



Shirpur Education Society's
R. C. Patel Institute of Technology, Shirpur
(An Autonomous Institute)
Course Structure
Third Year B. Tech
(Department of Civil Engineering)

With effect from Year 2026-27
RCP23 NEP Scheme Revision 1



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Third Year B. Tech Civil Engineering - Semester- V (w. e. f. 2026-27)

S. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit	
				L	T	P	Continuous Assessment				ESE			
							TA	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2)				
							[A]			[B]	[C]	[A+B+C]		
1	PC	RCP23VPC301	Hydraulics and Fluid Machinery	3	-	-	25	15	15	15	60	100	3	4
		RCP23VPC301L	Hydraulics and Fluid Machinery Laboratory			2	25	-	-	-	25	50	1	
2	PC	RCP23VPC302	Design of Concrete Structures	3	-	-	25	15	15	15	60	100	3	4
		RCP23VPC302L	Design of Concrete Structures Laboratory	-	-	2	25	-	-	-	25	50	1	
3	PC	RCP23VPC303	Transportation Engineering	3	-	-	25	15	15	15	60	100	3	4
		RCP23VPC303L	Transportation Engineering Laboratory	-	-	2	25	-	-	-	25	50	1	
4	PC	RCP23VPC304	Theory of Structure	3	-	-	25	15	15	15	60	100	3	3
5#	PE	RCP23VPE311	Smart city Planning	3	-	-	25	15	15	15	60	100	3	3
		RCP23VPE312	Prefabricated structure											
		RCP23VPE313	Construction Equipment and Automation											
		RCP23VPE314	Engineering Geology											
6	MD	RCP23VMD301	Legal aspects in Civil Engineering	2	-		50	-	-	-	-	50	2	2
7	SC	RCP23XSC301P	Semester Project -III	-	-	2	25				25	50	1	1
8	HS	RCP23XHS311	Constitution of India	1	-	-	-						A	A
9	SC	RCP23VSC301	Formwork Practices	1	-	-	40				-	40	1	1
Total				19	-	8	300	75	75	75	400	790	22	22

TA-Teacher Assessment, ESE- End Semester Examination

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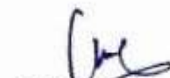

Prepared by


Dean Academic/Dy. Director


Checked by


C.O.E




BOS Chairman


Director

Program : Civil Engineering	TY BTECH	Semester: V
Hydraulics and Fluid machinery (RCP23VPC301)		
Hydraulics and Fluid Machinery Laboratory (RCP23VPC301L)		

Prerequisites: Fluid Mechanics, Engineering Mathematics

Course Objectives

1. Student will able to Understand, analyze and design the flow through open channels.
2. Students will able to understand boundary layer condition for different condition.
3. The student must have knowledge of hydraulic machines like pumps and turbines that are commonly used in civil engineering.
4. Understand the application of Hydraulic machines impact of jet, turbine and pumps etc.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the basic principles of open channel flow to analyze uniform, gradually and rapidly varied flow under steady conditions.	3	Apply
CO2	Understand and analyze boundary layer theory and fluid flow governing equations to determine boundary layer behavior.	2	Understand
CO3	Analyze the impact of jets and evaluate the performance of hydraulic turbines.	5	Analyze

Course Content

Unit-I Flow in Open Channels

07 Hrs.

Definition of open channel, difference between pipe and open channel flow, classification, types of flows, geometric properties of open channels.

Uniform flow in open channels, Chezy's & Manning's formula, most economical open sections- rectangular, trapezoidal, circular sections- derivations. Specific energy, Specific energy curve, Condition for maximum discharge & minimum specific energy, Critical flow in rectangular sections, Specific force.

Unit-II G.V.F and R.V.F

06 Hrs.

Gradually varied Flow (G.V.F.): Definition, classification of channel Slopes, dynamic equation of G.V.F. (Assumption and derivation), classification of G.V.F. profiles-examples.

Rapidly varied flow (R.V.F.): Definition, practical examples, hydraulic jump- phenomenon, relation of conjugate depths, parameters, uses, types of hydraulic jump.

Unit-III Boundary Layer Theory

07 Hrs.

Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Unit-IV Impact of jets and Turbines

10 Hrs.

Impact of Jets: Dynamic of force and momentum, impulse momentum equation, jet force on stationary and moving vanes, jet propulsion. Turbines: Classification and types of turbines, impulse and reaction turbines, components and parts, vane angle, inflow and outflow condition, efficiency and characteristics of turbines based on Performance, specific speed, selection criteria for turbines, Governing of turbines, cavitation, draft tube and its function.

Unit-V Pumps

09 Hrs.

Pumps: Basics, operating characteristics, pump head curve, system head curve, pumps in series & parallel, common problems and remedies; heads and efficiencies; specific speed; multistage pump for high head and large discharge; model testing of pump with applications of dimensional analysis and circular sections.

Reference Books

1. Fluid Mechanics & Hydraulic Machines by S. C. Gupta, 18th Edition, Pearson India Education Services Pvt. Ltd., Noida, Uttar Pradesh, 2023.
2. Fluid Mechanics: Fundamentals and Applications by Yunus A. Çengel and John M. Cimbala, 5th Edition, McGraw Hill Education, 2022.
3. Open-Channel Hydraulics by Ven Te Chow, McGraw-Hill Education (Reprint Edition), 2010 (Latest Reprint).
4. Flow in Open Channels by K. Subramanya, 6th Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2023.
5. Fluid Mechanics and Fluid Power Engineering by D. S. Kumar, 9th Edition, S. K. Kataria & Sons, New Delhi, 2021.

Text Books

1. Hydraulics and Fluid Mechanics including Hydraulic Machines by P. N. Modi and S. M. Seth, 22nd Edition, Standard Book House, New Delhi, 2022.
2. Theory and Applications of Fluid Mechanics by K. Subramanya, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2019 (Latest Available).
3. A Textbook of Fluid Mechanics and Hydraulic Machines by R. K. Bansal, 11th Edition, Laxmi Publications (P) Ltd., New Delhi, 2022.

Hydraulics and Fluid Machinery Laboratory (RCP23VPC301L)

List of Experiments

Term work shall consist of performing experimental sets from the list below complete any seven.

1. Determination of Chezy's and Manning's constant.
2. Determination of coefficient for Venturi flume/Standing wave flume.
3. Measurement of drag and lift force on airfoil.
4. Determination and analysis of pressure distribution over circular cylinder.
5. Determination Depth of Hydraulic Jump.
6. Trial on Pelton turbine
7. Trial on Francis turbine
8. Trial on Kaplan turbine
9. Trial on Centrifugal pump
10. Trial on reciprocating pump

Program : Civil Engineering	TY BTECH	Semester: V
Design of Concrete Structure (RCP23VPC302)		
Design of Concrete Structure Laboratory (RCP23VPC302L)		

Prerequisites: Engineering Mechanics, Mechanics of Solids, Structural Analysis

Course Objectives

1. Understand the design philosophies and principles of the Limit State Method for reinforced concrete structures.
2. Analyze and design reinforced concrete beams, slabs, staircases, columns, and isolated footings using IS 456:2000 provisions.
3. Apply codal provisions to ensure the strength, serviceability, and safety of reinforced concrete structural elements.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand and compare different design philosophies in accordance with IS 456:2000.	2	Understand
CO2	Analyze and design singly and doubly reinforced concrete beams using the Limit State Method.	4	Analyze
CO3	Apply limit state principles to evaluate collapse due to shear and bond in structural elements.	3	Apply
CO4	Evaluate the design of reinforced concrete slabs, staircases, columns, and footings for structural safety, serviceability, durability, and compliance with relevant IS code provisions.	5	Evaluate
CO5	Prepare detailed design calculations and structural drawings for a complete RCC structure.	6	Create

Course Content

Unit- I Introduction and Design Philosophies –

06 Hrs.

a) Different design philosophies - Introduction to various design philosophies of R.C structures- Working stress method, Ultimate load method, Limit state method. Structural properties of concrete.

b) Limit state Method - Types and classification of limit states, Stress-strain behavior of materials, characteristic strength, characteristic load, partial safety factors for material strengths and loads, balanced, under reinforced and over reinforced RC sections, stress block for singly reinforced section.

Unit-II Design of beam – Flexure

09 Hrs.

Analysis and design of singly reinforced, doubly reinforced and flanged Section using limit state method – Derivation of formulae, General values, Types of problems, Moment of resistance of section.

Unit-III Design of beam – Shear and Bond

08 Hrs.

a) Shear and Bond - Mechanism of shear and bond failure, Types of Shear reinforcement, Types of bond, Factors affecting bond resistance, Development length of bars,

b) I.S. code provisions- design examples in simply supported and continuous beams with detailing by using IS code coefficient method.

Unit-IV Design of Slab and Staircase

08 Hrs.

a) Design of Slabs – Design of Simply supported One-way slab, Cantilever slab, Two-way slab with different support conditions as per IS:456-2000, placement of reinforcement in slab.

b) Design of Staircase – Design of doglegged staircase.

Unit-V Analysis and Design of Columns and Column footings

08Hrs

a) Column – Assumptions, Effective height of columns, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial loading.

b) Isolated Column Footing – Isolated rectangular column footing with constant depth subjected to axial loads.

Reference Books

1. P. Dayaratnam (2019), Design of Reinforced Concrete Structures, 3rd Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, ISBN: 9780199488831.
2. Ashok K. Jain (2012), Reinforced Concrete: Limit State Design, 7th Edition, Nem Chand & Brothers, ISBN: 9788185240531.
3. S. Ramamrutham & R. Narayan (2019), Design of Reinforced Concrete Structures (Conforming to IS 456:2000), 9th Edition, Dhanpat Rai Publications.

Text Books

1. Dr. V. L. Shah and Dr. S. R. Karve (2021), Limit State Theory and Design, 17th Edition, Structures Publications, Pune.
2. Dr. H. J. Shah (2021), Reinforced Concrete, Volume 2, 11th Edition, Charotar Publishing House Pvt. Ltd., ISBN: 9789385039734.
3. S. R. Karve & V. L. Shah (2022), Illustrated Design of Reinforced Concrete Buildings, 3rd Edition, Structures Publications, Pune.

4. P. C. Varghese (2019), Limit State Design of Reinforced Concrete, 2nd Edition, PHI Learning Pvt. Ltd., ISBN: 9789389347590.
5. S. N. Sinha & S. K. Roy (2018), Fundamentals of Reinforced Concrete, 3rd Edition, S. Chand & Company Ltd., New Delhi.
6. M. L. Gambhir (2017), Reinforced Concrete Design, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi.

Design Codes:

1. IS 456 (2000) Plain and reinforced concrete – Code of practice, Bureau of Indian Standard, Manak Bhavan, New Delhi.
2. Design aids for reinforced concrete to IS 456-1978, Bureau of Indian Standard, Manak Bhavan, New Delhi.
3. S.P. (16): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards 1980.
4. IS 875-Part 1-1987: Code of practice for design loads (other than earthquake) for buildings and structures: Part (I) dead loads-unit weights of building materials and stored materials, Bureau of Indian Standards, New Delhi
5. IS 875-Part 2-1987: Code of practice for design loads (other than earthquake) for buildings and structures: Part (II) imposed loads, Bureau of Indian Standards, New Delhi
6. S.P. (34): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards 1980.

Design of Concrete Structure Laboratory (RCP23VPC302L)

Lab course work shall consist of detailed structural design and drawing of G + 2 building covering slab, beam, column, footing & stair case. A design report shall be prepared showing details on half imperial drawing sheets. A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.

A report on at least one site visit shall be submitted in term work.

1) Structural Layout – (Typical detail drawing of structural elements- Sheet 1)

- a) To prepare a plan of G+2 building (Residential/ Commercial).
- b) To draw layout of Ground beam, plinth beam, floor beam, column, slabs etc.

2) Analysis and design of beams and slabs (Sheet 2- For Beam, Sheet 3- For Slab)

- a) To calculate of loads and internal forces on beams and slabs.
- b) To decide the sections and calculate steel reinforcement.
- c) To draw structural drawing of beams, slab.

3) Analysis and design of column and footing (Sheet 4)

- a) To calculate of loads and internal forces on column and footing.
- b) To decide the sections and calculate steel reinforcement.
- c) To draw structural drawing of Column and footing.

4) Analysis and design of dog-legged staircase (Sheet 5)

- a) To calculate of loads and internal forces.
- b) To calculate steel reinforcement.
- c) To draw structural drawing of dog-legged staircase.

Program : Civil Engineering	TY BTECH	Semester: V
Transportation Engineering (RCP23VPC303)		
Transportation Engineering Laboratory (RCP23VPC303L)		

Prerequisites: Nil

Course Objectives

1. To provide a coherent development to the students for the courses in sector of Engineering like Transportation Engineering.
2. To present the foundations of many basic Engineering tools and concepts related Highway Engineering.
3. To provide a coherent development to the students for the courses in sector of Railway Engineering.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Gain practical experience in implementing Transportation Engineering concepts in Highway Engineering.	3	Apply
CO2	Understand theoretical and practical aspects of highway engineering including design and management.	2	Understand
CO3	Design pavements considering traffic safety and related parameters.	4	Analyze
CO4	Understand the basics and design of railway components including tracks, junctions, and stations.	2	Understand

Course Content

Unit- I Introduction to Highway Engineering

06 Hrs.

a) Highway Planning and Development: Highway planning in India, development, rural and urban roads, road, departments in India, road classification, road authorities i.e. IRC, CRRI, NHAI, etc., Financing of road projects, road safety audit.

b) Field Surveys: Reconnaissance, aerial surveys, location surveys, location of bridges.

Highway alignment: Basic requirements of an ideal alignment and factors controlling it, special requirements for hill roads.

c) Highway Geometric Design: Topography and physical features, cross section elements like carriageway width, formation width, right of way, etc., friction, Light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, super-elevation, transition curve, gradients.

Unit-II Highway Material

08 Hrs.

a) Road Materials: Aggregates and their types, physical and engineering properties, Fillers, bitumen, characteristics, emulsions and cutbacks, basic tests on all materials, soil investigation, test on soil; CBR, test

b) Construction of Roads: Stabilized earth, gravel roads, W.B.M. roads, high cost Roads: bituminous roads, cement concrete roads.

c) Highway Drainage: Surface and sub-surface drainage arrangements,

d) Highway Pavements: Design of Flexible (G.I. method and CBR method using IRC recommendations) and rigid Maintenance & Strengthening of pavements.

Unit-III Traffic control

06 Hrs.

a) Traffic Engineering: Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures

b) Traffic control devices: pavement marking, signs, signals, Traffic management, various types of intersection and their design criteria, Traffic Simulation & its advantages,

Roadside Developments: Arboriculture, street lighting.

c) Advanced Urban Transport Technology: Classification, mass and rapid transit system, introduction to intelligent transportation System (ITS), electronic toll Collection.

Unit-IV Introduction to Railway Engineering

08 Hrs.

a) Introduction: Role of Civil Engineers in Infrastructure Development, Advantages of Railways as mode of transport, Organizational structure, Permanent Way, definition of track, basic components, and ideal requirements.

b) Railway Track Gauge: Different gauges on Indian Railways, loading gauge, construction gauge, Ungauged, Problems caused by change of gauge.

c) Track and Track stresses requirements, forces acting on Track, coning of Wheels, Tilting of Rails, Rails: Functions, types of rails, rail joints, rail failure, function suitability and drainage, treatment, Defects, Standard rail sections

d) Alignment of Railway lines: Importance, Basic requirements of an ideal alignment, selection of a good alignment, Geometric design of Track: Necessity for geometric design, Gradients, Grade compensation on curves, Super elevation, equilibrium cant, cant deficiency, maximum permissible speed,

and negative super elevation. Resistance to-friction, wave action, Causes of creep, Effects of creep

Unit-V Points & Crossing

08 Hrs

a) Construction and Track maintenance: Plate laying method, operations involved Tools & common items of track maintenance.

b) Points and crossings: Important terms, types of track layouts and sketches of turn out, diamond crossing, triangle, double junction, scissors cross over, Single slip, Double slip, Gathering line, Signalling and interlocking: objectives of signalling, classification of signals, CTC and ATC system, Interlocking & it's Principles.

Reference Books:

1. Khanna and Justo, "Highway Engineering", Nemchand & Bros., Roorkee.
2. Khanna S.K., "Highway Engineering".
3. Arora N. L., "Transportation Engineering".
4. Bindra and Arora, "Highway Engineering", Standard Publishers.
5. Vazirani V.N. and Chandola S.P., "Transportation Engineering", Vol I Khanna Publishers, N. Delhi.
6. Vazirani V.N. and Chandola S.P., "Transportation Engineering", Vol II Khanna.

Text Books:

1. Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi, 7th edition, 2010
2. Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi, 5th edition 2013

Transportation Engineering Laboratory (RCP23VPC303L)

List of Experiments

Term work shall consist of performing experimental sets from the list below.

A) Min two Assignment from following

1. Draw neat labeled sketches of Highway & railway track in cutting and in embankment
2. Draw neat labeled sketches of left hand turnout, right hand turnout and different type of crossings.
3. Draw neat labeled plans of different types of railway stations
4. Numerical on geometric design of railway tracks

B) Any six experiments on bitumen out of following set.

1. Penetration test
2. Ductility of Bitumen
3. Softening point of Bitumen
4. Flash & fire point
5. Specific gravity of Bitumen
6. Viscosity of Bitumen
7. Stripping value of road aggregates.
8. Bitumen extraction test (on premix sample)

B) Bituminous mix design Marshal Stability test

C) Numerical based on Flexible Pavement Design

D) Numerical based on Rigid Pavement Design

E) A report on at least one site visit.

Visit to construction site of major road projects, hot mix plant etc.

Program : Civil Engineering	TY BTECH	Semester: V
Theory of Structure (RCP23VPC304)		

Pre-requisite: Engineering Mechanics, Mechanics of Solids, Structural Analysis.

Course Objectives:

1. To develop the ability to analyze beams subjected to moving loads using influence lines for determining critical shear force and bending moment.
2. To impart knowledge of classical and matrix methods for analyzing statically indeterminate beams and rigid jointed frames.
3. To introduce the principles of plastic analysis for evaluating the ultimate load-carrying capacity and collapse behavior of structures.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Calculate maximum structural responses due to a moving unit load in terms of reactions, shear force, and bending moment.	3	Apply
CO2	Analyze indeterminate structures such as continuous beams and frames using the moment distribution method.	4	Analyze
CO3	Analyze complex structures including the statically indeterminate type by applying matrix method of analysis.	4	Analyze
CO4	Evaluate member forces and displacements in structural systems using method of consistent deformation.	5	Evaluate
CO5	Explain concept of plastic theory for analysis of beams and frames, calculation of shape factors for various cross sections.	2	Understand

Course Content

Unit-I Influence Lines and Moving Load

09 Hrs.

a) Influence lines: - Basic concepts, influence line for reactions, B.M. & S.F. for simply Supported, overhanging beams, Cantilever beam, continuous beam with internal hinge. Calculations for Shear Force and Bending Moment in beam using influence lines.

b) Moving loads: - Introduction, conditions for maximum B.M. and maximum S.F. at a section due to moving point loads, UDL longer or shorter than span and train of moving loads, Absolute maximum B.M. & S.F., Construction of Max. S. F. and B.M. diagram.

Unit- II Moment Distribution Method

08 Hrs.

Introduction, concept of carry over moment, carry over factor, distribution factor, analysis of indeterminate continuous beams, analysis of rigid jointed rectangular frames with and without sway.

Unit-III Stiffness Method of Structural Analysis

08 Hrs.

Introduction to fundamental concept of stiffness, degree of freedom, matrix formulation for stiffness methods, analysis of continuous beam and rigid jointed plane frames (maximum up to three unknowns)

Unit-IV Flexibility Method of Structural Analysis

08 Hrs.

Introduction to fundamental concept of flexibility, matrix formulation for flexibility methods, analysis of continuous beam and rigid jointed plane frames (maximum up to three unknowns)

Unit-V Plastic Analysis of Structure

08 Hrs.

Introduction, stress- strain curve, concept of plastic design, shape factor (including numerical examples), plastic hinge, plastic moment capacity, plastic modulus, collapse load, collapse mechanism, lower bound and upper bound theorem, uniqueness theorem.

Reference Books:

1. A. Ghali, A. M. Neville, "Structural Analysis- A Unified classical and matrix Approach", CRC Press, 2017
2. B. C. Punmia, Ashok K. Jain and Arun K. Jain, "Theory of Structures", Laxmi Publication, 2017.
3. C. S. Reddy, "Basic Structural Analysis", McGraw Hill Education, 2017.
4. G. S. Pandit & S. P. Gupta, "Structural Analysis – A Matrix Approach" McGraw Hill Education, 2018.
5. S. S. Bavikatti, "Structural Analysis-II", Vikas Publishing Company, 2021
6. S. Ramamruthum and R. Narayanan, "Theory of Structures", Dhanpat Rai Publishing Company, 2021

Program: Civil Engineering	TY B Tech	Semester: V
Elective-I Smart City Planning -I (RCP23VPE311)		

Pre-requisite: Nil

Course Objectives:

1. To understand need and Scope of Smart city Planning.
2. To develop the concepts of Smart city Infrastructure basic requirements and apply his/her knowledge for planning and designing a smart city.
3. Understand National and Global policies to implement for smart city development.
4. To study the parameters of a smart city

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	To understand need and Scope of Smart city Planning.		Understand
CO2	To study the concepts of Smart city Infrastructure basic requirements and apply his/her knowledge for planning and designing a smart city.	4	Analyze and design
CO3	Understand National and Global policies to implement for smart city development.	3	Understand
CO4	Students able to design of smart city layout	2	Design

Course Content

Unit I Fundamental of Smart City

(06 Hrs.)

Introduction of Smart City, Concept of smart city, Objective for smart cities, History of Smart city world and India. Need to develop smart city, Challenges of managing infrastructure in India and world, various types of Infrastructure systems, Infrastructures need assessment

Unit II Utility in Infrastructure

(08 Hrs.)

Planning and development of Smart city Infrastructure: Energy and ecology, solar energy for smart city, Housing, sustainable green building, safety, security, disaster management, economy, cyber security, Project management.

Unit-III Management of water resources and related infrastructure

(08 Hrs.)

Management of water resources and related infrastructure Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system etc.

Unit-IV Infrastructure Management system & Policy for Smart city

(06 Hrs.)

Infrastructure Management system & Policy for Smart city. Integrated infrastructure management systems for smart city, Infrastructure management. System applications for existing smart city. Worldwide policies for smart city Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city

Unit-V Case study of Smart city

(08 Hrs.)

Worldwide policies for smart city Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city

Text Books:

1. UDPFI guidelines, ministry of urban affairs and employment, Govt. & India.
2. Koenigsbeger, “Manual of tropical housing and building”, Universities Press (India)
3. Sustainable Building - Design Manual: Sustainable Building Design Practices, 2009 by TERI

Reference Books:

1. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li
2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos
3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend
4. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988
5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997

Program: Civil Engineering	TY B Tech	Semester: V
Elective-I Prefabricated Structure (RCP23VPE312)		

Pre-requisite: Nil

Course Objectives:

1. To understand the principles of modular coordination.
2. To study the importance of prefabricated structure.
3. Identify the different types of connections between structural members
4. Understand the concept of progressive collapse

COs	Course Outcomes	Blooms	Blooms Description
CO1	To Identify design principles and IS code specifications.	3	Understand
CO2	To study the importance of prefabricated components	4	Analyze and design
CO3	To analyze and design structural components	2	Design
CO4	Understand the concept of progressive collapse	3	Understand

Course Content

Unit I Introduction

(06 Hrs.)

Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Disuniting of Structures.

Unit II Prefabricated Components

(08 Hrs.)

Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.

Unit-III Design Principles

(08 Hrs.)

Design of Structural components – Beam, Column and Corbel - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces.

Unit-IV Joints in Structural Members

(06 Hrs.)

Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.

Unit-V Design For Earthquakes and Cyclones

(08 Hrs.)

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.

Text Books:

1. Hubert Bachmann and Alfred Steinle. Precast Concrete Structures, 2012.
2. Laszlo Mokka, Prefabricated Concrete for Industrial and Public Structures, Akademiai Kiado, Budapest, 1964

Reference Books:

1. PCI Design Hand Book, 6th Edition, 2004.
2. Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016.
3. A.S.G. Bruggeling and G.F.Huyghe, Prefabrication with concrete, Netherlands: A.A. Balkema Publishers, 1991.

Program: Civil Engineering	TY B Tech	Semester: V
Elective-I Construction Equipment and Automation (RCP23VPE313)		

Pre-requisite: Nil

Course Objectives:

1. To understand the importance, scope and application of various construction equipment's
2. Student must be able to apply a correct machine for a specific construction task and get Optimal output of the same.
3. Student must know about the robots being used for critical construction tasks and must be Able to deploy them as per need.
4. Analyze benefits of robotics versus conventional construction equipment
5. Classify application of Virtual Reality, Augmented Reality, BIM in construction industry

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will be able to understand the importance, scope and application of various construction equipment's	3	Learn
CO2	Student must be able to apply a correct machine for a specific construction task and get optimal output of the same	4	Analyze and design
CO3	Student must know about the robots being used for critical construction tasks and must be Able to deploy them as per need.	3	Understand
CO4	Classify application of Virtual Reality, Augmented Reality, BIM in construction industry	2	Analyze

Course Content

Unit I Introduction to Construction Equipment (06 Hrs.)

Introduction: Unique features of construction equipment, Need of construction Equipment, past history.

Construction Equipment: Capacity, Feasibility, owning and Hiring operating cost and Productivity of Different Equipment: Excavators, Pavers, Cranes and Hoists, Concrete Batching Plants, etc.

Unit II Automation in Construction Industry (08 Hrs.)

Automation in Construction Industry: Need and Benefit of automation: Automation in Canal lining, Automation in Construction of Highway, and Automation in concrete technology. Plastering machines; Pre-stressing and Post stressing jacks and grouting equipment etc.

Unit-III Robotics in Construction Industry (08 Hrs.)

Robotics in Construction: Introduction, Benefits of robots in construction industry with respect to time, cost, quality, safety. Use of robots for construction activities like Brick laying, Demolition, Material Handling, Structural steel cutting, Rebar tying/bending, Form work mold making, 3D printing- print complex, layered, parts and objects of homes, buildings, bridges and roads etc.

Unit-IV (08 Hrs.)

Excavating equipment Selection, basic parts, operation, and factors affecting output, Tractors and related equipment: Bulldozers, Rippers, Scrapers Power shovels, Draglines, Hoes, Clam shells and trenching machines.

Unit-V Building Information Modeling (BIM). (06 Hrs.)

Introduction to Advanced Technologies: Virtual Reality, Augmented Reality, Building Information Modeling (BIM).

Text Books:

1. Construction Planning, Equipment and Methods by R L PEURIFOY, C J Schexnayder And A V Shapira, Mc Graw Hill publication.
2. Construction Equipment and Its Management by S C Sharma, Khanna Publications.

Reference Books:

1. Construction Planning, Methods and Equipment, R.L Peurifoy, McGraw Hill, 2011
2. Construction Project management, Theory & Practice, Kumar Neeraj Jha,, Pearson Education India.
3. BIM and Construction Management: Proven Tools, Methods, and Workflows By Brad Hardin, Dave McCool, John Wiley & Sons
4. Construction equipment and its planning and application Mahesh Varma Metropolitan Book Co
5. Robotics and Automation in Construction, Open access peer- reviewed edited volume.

Program: Civil Engineering	TY B Tech	Semester: V
Elective-I Engineering Geology (RCP23VPE314)		

Pre-requisite: Nil

Course Objectives:

1. To study and identify different types natural materials like rocks & minerals and soil.
2. To understand the various natural dynamic processes their influence on the surficial features, natural material and their consequences.
3. To know the physical properties of rocks & minerals,
4. To know the importance of geological maps and language helpful for Civil Engineering projects

Course Outcomes (COs): After completion of this course students will be able to:

COs	Course Outcomes	Bloom s	Blooms Description
CO1	Understanding various geology factors and importance of Rock and mineral.	2	Understanding
CO2	Students are able to know the different geological hazards and its mitigation, Students are able to understand the different method of geological exploration	3	Applying
CO3	Students are able to understand the different geological structures and their impact on civil engineering structure.	3	Applying

Course Content

Unit I

(06 Hrs.)

Introduction and scope of Geology and subdivision, Internal structure of the earth, Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers. Earthquakes: Basics of earthquake, earthquake history, seismic activity, concept of intensity and magnitude of earthquake, causes of earthquake, influence on civil structures and engineering consideration, seismic zonation, Stratigraphy of INDIA-Introduction

Unit II

(06 Hrs.)

Study of physical properties of mineral and study of common rock forming minerals & way of Formation of minerals, Study of three types of rocks with reference to their formation, identification, textural and structural features Rocks and natural materials as a construction material

Unit-III

(06 Hrs.)

Outcrop, stratification, dip and strike relation, Unconformity, joints their types and genesis Faults and folds with their types and causes, Engineering consideration of joints, folds and faults

Unit-IV

(06 Hrs.)

Basics of Engineering Geology, Importance of geological studies to Engineers and significance of geological Investigations for civil engineering projects, Geology for Site selection of Dam, Tunnel, Reservoir and Highways

Unit-V

(06 Hrs.)

Ground water and occurrence, investigations, quality, artificial recharging, Hydrogeological Cycle)

Text Books:

1. Mukharjee, P.K., A text book of Geology, The World Press Pvt. Ltd.
2. Kesavulu, C., Textbook of Engineering Geology, Macmillan India Ltd, 1993, NewDelhi
3. Bangar, K.M, Principles of Engineering Geology, Standard Publishers Distributors, 1995, New Delhi
4. Billings, M.P., Structural Geology, Prentice-Hall India, 1974, New Delhi
5. Blyth, F.G.H and de Freitas, M.H. Geology for Engineers, ELBS, 1974London

Program: Civil Engineering	TY B Tech	Semester: V
Legal aspects in Civil Engineering (RCP23VMD301)		

Pre-requisite: Nil

Course Objectives:

1. To Understanding the Civil Engineering Contract Administration system & importance
2. To study the various important terms like Bailment, Arbitrator, guarantee etc.
3. To learn the importance of Labor law and different types.

Course Outcomes (COs): After completion of this course students will be able to:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand and analyses standard building contracts, Indian Contract Act provisions, and RERA regulations applicable to civil engineering projects.	3	Understand
CO2	Comprehend the legal concepts of bailment, injunctions, indemnity and guarantee in the context of construction industry transactions.	4	Analyze
CO3	Evaluate industrial acts and Labour laws governing construction workers, factory operations, and employment conditions in civil engineering projects.	3	Understand

Course Content

Unit- I

04 Hrs.

Professional Practice and Administration Contracts: The standard form of building contracts, Indian contract Act, The right of building owner, Right of Contractor, Types of Civil Engineering contracts, RERA

Unit-II

06 Hrs.

Bailment: Nature of Transactions, Delivery of Bailee, care to be taken, Bailee's Responsibility, Termination, Bailment of pledges. Injunction: Types Temporary, Perpetual, Mandatory when referred, Indemnity and Guarantee: Difference between the two, The Contract of Guarantee and Indemnity,

Unit-III

06 Hrs.

Industrial Acts and Labour Laws: Indian factories Act, Industrial Dispute Act, Payment of Wages Act, Work Compensation Act, Trade Union Act, The Building and Other Constructions Workers' (Regulation of Employment and Conditions of Service) Act, 1996

Unit-IV

6 Hrs.

Arbitration and Award: Indian Arbitration Act, Arbitration Agreement, Conduct of Arbitration, Power and Duties of Arbitration, Rules of Evidence, E- Tendering, Preparation and publication of award, Methods of Enforcement impending and Awards.

Reference Books:

1. Indian Contract Act Avatar Singh.
2. Indian contract Act Jhamb.

Text Books:

1. Indian arbitration Act by B. S. Patil.
2. Indian Contract Act.
3. Safety Engineering, Govt. of India Publication.
4. Professional Practice, Roshan Namavati.
5. Legal Aspects of building and Engineering Contracts by B. S.

Program: Civil Engineering	TY B Tech	Semester: V
Semester Project –III (RCP23XSC301P)		

Pre-requisite: Nil

Course Objectives:

Students are expected to design, simulate/implement a project based on the knowledge acquired from Current semester subjects.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Conduct a survey of several available literatures in the preferred field of study.	4	Analyze
CO2	Demonstrate various/alternate approaches to complete a Project.	2	Understand
CO3	Ensure a collaborative project environment by interacting And dividing project work among team members.	3	Apply
CO4	Present their project work in the form of a technical report / paper and thereby improve the technical communication skill.	3	Apply
CO5	Demonstrate the ability to work in teams and manage the conduct of the research study.	2	Understand

Semester Project:

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, Presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the Content of semester project report which is being submitted in partial fulfillment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report. Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for Each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The Departmental committee shall finalize one topic for every group. Semester Project Title or Theme Should be based on knowledge acquired during semester. The project work shall involve sufficient work So that students get acquainted with deferent aspects of knowledge acquired from semester subjects. Student is expected to:

- _ Select appropriate project title based on acquired knowledge from current semester subjects.
- _ Maintain Log Book of weekly work done (please see attached log book format).
- _ Report weekly to the project guide along with log book.

Assessment Criteria:

- _ at the end of the semester, after conformation by the project guide, each project group will Submit project completion report in prescribed format for assessment to the departmental committee (including project guide).
- _ Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide).

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- _ Introduction
- _ Literature Survey _ Related Theory
- _ Implementation details _ Project Outcomes
- _ Conclusion _ References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment: Guide will monitor weekly progress and marks allocation will be as per Table 2.

Assessment criteria for the departmental committee (including project guide) for End Semester Exam: Departmental committee (including project guide) will evaluate project as per Table 3. Each group shall present/publish a paper based on the semester project in reputed/peer Reviewed Conference/Journal/Tech Fest/Magazine/ before the end of the semester.

Table 1 Log Book format

S.NO.	Week (Start date / End date)	Work done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2 Continuous Assessment sheet

S.NO.	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Table 3 Evaluation sheet

S.NO.	Exam Seat No	Name of Student	Project Selection	Design Simulation logic	PCB hardware programing	Result Verification	Presentation	Total
			5	5	5	5	5	25

Program: Civil Engineering	TY B Tech	Semester: V
Constitution of India (RCP23XHS311)		

Course Objective(s):

1. To provide basic information about Indian constitution.
2. To identify individual role and ethical responsibility towards society.
3. To understand human rights and its implications.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Use general knowledge and legal literacy and thereby to take up competitive examinations.	L3	Apply
CO2	Explain state and central policies, fundamental duties.	L2	Understand
CO3	Discuss Electoral Process, special provisions.	L2	Understand
CO4	Explain powers and functions of Municipalities, Panchayats and Co-operative Societies.	L2	Understand
CO5	Discuss Engineering ethics and responsibilities of Engineers.	L2	Understand
CO6	Explain Engineering Integrity & Reliability.	L2	Understand

Course Content

Unit-I Introduction to the Constitution of India

02 Hrs.

The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution, Fundamental Rights & its limitations.

Unit-II Directive Principles of State Policy

02 Hrs.

Relevance of Directive Principles State Policy, Fundamental Duties.

Union Executives – President, Prime Minister, Parliament, Supreme Court of India.

Unit-III State Executives

03 Hrs.

Governor, Chief Minister, State Legislature, High Court of State.

Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.

Unit-IV Special Provisions

02 Hrs.

For SC & ST, Special Provision for Women, Children & Backward Classes, Emergency Provisions.

Unit-V Human Rights

03 Hrs.

Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co-Operative Societies.

Unit-VI Scope & Aims of Engineering Ethics

02 Hrs.

Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

Text Books:

1. Durga Das Basu, “Introduction to the Constitution on India”, (Student Edition) Prentice-Hall EEE, 25th Edition, 2021.
2. Charles E. Haries, Michael S. Pritchard and Michael J. Robins, “Engineering Ethics”, Thompson Asia, 2003.

Reference Books:

1. M. V. Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 3rd Edition, 2003.
2. M. Govindarajan, S. Natarajan, V. S. Senthilkumar, “Engineering Ethics”, Prentice-Hall of India Pvt. Ltd. New Delhi, 2013.
3. Brij Kishore Sharma, pl“Introduction to the Constitution of India”, 7th Edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
4. Latest Publications of Indian Institute of Human Rights, New Delhi.

Online Resources:

1. www.nptel.ac.in
2. www.hnlu.ac.in
3. www.nspe.org
4. www.preservearticles.com

Program: Civil Engineering	TY B Tech	Semester: V
Coursera Course Formwork Practice (RCP23VSC301)		

Course Objectives:

1. Understand the fundamentals, materials, components, accessories, functions, and codal provisions related to conventional and modern formwork systems used in concrete construction.
2. Analyze the structural behaviours, design principles, loading conditions, and selection criteria of various formwork systems for different structural elements.
3. Apply formwork design concepts and perform numerical design calculations for beam, slab, column, and wall formwork in accordance with relevant Indian Standards

COs	Course Outcomes	Bloom's Level	Bloom's Description
CO1	Explain the fundamentals, classification, materials, accessories, functions, and relevant IS Codes of conventional and modern formwork systems	L2	Understand
CO2	Compare different formwork systems and select suitable formwork based on structural requirements, economy, safety, and construction efficiency.	L4	Apply
CO3	Apply design principles to determine loads on formwork and perform numerical design of beam, slab, column, and wall formwork.	L3	Analyze

Course Content

UNIT I: Fundamentals of Formwork Systems

(8 Hours)

Introduction to formwork engineering, objectives and importance of formwork in construction, classification of formwork systems, functions and performance requirements, selection criteria, materials used in formwork (timber, plywood, steel, aluminium, plastic), formwork accessories and consumables, tools and equipment, codal provisions, safety requirements, quality considerations, and sustainability in formwork practices.

UNIT II: Conventional and Engineered Formwork Systems (9 Hours)

Study of conventional and engineered formwork systems for foundations, walls, columns, beams, and slabs. Components, assembly, erection, alignment, and deshuttering procedures. Modular formwork systems, aluminium (MIVAN) formwork, steel formwork, plastic formwork, heavy-duty tower systems, and horizontal and vertical formwork applications. Comparison based on quality, speed, economy, safety, durability, and reusability

UNIT III: Formwork Planning, Design and Drawings (8 Hours)

Principles of formwork planning, logistics and sequencing, formwork layout and shop drawings, conventional and system formwork drawings, design philosophy, design loads on formwork, lateral pressure of fresh concrete, design assumptions, strength, stability and serviceability requirements, codal provisions, numerical problems on beam, slab, column and wall formwork design

UNIT IV: Formwork Cost Estimation and Project Management (8 Hours)

Formwork quantity estimation, bill of quantities (BOQ), material, labour and equipment costing, productivity analysis, planning and scheduling of formwork operations, logistics management, mobilization planning, cost optimization techniques, digital planning, BIM applications in formwork management, quality control and monitoring of formwork operations.

UNIT V: Advanced Formwork Systems and Safety Practices (9 Hours)

Specialized formwork systems including tunnel formwork, climbing formwork, slip formwork, self-climbing systems, table (flying) formwork, applications in high-rise buildings, silos, chimneys, bridge piers and other complex structures. Formwork inspection, failure analysis, case studies, construction safety practices, risk assessment, quality assurance, maintenance, dismantling procedures, and industrial best practices.

Web Links

1. Coursera – Formwork Practice