 2: Petrology and Structural Geology (8 Hours)

Lecture	Topics
L9	Rock cycle and classification of rocks
L10	Igneous rocks: types, structures & engineering uses
L11	Sedimentary rocks: classification & suitability
L12	Metamorphic rocks & strength aspects
L13	Physical & geo-mechanical properties of rocks
L14	Rock deformation, dip, strike & outcrops
L15	Folds & joints – classification and identification
L16	Faults, unconformities & civil engineering importance

Unit 3: Landslides and Earthquake (7 Hours)

Lecture	Topics
L17	Landslides: causes & classification
L18	Types of landslides & case studies
L19	Prevention and control measures of landslides
L20	Earthquakes: causes & effects
L21	Measurement of earthquakes (Richter & Mercalli scales)
L22	Seismic zones of India
L23	Geological considerations in seismic-resistant construction

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Unit 4: Geological Investigation (7 Hours)

Lecture	Topics
L24	Geological investigations – purpose & stages
L25	Site investigations for dams & reservoirs
L26	Geological considerations in tunnelling
L27	Geological aspects of bridges, railways & highways
L28	Geophysical methods – classification
L29	Seismic, electrical & magnetic methods
L30	Rock excavation methods & geological maps

Unit 5: Remote Sensing (6 Hours)

Lecture	Topics
L31	Introduction & uses of remote sensing
L32	Types, components & elements of remote sensing
L33	EMS, MSS & sensors
L34	Visual interpretation techniques
L35	GPS & GIS – principles & components

Lecture	Topics
L36	Applications of GIS & remote sensing in civil engineering and resource mapping

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Lesson Plan
B. Tech IInd year
CE21524: STRUCTURAL MECHANICS
Semester: IV

Unit – 1: Strain Energy & Deflection of Structures (8 Hours)

Lecture	Topics
1	Introduction to strain energy, resilience & proof resilience
2	Strain energy due to axial tension & compression
3	Strain energy due to shear, bending & torsion
4	Theories of elastic failure (Maximum stress, strain, shear, energy theories)
5	Gradually applied loads vs suddenly applied loads
6	Impact & falling loads – derivations & numerical problems
7	Deflection of beams using strain energy method
8	Castigliano's First Theorem – applications to beams & determinate trusses

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Unit – 2: Columns and Struts (7 Hours)

Lecture	Topics
9	Columns & struts – classification (short & long columns)
10	Axially loaded columns – crushing & buckling
11	Euler's theory – assumptions, derivation & limitations
12	Rankine's formula – theory & numerical problems
13	Columns under eccentric loading – stress distribution
14	ISI formula for columns
15	Beam–column behavior & columns with lateral loads (introductory concepts)

Unit – 3: Unsymmetrical Bending & Pressure Vessels (7 Hours)

Lecture	Topics
16	Principal moments of inertia & principal axes
17	Unsymmetrical bending of standard sections
18	Change in orientation of neutral axis
19	Shear centre – concept & determination
20	Thin cylindrical pressure vessels – hoop & longitudinal stresses
21	Thin spherical pressure vessels – stress analysis
22	Wire wound thin tubes & external radial pressure

Unit – 4: Curved Bars, Rigid Frames & Springs (7 Hours)

Lecture	Topics
23	Stress in curved bars – small initial curvature
24	Stress in curved bars – large initial curvature
25	Deflection of curved bars – direct method
26	Deflection using strain energy (Castigliano's theorem)
27	Portal frames – strain energy method
28	Helical springs – closed & open coiled, stress & stiffness
29	Springs: axial load & couple, spring grouping, leaf springs (semi & quarter elliptic)

Unit – 5: Mechanical Vibrations (7 Hours)

Lecture	Topics
30	Basics of mechanical vibration & SDOF systems
31	Free vibration of undamped & damped systems
32	Forced vibration with viscous damping
33	Coulomb damping & harmonic excitation

Lecture	Topics
34	Vibration due to rotating unbalance
35	Support excitation, vibration isolation & transmissibility
36	SDOF systems as vibrometer & accelerometer

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Lesson Plan
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CE21517: FLUID MECHANICS
Semester: IV

Unit – 1: Properties & Statics of Fluids (8 Hours)

Lec	Topics
1	Scope & applications of Fluid Mechanics
2	Physical properties of fluids: density, specific weight, specific volume, SG
3	Viscosity: dynamic & kinematic viscosity, Newton's law, classification of fluids
4	Compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure
5	Pressure at a point & pressure variation in static fluids
6	Barometer, gauges & manometers
7	Hydrostatic forces on plane & curved surfaces
8	Floatation, stability of floating & submerged bodies, rotation of fluids, free & forced vortices

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Unit – 2: Fluid Kinematics & Dynamics (8 Hours)

Lec	Topics
9	Velocity field, classification of flows
10	Streamlines, path lines & streak lines
11	Continuity equation & applications
12	Stream function, velocity potential & flow nets
13	Euler's equations of motion
14	Bernoulli's equation & practical applications
15	Pitot tube & Prandtl tube
16	Flow through orifices, mouthpieces, notches & weirs (empirical formulae)

Unit – 3: Dimensional Analysis & Model Studies (5 Hours)

Lec	Topics
17	Units & dimensions, dimensional homogeneity
18	Buckingham π–theorem
19	Dimensionless numbers (Re, Fr, We, Ma, Eu)
20	Similitude: geometric, kinematic & dynamic
21	Model studies & applications in fluid engineering

Unit – 4: Flow Through Pipes (8 Hours)

Lec	Topics
22	Laminar flow through circular pipes
23	Flow between parallel plates & viscosity measurement
24	Reynolds experiment & critical velocity
25	Turbulent flow in pipes & friction factor
26	Losses in pipes: major & minor losses
27	Pipe networks & Hardy Cross method
28	Measurement of pipe flow – orifice, nozzle, venturi, bend meter, rotameter
29	Water hammer & pipe surges (concepts)

Unit – 5: Flow Through Open Channels (7 Hours)

Lec	Topics
30	Classification of open channel flow & geometric elements
31	Continuity, energy & momentum equations
32	Velocity & pressure distribution
33	Uniform flow, normal depth, Chezy & Manning formulae

Lec	Topics
34	Best hydraulic sections
35	Specific energy, specific force & hydraulic jump
36	Gradually varied flow, surface profiles & dynamic equations

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