



Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur
(An Autonomous Institute)

Course Structure and Syllabus
Third Year B. Tech (Civil Engineering)

With effect from Year 2024-25



Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405 Ph: 02563
259802, Website: www.rcpit.ac.in



R. C. PATEL
INSTITUTE OF TECHNOLOGY
An Autonomous Institute

Department of Civil Engineering

Vision of the Institute

To become a leading Institute in Technical education fostering innovation, research, ethical values, and sustainable development for the betterment of society.

Mission of the Institute

To impart high quality Technical Education through:

- M1.** Innovative and Interactive learning process and high quality, globally recognized instructional programs.
- M2.** Fostering a collaborative scientific temper among students with ethical responsibility towards the society.
- M3.** Preparing students from diverse backgrounds to have aptitude for employment, entrepreneurship and research with a spirit of Professionalism.
- M4.** To contribute to nation's sustainable development.

Vision of the Civil Engineering

To provide quality Civil engineering education with socio-moral values catering to the need of nation and globe.

Mission of the Civil Engineering

- M1:** Provide civil engineering education with technical and ethical excellence.
- M2:** Empower students through innovation, research, and sustainable engineering design.
- M3:** Prepare civil engineers with research skills and entrepreneurial career mindset.

Program Educational Objectives (PEOs) of the Department

- PEO 1** Graduates will apply scientific, mathematical, and engineering principles to solve complex civil problems ethically and sustainably.
- PEO 2** Graduates will design and implement resilient civil solutions addressing societal needs through innovation, collaboration, and environmental responsibility.
- PEO 3** Graduates will exhibit professional competence, communication, teamwork, and lifelong learning for career advancement, entrepreneurship, and higher education.



Department of Civil Engineering

Program Specific Outcomes (PSOs)

PSO 1- Graduates will apply core Civil Engineering principles to survey, plan, analyze, design, and manage infrastructure systems using innovative, sustainable, and efficient approaches for real-world challenges.

PSO 2- Graduates will uphold ethical professional practice, collaborate effectively in teams, and communicate clearly to enhance employability skills while fostering entrepreneurial ventures in diverse civil engineering contexts.

Third Year B. Tech Civil Engineering - Semester- V (w.e.f. 2024-25)

Third Year B. Tech Civil Engineering - Semester- V (w.e.f. 2024-25)												
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme			Total [A + Average (B, C) + D]	Credit	
							Continuous Assessment					ESE [D]
				L	T	P	TA [A]	Term Test- 1 [B]	Term Test- 2 [C]			
1	PC	22PCCE5010T	Hydraulics and Fluid Machinery	3	-	-	20	15	15	65	100	3
2	PC	22PCCE5010L	Hydraulics and Fluid Machinery Laboratory	-	-	2	25	-	-	25	50	1
3	PC	22PCCE5020T	Design of Concrete Structures	3	-	-	20	15	15	65	100	3
4	PC	22PCCE5020L	Design of Concrete Structures Laboratory	-	-	2	25	-	-	25	50	1
5	PC	22PCCE5030T	Transportation Engineering	3	-		20	15	15	65	100	3
6	PC	22PCCE5030L	Transportation Engineering Laboratory	-	-	2	25	-	-	25	50	1
7	PC	22PCCE5040T	Theory of Structure	3	-	-	20	15	15	65	100	3
8#	PE	22PECE505-T	Professional Elective Course – I	3	-	-	20	15	15	65	100	3
9	MC	22MCCE5060T	Civil Engineering Social & Global Impact	1	-	-	50	-	-	-	50	1
10	HM	22HMCE5070T	Professional & Business Communication Tutorial	-	2	-	50	-	-	-	50	2
11	PJ	22PJCE5080L	Semester Project-III	-	-	2	25	-	-	25	50	1
12	HM	22HMCE5090L	Employability skills development program- II	-	-	2	50	-	-	-	50	1
Total				16	2	10	350	75	75	425	850	23

Semester-V-Professional Elective Courses-I#					
Sr No.	Course Code	Course Title	Sr No	Course Code	Course Title
1	22PECE5051T	Smart city Planning	3	22PECE5053T	Prefabricated Structure
2	22PECE5052T	Construction Equipment's and Automation	4	22PECE5054T	Repairs & Rehabilitation of Structure

TA- Teacher assessment, ESE- End Semester Exam,



Prepared by

Checked by

BOS Chairman

Dean Academic/Dy. Director

C.O.E

Director

Third Year B. Tech Civil Engineering - Semester- VI (w.e.f. 2024-25)

Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Total [A + Average (B, C) + D]	Credit
							Continuous Assessment			ESE [D]		
				L	T	P	TA [A]	Term Test- 1 [B]	Term Test- 2 [C]			
1	PC	22PCCE6010T	Estimating & Costing	3	1	-	20	15	15	65	100	4
2	PC	22PCCE6010L	Estimating & Costing Laboratory	-	-	2	25	-	-	25	50	1
3	PC	22PCCE6020T	Design of Steel Structures	3	1	-	20	15	15	65	100	4
4	PC	22PCCE6020L	Design of Steel Structures Laboratory	-	-	2	25	-	-	25	50	1
5	PC	22PCCE6030T	Water Resource Engineering	3	-	-	20	15	15	65	100	3
6	PC	22PCCE6040T	Construction Management	3	-	-	20	15	15	65	100	3
7#	PE	22PECE605-T	Professional Elective Course -II	3	-	-	20	15	15	65	100	3
8	PJ	22PJCE6060L	Project Stage-I	-	-	4	25	-	-	25	50	2
9	ES	22ESCE6070L	Computer Aided Civil Engineering Drawing Laboratory	-	-	2	50	-	-	-	50	1
10	MC	22MCCE6080T	Environmental Studies	1	-	-	-	-	-	-	-	Audit
Total				16	2	10	225	75	75	400	700	22

Semester-VI-Professional Elective Courses-II#

Sr No.	Course Code	Course Title	Sr No.	Course Code	Course Title
1	22PECE6051T	Traffic Engineering & Management	3	22PECE6053T	Town & Urban Planning
2	22PECE6052T	Geographical Information System	4	22PECE6054T	Advanced Design of RC Structure

TA- Teacher assessment, ESE- End Semester Exam,



Prepared by

Dean Academic/Dy. Director

Checked by

C.O.E

BOB Chairman

Director

SEM

V

Program : Civil Engineering	TY BTECH	Semester: V
Hydraulics and Fluid Machinery (22PCCE5010T)		
Hydraulics and Fluid Machinery Laboratory (22PCCE5010L)		

Prerequisites: Mechanics, Physics and Fluid Mechanics

Course Objectives

1. To understand and Analyse flow behaviour in open channels and boundary layer conditions under various flow situations.
2. To develop knowledge of hydraulic machines such as pumps and turbines used in civil engineering.
3. To understand the working principles and applications of hydraulic machines, including impact of jets, pumps, and turbines.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply basic principles of flow in open channel to solve fluid flow problems.	3	Apply
CO2	Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions	3	Apply
CO3	Impart knowledge of boundary layer flows, governing equations of fluid flow for different flow regimes, different geometries under the effect of various boundary conditions.	2	Understand
CO4	Understand the theory of impact of jet and apply the same for analyzing hydraulic turbine.	4	Analyze
CO5	Discuss performance of hydraulic turbines and centrifugal pumps in terms of unit and specific quantities and demonstrate their characteristics curves.	3	Apply

Course Content

Unit-I	Flow in Open Channels	8 Hrs
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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	7 Hrs
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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	8 Hrs
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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
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Impact of jets: Dynamic 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	9 Hrs
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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.

References / Text Books

Reference Books

- Fluid Mechanics including Hydraulic Machines by Dr. A.K. Jain
- Fluid Mechanics – Fundamentals and Applications by Yunus Cengel, John M. Cimbala, Tata McGraw Hill Publishing Company Ltd., New Delhi, latest edition/reprint.
- Flow in Open Channel by K. Subramanya, Tata McGraw Hill Publishing Ltd., New Delhi.
- Fluid Mechanics Hydraulic and Hydraulic Machines K R Arora

Text Books

- A textbook of Fluid Mechanics & Hydraulic Machines by R. K. Bansal.
- Hydraulics and fluid mechanics including Hydraulic machines by Dr. P. N. Modi and S. M. Seth, Latest edition, Standard book house.
- Fluid Mechanics & Hydraulic Machines by K Subramanya, Tata McGraw Hill Publishing Company Ltd New Delhi.
- A textbook of Fluid Mechanics & Hydraulic Machines by R. K. Bansal.

List of experiments

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

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. Study of Pelton turbine
7. Study of Francis turbine
8. Study of Kaplan turbine
9. Study of Centrifugal pump
10. Study of reciprocating pump

Program : Civil Engineering	TY BTECH	Semester: V
Design of Concrete Structures (22PCCE5020T)		
Design of Concrete Structures Laboratory (22PCCE5020L)		

Prerequisites: Engineering Mechanics, Mechanics of Solids, Structural Analysis,

Course Objectives

1. To introduce the various basic design philosophies followed in Reinforced Concrete Design.
2. To develop Civil Engineering graduates having clear understanding of concepts of reinforced concrete design using Limit state approach.
3. To impart the concepts of design and detailing of RCC components under flexure, shear and bond.
4. Apply the limit state method for design and detailing of RCC structural components to ensure serviceability, while effectively utilizing IS 456:2000 and relevant IS codes in RCC design.
5. To familiarize students to use of IS 456-2000 and relevant IS codes, its importance in RCC design.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the different design philosophies as per the provisions made in IS-456-2000	2	Understand
CO2	Analyse and design singly and doubly reinforced sections using the Limit State Method.	4	Analyze
CO3	Apply limit state of Collapse for shear and bond.	3	Apply
CO4	Design of slab, staircase, column and footings.	6	Create

Course Content

Unit-I	Design Philosophies	6 Hrs
Different design philosophies: Working stress method, Ultimate load method, Limit state method Stress-strain behavior of materials Permissible stresses in steel and concrete Structural properties of concrete		
Unit-II	Design of Beam – Flexure	10 Hrs
a) Introduction to limit state method – Types and classification of limit states, Characteristic strength and characteristic load, Load factor, Partial safety factors. b) Singly and Doubly Reinforced Section – Assumptions, stress & strain diagram, Balanced, under reinforced & over reinforced RC sections, Analysis and design of rectangular section. c) Flanged Section – Properties of flanged (L and T) sections, Analysis and design of flanged sections.		
Unit-III	Design of Beam – Shear and Bond	10 Hrs
Shear failure, Types of Shear reinforcement (Simply supported beams, cantilever beams & continuous beams using IS code coefficient method) Bond – Types of bond, Factors affecting bond resistance, Check for development length		
Unit-IV	Design of Slab and Staircase	8 Hrs
a) Design of Slabs – Simply supported One-way slab, Cantilever Slab, two-way slab with different support conditions as per IS:456-2000. b) Design of Staircase – Design of doglegged staircase		
Unit-V	Analysis and Design of Columns and Column Footings	8 Hrs
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 load. b) Isolated Column Footing – Isolated rectangular column footing with constant depth, trapezoidal section subjected to axial loads.		

References / Text Books

Design Codes:

- IS 456 (2000) Plain and reinforced concrete – Code of practice, Bureau of Indian Standard, Manak Bhavan, New Delhi.
- Design aids for reinforced concrete to IS 456-1978, Bureau of Indian Standard, Manak Bhavan, New Delhi.

Reference Books:

- P. Dayaratnam,(2011), “Design of Reinforced Concrete Structures”, Oxford &Ibh-Pubs Company-New Delhi, ISBN 8120414195
- Ashok K. Jain(1993), “Reinforced Concrete: Limit State Design” , Nem Chand & Brothers, ISBN 8185240531, 844 pages.
- Design of Reinforced Concrete Structures (conforming to IS 456)S. Ramamrutham, R. Narayan , Dhanpat Rai Publication, 7th edition 2013

Text Books:

- Limit state theory and Design –Dr. V. L. Shah and Dr. S. R, Structures publications, Pune
- Dr. H. J .Shah,(2008),”Reinforced Concrete, Volume 2”, Charotar Publishing House Pvt. Limited, ISBN 8185594732, 536 pages
- S. N. Sinha, (2002),”Reinforced Concrete Design, Second Revised Edition”, Tata McGraw-Hill Education, ISBN 0070473323, 708 pages

- Karve & Shah, (2011), “Illustrated Design of Reinforced concrete Buildings”,
- P.C. Varghese (2009), “Limit state design of Reinforced concrete,” PHI Learning.
- B.C. Punmia, Ashok kumar Jain and Arun kumar jain (2007), Limit State Design of Reinforced Concrete.
- Sinha and Roy, S. “Fundamentals of Reinforced Concrete” –Chand and company Ltd. Ram Nagar, New Delhi
- Gambhir-Mcmillan, “Reinforced Concrete Design-M. L. India Ltd. New Delhi.
- Bandyopadhyay J. N.(2008) “Design of concrete structures” PHI Learning, New Delhi.
- Bhasvikatti S S, (2007), “Design of RCC structural elements RCC- I”, New age International, Publishers.

List of experiments

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 for a G+2 building (Residential/ Commercial).
 - b) To draw the layout of Ground beam, plinth beam, floor beam, column, slabs etc. (Sheet-2)
- 2) Analysis and design of beams and slabs
 - a) To calculate loads and internal forces on beams and slabs.
 - b) To decide the sections and calculate steel reinforcement.
 - c) To draw structural drawings of beams, slabs. (Sheet 3- For Beam, Sheet 4- For Slab)
- 3) Analysis and design of column and footing
 - a) To calculate loads and internal forces on columns and footings.
 - b) To decide the sections and calculate steel reinforcement.
 - c) To draw structural drawing of column and footing. (Sheet 5- For Column, Sheet 6- For Footing)
- 4) Analysis and design of dog-legged staircase
 - a) To calculate loads and internal forces.
 - b) To calculate steel reinforcement.
 - c) To draw structural drawing of dog-legged staircase (Sheet 7- For staircase)
- 5) A report on at least one site visit.

Program : Civil Engineering	TY BTECH	Semester: V
Transportation Engineering (22PCCE5030T)		
Transportation Engineering Laboratory (22PCCE5030L)		

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
4. To understand the basics involved in the crossing and turnout of railway track.
5. To understand the Civil engineering aspects of Highway and Railway Engineering

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Assess the implementation of Transportation Engineering concepts applied in Highway Engineering.	5	Evaluate
CO2	Analyse the theoretical and practical aspects of highway engineering along with their design and management applications.	4	Analyse
CO3	Analyse pavement design by considering various aspects associated with traffic safety measures.	4	Analyse
CO4	Evaluate the basics and design considerations of various components of railway engineering.	5	Evaluate
CO5	Analyse the types and functions of tracks, junctions, and railway stations.	4	Analyse

Unit-I	Introduction to Highway Engineering	8 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.		
Unit-II	Highway Material	8 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. Highway Drainage: Surface and sub-surface drainage arrangements,		
Unit-III	Traffic control	8 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.		
Unit-IV	Introduction to Railway Engineering	3 Hrs
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. 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 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	4 Hrs
a. Construction and Track maintenance: Plate laying method, operations involved Tools & common items of track maintenance. a. 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

- 8

- Vazirani V.N. and Chandola S.P., “Transportation Engineering”, Vol II Khanna. Text Books
- Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi.,7th edition, 2010
- Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi.,5th edition 2013

List of experiments

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

A) Min two Assignment from following

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

B) Any six experiments on bitumen out of the 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 (22PCCE5040T)		

Prerequisites: Engineering Mechanics, Mechanics of Solid, Structural Analysis

Course Objectives

1. To understand the concept of influence lines and moving loads and apply them to determine maximum shear force and bending moment in beams.
2. To Analyse indeterminate structures such as continuous beams and rigid frames using moment distribution and matrix stiffness methods.
3. To understand flexibility and plastic analysis methods and evaluate collapse load and plastic behaviour 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	Analyse indeterminate structures such as continuous beams and frames using the moment distribution method.	4	Analyze
CO3	Analyse 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 methods 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

Unit-I	Influence Lines and Moving Loads	9 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 & 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	9 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	8 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	8 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	8 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

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Program : Civil Engineering	TY BTECH	Semester: V
Professional Elective Course - I (Smart city Planning -I) (22PECE5051T)		

Prerequisites: Basic concepts of Building Construction Materials etc.

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	Explain the importance of Smart City Planning and describe its potential role in modern urban development.	2	Understand
CO2	Apply your understanding of fundamental smart city infrastructure concepts and requirements to plan and design an efficient smart city.	3	Apply
CO3	Analyse and implement national and international policies to develop effective strategies for smart city planning.	4	Analyse
CO4	Design of smart city layout	6	Create

Course Content

Unit-I	Fundamental of Smart City	8 Hrs
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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	8 Hrs
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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	8 Hrs
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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	10 Hrs
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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	8 Hrs
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Worldwide policies for smart city Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city

References / Text Books

Reference Books

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

Text Books

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

Program : Civil Engineering	TY BTECH	Semester: V
Professional Elective Course – I (Construction Equipment and Automation) (22PECE5052T)		

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. Analyse 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	Analyse 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

Unit-I	Introduction to Construction Equipment	6 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	8 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	8 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	Excavating equipment	8 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).	6 Hrs
Introduction to Advanced Technologies: Virtual Reality, Augmented Reality, Building Information Modeling (BIM).		

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

Text Books:

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

Program : Civil Engineering	TY BTECH	Semester: V
Professional Elective Course - I Prefabricated Structure (22PECE5053T)		

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 Level	Blooms Description
CO1	To Identify design principles and IS code specifications.	3	Understand
CO2	To study the importance of prefabricated components	4	Analyseand design
CO3	To Analyse and design structural components	2	Design
CO4	Understand the concept of progressive collapse	3	Understand

Course Content

Unit-I	Introduction	6 Hrs
Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Disuniting of Structures.		
Unit-II	Prefabricated Components	8 Hrs
Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.		
Unit-III	Design Principles	8 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	6 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	8 Hrs
Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.		

References / Text Books

Reference Books

- PCI Design Hand Book, 6th Edition, 2004.
- Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016.
- A.S.G. Bruggeling and G.F.Huyghe, Prefabrication with concrete, Netherlands: A.A. Balkema Publishers, 1991.
- Glover C.W, Structural Precast Concrete, Asia Publishing House, 1965.

Text Books:

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

Program : Civil Engineering	TY BTECH	Semester: V
Professional Elective Course - I Repair and Rehabilitation of Structures (22PECE5054T)		

Course Objectives

1. To understand need for repair and rehabilitation.
2. To develop clear understanding of concepts, and practical knowledge of modern Civil Engineering techniques.
3. To encourage students and faculty to interact with industry, alumni and other reputed institutes for purpose of better understanding of industry requirements and different materials used.
4. To deal with social, environmental and economic issues when applying various techniques.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understanding various repair techniques as per the requirement of the problem.	2	Understanding
CO2	To act as catalyst in transferring the Civil Engineering knowledge to field usage for the socio-economic development of the society	3	Applying
CO3	To provide a platform to students, scientists, engineers and working professionals to come together and implement the academic outcome to the field.	3	Applying

Course Content

Unit-I	Introduction	6 Hrs
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Need for strengthening due to various reasons such as ageing, natural calamities, increase of load, change of function and design, construction errors

Unit-II	Structural Strengthening	8 Hrs
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Strengthening and retrofitting of columns, beams, walls, footings and slabs, piers of concrete structures by jacketing, external post-tensioning, replacing or adding reinforcement, plate bonding, textile reinforced concrete

Unit-III	Specialized Repairs	8 Hrs
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Electro chemical repair using re-alkalization and chloride extraction techniques, Specialized repairs for chemical disruption, fire, marine exposure etc, Repair of damaged structures of water retaining structures, hydraulic structures, Pavements and Runways, Tunnels, Bridges, Piers and Flyovers, Parking Garages, Underwater repair, Masonary Repair, Repair and Restoration of Heritage Structures

Unit-IV	Seismic Retrofitting	6 Hrs
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Seismic strengthening of existing RC structures, Use of FRP for retrofitting of damaged structures

Unit-V	Retrofitting by composite materials	8 Hrs
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Fiber reinforced concrete, Ultra-high performance fibre reinforced concrete (UHPFRC), Fiber reinforced composites, Carbon fibre reinforced polymer (CFRP), Fibre wrapping (Carbon, Aramide, Glass)

References / Text Books

Reference Books:

- Concrete Repair and Maintenance: Peter H. Emmons and Gajanan M. Sabnis, Galgotia Publication.
- Repairs and Rehabilitation-Compilation from Indian Concrete Journal-ACC Publication.
- Guide to Concrete Repair and Protection, HB84-2006, A joint publication of Australia Concrete Repair Association, CSIRO and Standards Australia.
- CPWD hand book on Repairs and Rehabilitation of RCC buildings published by DG(Works), CPWD, Government of India (Nirman Bhawan), <http://www.cpwd.gov.in/handbook.pdf>
- Guide to Concrete Repair, Glenn Smoak, US Department of the Interior Bureau of Reclamation, Technical Service Center , <http://books.google.co.in>
- Management of Deteriorating Concrete Structures: George Somerville, Taylor and Francis Publication
- Concrete Building Pathology: Susan Macdonald, Blackwell Publishing.
- Testing of Concrete in Structures: John H. Bungey, Stephen G. Millard & Michael G. Grantham, Taylor & Francis Publication.
- Durability of concrete and cement composites: C.L.Page& M.M. Page,Woodhead Publishing
- Concrete Repair, Rehabilitation and Retrofitting: M. Alexander, H. D. Beushausen, F. Dehn& P. Moyo, Taylor & Francis Publication
- Concrete Repair Manual, Volume I & II, Published jointly by ACI, BRE, Concrete Society, ICRI

Text Books:

- Repairs, Rehabilitation & Restoration of structures: Dr. K.Saxena .Anuvi Chemicals Ltd.

- Repairs, Rehabilitation & water proofing to RCC structures: J J Shah.2ndEdition.

Program : Civil Engineering	TY BTECH	Semester: V
Civil Engineering Social & Global Impact (22MCCE5060T)		

Course Objectives

1. To Understanding the impact of which Civil Engineering has on the society at large and on the global area
2. To study the impact on the Infrastructure, Energy consumption and generation, sustainability of the Environment, Aesthetics of the environment, Employment creation, Contribution to the GDP, and on a more perceptible level, the Quality of Life
3. Evaluate the potential of Civil Engineering for employment creation and its contribution to the GDP.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe how incorporating the goal of sustainable development helps minimize potential impacts on the global environment.	3	Learn
CO2	Explain various measures that enhance the built environment and how they improve the quality of life for occupants.	4	Analyseand design
CO3	Outline the role of Civil engineering in evolution and revolution of mankind and globally present status of development in India.	3	Understand
CO4	Analyse the level of resource utilization for present and future infrastructural projects by applying various tools and methods.	2	Design
CO5	Summarize the reasons for undertaking conventional and futuristic infrastructural projects.	2	Understand

Course Content

Unit-I	Introduction to Course and Overview	3 Hrs
Introduction to Course and Overview; Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis		
Unit-II	Modern Infrastructure	3 Hrs
Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability.		
Unit-III	Environment Impact	3 Hrs
Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability		
Unit-IV	Built Environment	2 Hrs
Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability		
Unit-V	Environmental Impact of Civil Engineering Projects	3 Hrs
Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development		

References / Text Books

Reference Books:

- Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht

- Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASCE Annual Conference and Exposition.
- NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
- Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
- Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
- Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water Research FR/R0014
- Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. P 129-130
Text Books:
- Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63
- Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency Entrapment: An Agenda for Urban Water Research. Water Resources Management. Vol. 23, No.4. European Water Resources Association (EWRA) ISSN 0920-4741.
- 3.Brugnach M., Dewulf A., Pahl-Wostl C., Taillieu T. (2008) Toward a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. Ecology and Society 13 (2): 30
- Cavill S., Sohail M. (2003) Accountability in the provision of urban services. Proc. ICE. Municipal Engineer 156. Issue ME4 paper 13445, p235-244.

Program : Civil Engineering	TY BTECH	Semester: V
Professional & Business Communication (22HMCE5070T)		

Prerequisites: Language Proficiency- English, Effective Communication Skill

Course Objectives

1. To inculcate professional and ethical attitude at the workplace
2. To enhance communication and interpersonal skills
3. To develop effective presentation skills
4. To hone written skills for technical documentation.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Design and produce technical documents using appropriate style, format, and language.	6	Create
CO2	Use employability skills to optimize career opportunities.	3	Apply
CO3	Apply storytelling techniques appropriately in various corporate situations.	3	Apply
CO4	Design and develop effective meeting structures and create comprehensive documentation of the meeting process.	6	Create
CO5	Demonstrate interpersonal skills in professional and personal situations	3	Apply
CO6	Use knowledge of cultural differences and professional etiquettes to interact appropriately in workplace scenarios.	3	Apply

Course Content

Unit-I	Report Writing	6 Hrs
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Report Writing: Types of report, parts of formal report, collection of data and survey analysis, pre-writing of report, language and style in reports, formatting of reports, referencing in report Proposal Writing: Types of technical proposals, format of proposal, language and style, presentation of proposal Technical Paper Writing: Parts of a technical paper, language and formatting, referencing in IEEE format Plagiarism: Types of plagiarism, consequences of plagiarism

Unit-II	Group Discussion	6 Hrs
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Group Discussion: Purpose of a GD, types of GD, criteria for evaluating a GD, Dos and Don'ts of a GD, Tips to be successful in GD Cover Letter & Resume Writing: Format and content of cover letter, types of resume, structure, content and formatting of resume Interview Skills: Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview

Unit-III	Interpersonal Skills	6 Hrs
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Emotional Intelligence: Definition, difference between IQ and EQ, how to develop EQ Leadership: Types of leadership, leadership styles, case studies Team Building: Difference between group and team, importance of team work, strategies To be a good team player Time Management: Importance of time management, cultural views of time, 80/20 rule, Time wasters, setting priorities and goals, Conflict Management: Types of conflicts, strategies to manage conflict, case studies

Unit-IV	Meetings and Documentation	5 Hrs
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Planning and preparation for meetings, strategies for conducting effective meetings, notice, agenda and Minutes of a meeting, business meeting etiquettes

Unit-V	Cross-cultural communication and Ethics	5 Hrs
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Communication across cultures, professional and work ethics, responsible use of social media, introduction to Intellectual Property Right

List of Assignments

1. Business Proposal (PowerPoint presentation)
2. Resume writing
3. Interpersonal Skills (documentation of activity)
4. Meetings and Documentation (Notice, Agenda, Minutes of Mock Meetings)
5. Business ethics
6. Presentation Skills

Program : Civil Engineering	TY BTECH	Semester: V
Semester Project-III (22PJCE5080L)		

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	Analyse survey of several available literatures in the preferred field of study.	1	Analyze
CO2	Describe various/alternate approaches to complete a project.	2	Understand
CO3	Apply a collaborative project environment by interacting and dividing project work among team members.	3	Apply
CO4	Use technical communication skills to present project work in the form of a technical report/paper.	3	Apply
CO5	Apply teamwork and project management skills to plan, execute, and manage the research study.	3	Apply

Course Content / Guidelines

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 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 BTECH	Semester: V
Employability Skill Development Programme (22HMCE5090L)		

Course Objectives

1. To enhance the problem solving skills with real life examples.
2. To enable the students to express their thoughts and knowledge on various platforms.
3. Able to describe the basic database management system.
4. Able to implement basic programming project using python.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Solve logical problems based on words, Venn diagrams, etc.	L3	Apply
CO2	Solve English comprehension, sentence completion, and sentence correction problems.	L3	Apply
CO3	Illustrate the concepts of Exception Handling and Garbage Collection.	L3	Apply
CO4	Describe the fundamentals of DBMS, NoSQL, and MongoDB.	L2	Understand

Course Content

Unit-I

6 Hrs

Reasoning: Data sufficiency, Logical Deductions, Logical Sequence of Words, Logical Venn Diagrams, Statement and Arguments, Statement and Assumptions, Statement and Conclusions Syllogism. English: Reading Comprehension, Para Jumbles, Cloze Test, Tenses/Voice/ Speech, Prepositions/ SVA/ Articles, Vocab /Verbal Analogy, Sentence completion, Sentence Correction

Unit-II

6 Hrs

Modules Introduction, Importance of Modularity programming, Import keyword, User defined

Modules creation, Function based modules, Classes based modules, Connecting modules, from keyword. Collections Framework Introduction to collection of data types, Importance of Data processing, DS Algorithms introduction.

Exception Handling Introduction, The need of exception handling, Getting exceptions, Default exception handler, Handling exception, Try, Except. List Create a list, Adding elements, Deleting elements, Pre-defined functionality of List, Nested List, Immutability and Mutability of List. Set The functionality of Set object, Frozen set, Dictionaries, Create a dictionary, Adding elements. Dict Pre-defined functions of Dict class, Programs using Collection types. Garbage collection Introduction, Importance of manual GC, Self-referenced objects, gc module, Collect () method, Threshold function.

Unit-III

6 Hrs

Collections Framework Introduction to collection of data types, Importance of Data processing, DS Algorithms introduction. List Create a list, Adding elements, Deleting elements, Pre-defined functionality of List, Nested List, Immutability and Mutability of List. Set The functionality of Set object, Frozen set, Dictionaries, Create a dictionary, Adding elements. Dict Pre-defined functions of Dict class, Programs using Collection types.

Unit-IV

4 Hrs

Tkinter GUI Types of Layouts , Create Labels and Display images, Create Buttons, Create Events, StringVar class, Calculator program using GUI. Basic ML AI including Projects Iterators, Nested functions, Generators, Closures, Decorators, Basic ML and AI, PIP, Visualization etc. Project Domain (Per domain 1 or 2 project) ML/AI Based Projects Data Analysis Based projects Test Summarization based projects web scrapping and crawling

Unit-V

4 Hrs

DBMS Using Python Introduction to Mysql, Mysql Python connectivity, DDL, DRL, DML, Transaction management examples (rollback and commit), GUI Database connectivity. No Sql Using Python Installation and Configuration, Mongo DB Tools, Collection and Documents, CRUD and the Mongo DB Shell, Introduction to CRUD, Introduction to the Mongo DB API, Creating a Database, Collection and Documents. Data Modelling and Schema Design Mongo DB Database References Model Tree Structures, Mongo DB Analyzing Queries, Atomic Operations, Map Reduce, Text Search, Regular Expression, Capped Collections. Administration Mongo DB Deployment and Cluster setup, Mongo DB Grid FS, Trident Spout, Working with Replica Sets, Mongo DB Sharding

Reference Books

1. Quantitative Aptitude for Competitive Examinations by Dr. R S Aggarwal, S Chand Publication
2. Programming Techniques through C, by M. G. Venkateshmurthy, Pearson Publication.
3. A Computer Science Structure Programming Approaches using C, by Behrouz Forouzan, Cengage Learning.
4. Let Us C, by Yashwant Kanetkar, BPB Publication.

SEM

VI

Program : Civil Engineering	TY BTECH	Semester: VI
Estimating & Costing (22PCCE6010T)		
Estimating & Costing Laboratory (22PCCE6010L)		

Prerequisites: Engineering Graphics, Building Drawing

Course Objectives

1. Impart the knowledge of Estimating, Costing and Valuation for Civil Engineering Structures
2. This subject covers the various aspects of estimating the quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works.
3. At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Students should also be able to prepare value estimates.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the concept of Estimating and its importance.	2	Understand
CO2	Calculate the detailed quantity, costing & numbers of man power etc. related to construction projects.	3	Apply
CO3	Prepare abstract cost, bill of quantities (BOQ), and detailed cost estimates in accordance with standard specifications.	3	Apply
CO4	Analyse bar bending schedules for reinforcement works, focusing on key components and their interrelationships.	4	Analyze

Course Content

Unit-I	Introduction of Estimating and Costing	08 Hrs
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Estimate, detailed estimate, types of detailed estimate, purpose and data required for preparing detailed estimate, factors to be considered during preparation of detailed estimate, methods of taking out quantities, abstracting, units of measurements, building cost index, prime cost, provisional sum, centage charges, work charged establishment, administrative approval, technical sanction. Approximate estimate, importance, purposes, approximate methods of building estimating and various civil engineering works.

Unit-II	Detailed Estimate	10 Hrs
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Detailed estimate of load bearing structure, framed structure, community well, septic tank, pipe culvert, earthwork in roads and canals

Unit-III	Detailed Estimate of R.C.C. Element	08 Hrs
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Detailed estimate of reinforcement quantities of R.C.C. elements like isolated column, footings, beam, staircase, slab, and preparation of bar bending schedule.

Unit-IV	DSR & Rate Analysis	08 Hrs
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Study of current year district schedule rates, significance, necessity, importance, factors considered while preparing schedule of rates. Task work, factors affecting task work, schedule of rate, task work of various items of construction, analysis of rates, factors affecting cost of an item of work, material, labor etc., analysis of various items of construction

Unit-V	Specification & Valuation	08 Hrs
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Specifications, purposes, types, drafting of specifications, and specifications of a few main items of civil engineering works. Valuation, purposes, price, cost and value, factors affecting value of a property, various types of value like market value, sentimental value, mortgage, year's purchase and outgoings, legal aspects of valuation and easement act. Methods of valuation, land and building method, rental method, belting method of valuation of land. Standard rent and Standard rent fixation. Depreciation, various methods of depreciation, sinking fund, book value, free hold and lease hold properties.

References / Text Books / List of experiments / Assignment

Reference Books:

- PWD Hand Book and Red Book.
- PWD District Schedule of Rates (DSR) – Latest.
- IS 1200 (Part1–Part 28) Method of measurement of building and civil engineering works.

Text Books:

- B.N. Dutta, “Estimating and costing”, 28th Edition, UBH Publishing.
- B.S. Patil, “Civil Engineering Contracts and Estimates”, 4th Edition, Universities press.
- Bhasin P. L., “Quantity Surveying: For Building and Civil Engineering Works”, S. Chand, Limited, 3rd Edition 1987.
- Chakraborti M., “Estimating, Costing and Specification in Civil Engineering”, 24th Edition.
- G.H. Birdie, “Estimating and Costing (Civil Engineering)”, 7th Edition 2015, Dhanpat Rai Publishing.
- Rangwala, “Elements of Estimating and Costing”, 8th Edition, Charotar Publishing House.

List of Experiments

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

List of Experiments:

1. Units of measurements of various items of civil engineering works / Study of DSR, study and use of check list of PWD for estimating of various building works.
2. Approximate estimate of:
 - i) Residential building.
 - ii) Public building.
 - iii) Elevated service reservoir.
 - iv) Roads and bridges.
3. Prepare check list of items, detailed estimate of a single storey (up to 2 BHK) load bearing structure by using current DSR.
4. Site visit (attached estimate and photographs) / study standard estimate of PWD or any civil organization.
5. Prepare check list of items, detailed estimate of a framed residential double storey structure by using current DSR and estimate of detailed quantities of steel. Reinforcement and prepare bar bending schedule.
6. Detailed estimate of any two of following:
 - i) Compound wall.
 - ii) Septic tank.
 - iii) Earth works in roads / channels.
7. Rate Analysis of Any Five Items.
8. Preparation of Bar Bending Schedule (BBS) and Estimation of Reinforcement Steel Quantity for RCC Structural Members.

Program : Civil Engineering	TY BTECH	Semester: VI
Design of Steel Structures (22PCCE6020T)		
Design of Steel Structures Laboratory (22PCCE6020L)		

Prerequisites: Engineering Mechanics, Mechanics of Solids, Structural Analysis, Structural Mechanics

Course Objectives

1. To introduce behavior and design of simple steel structures according to limit state design concept.
2. To have the basic knowledge about the design and failure mode of steel structural members.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Recognize the material properties of steel products, design philosophy of steel structures and concept of limit state design	2	Understand
CO2	Explain provisions in relevant BIS Code	2	Understand
CO3	Describe the mechanism and behavior of various connection types under different loading conditions for analysis and design of connection	2	Analyse
CO4	Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, beams, columns, column bases	3	Apply
CO5	Evaluate design loads for trusses and welded plate girder	5	Evaluate

Course Content

Unit-I	Introduction, Connections	10 Hrs
a) Introduction: Introduction to types of steel, mechanical properties of steel, advantages of steel as structural material, design philosophies of Working Stress Method (WSM) and Limit State Method (LSM). Limit state method, limit state of strength and serviceability (deflection, vibration, durability, fatigue, fire), characteristics and design loads, Classification of cross section- plastic, compact, semi-compact and slender, limiting width to thickness ratio, partial safety factor for load and resistance, various design load combinations. b) Types of Connections: Strength of bolted & welded Connections, Design of connections subjected to Axial Forces & Moments. Beam to beam & beam to column connection (framed connections)		
Unit-II	Tension Members & Compression members	08 Hrs
a) Tension member: Behaviour, Modes of failure – Yielding of cross-section, Rupture, block shear. Design of single and double angle sections with gusset plate with bolted and welded end connections. b) Compression member: Behaviour – effective length, slenderness ratio, Modes of failure- failure with full strength, local buckling, torsional buckling. Classification of cross sections, buckling curves, Design of compression members with bolted and welded connection using single and double angle sections.		
Unit-III	Design of built-up column & Roof Trusses	08 Hrs
a) Design of built-up column: Built up Column. Design of lacing by bolts and welds. Introduction to battened column, design of connections. b) Roof truss: Analysis of pin-jointed trusses under various loading cases, computation of design forces in members, design and detailing of connections		
Unit-IV	Design of Flexural Member & Compound Beams	08 Hrs
a) Flexural member- Laterally supported beams using single rolled steel section with and without flange plate, strength in flexure, low and high shear, check for deflection. Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld. Design of purlin. b) Compound beams: Design of compound beams, using flange plates, curtailment of flange plates		
Unit-V	Design of Column Bases & Welded Plate Girder	08 Hrs
a) Column Bases: Design of column bases under axial load: design of slab base, gusseted base. b) Design of welded plate girder: design of cross section, curtailment of flange plates, stiffeners and connections Note: a. Use of IS: 800-2007, IS: 875 part III and steel table is permitted for theory examinations. b. The Design shall be as per IS: 800 – 2007 by limit state method.		

References / Text Books / List of experiments / Assignment

Reference Books:

- Anand S. Arya, J.L. Ajmani (1977), “Design of Steel Structures”, Nem Chand & Bros., India, ISBN 0861861671
- B. C. Punmia, Ashok Kumar Jain (2006), “Comprehensive Design of Steel Structures”, Laxmi Publications, ISBN 8170080932,
- Edwin H. Gaylord, Charles N. Gaylord, James E. Stallmeyer (1991), “Design of Steel Structures”, Tata McGraw-Hill, ISBN 0070230544
- Charles G. Salmon, John E. Johnson, Faris A. Malhas (2008), “Steel Structures: Design and Behavior”, Prentice Hall, ISBN 0131885561
- Satinder Singh, Ic Syal (2007), “Design Of Steel Structures”, Standard Publishers Distributors, ISBN 8186308646
- N. Subramanian (2008), “Design Of Steel Structures”, Oxford, ISBN 0195676815,
- Pasala Dayaratnam (2014), “Design Of Steel Structures”, S. Chand Publishing, ISBN 8121923204,

Text Books:

- S. S. Bhavikatti (2009), “Design of Steel Structures by Limit state method as per IS 800:2007”, I K International Pvt. Ltd
- Duggal S K (2010), “Limit State Design of Steel Structures”, Tata McGrwaHill
- Shiyekar M R (2010), “Limit State Design of Steel Structures”, PHI Learning
- Shah V. L. & Gore, Limit state design of Steel Structure, Structures Publication, Pune
- Sai Ram K S (2010), “Design of Steel Structures”, PHI Learning
- Dr Ramachandra (2010), “Design Of Steel Structures Vol. II”, Scientific Publishers-Jodhpur, ISBN 8172336446

Design Codes:

- IS 800 (2007), General Construction in Steel- Code of Practice, Ced 7: Structural Engineering and Structural Section, Published by Bureau of Indian Standard Manak Bhavan, New Delhi
- IS 875- Part 1 (1987): Dead Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi
- IS 875- Part 2 (1987): Imposed Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi
- IS 875- Part 3 (2015): Wind Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- IS 875- Part 4 (1987): Snow Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- IS 875- Part 5 (1987): Special Loads and Combinations, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi

List of Experiments

Lab course work shall consist of detailed structural design and drawing of any one of the following steel structure along with necessary drawings.

1. Design of Roof Truss

- a) Load Analysis-Dead load, Live load, Wind load as per IS: 875 part I to III
- b) Design of various components of roof truss by IS 800:2007
- c) Detailing & drawing of roof truss.

Or

Design of an Industrial Building

- a) Analysis of industrial building: Calculations of member forces.
- b) Design of main beam & secondary beams, connections, columns, column bases.
- c) Detailing & drawing of various components of industrial building.

Or

Design of Welded Plate Girder

- a) Analysis of welded plate girder- Calculation of maximum shear force and maximum bending moment.
- b) Design of web plate for shear, design of flange plate for bending moment, design of web stiffeners, design of intermediate stiffeners, and design of bearing stiffeners, curtailment of flange plate

- 1. A report on at least one site visit.

Program : Civil Engineering	TYECH	Semester: VI
Water Resource Engineering (22PCCE6030T)		

Pre-requisite: - Basic Environmental Science

Course Objectives

1. To understand and analyse the hydrologic cycle and key hydrological processes relevant to water resources engineering.
2. To evaluate hydrological parameters and apply them in the planning and management of water resources systems.
- 3 To understand and select appropriate irrigation, drainage techniques, and applications of hydraulic machines in water resource engineering.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain hydrology cycle and water distribution on Earth.	2	Understand
CO2	Describe evaporation and calculate runoff water.	3	Apply
CO3	Draw Hydrograph and find volume of runoff	3	Apply
CO4	Describe the basic aquifer parameters and groundwater resources.	2	Understand
CO5	Assess water requirements of crops. Explain hydrology cycle and water distribution on Earth.	5	Evaluate

Course Content

Unit-I	Hydrology	08 Hrs
Hydrology and Water resources development, Hydrologic cycle, applications of hydrology and hydrological cycle. Precipitation: Forms of precipitation, different types of rain and measurement of precipitation (recording and non-recording type gauge), rain gauge network and presentation of precipitation data: mass curve and hyetograph, presentation of rainfall data, mean precipitation over an area, depth area distribution curves and frequency of rainfall.		
Unit-II	Evapotranspiration, Infiltration and Runoff	07 Hrs
Evaporation and evapotranspiration: Evaporation process, Evaporimeters, reduction in evaporation measurement of evapotranspiration. Infiltration, Introduction to stream gauging and introduction to methods of discharge and stage measurement in streams. Runoff: Different routes of runoff, rainfall runoff correlation, Searcy's tables, factors affecting runoff, flow distribution curve, flow mass curve and uses.		
Unit-III	Hydrograph	08 Hrs
Introduction, Factors affecting Flood Hydrograph, Components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph, Use and Limitations of unit hydrograph, Derivation of unit hydrograph, Synthetic Unit Hydrograph, Instantaneous Unit Hydrograph, Flood Studies: Design Flood and method of its estimation, empirical formula, frequency analysis, Gumbel's and Log Pearson distribution, Muskingum methods.		
Unit-IV	Ground water hydrology	09 Hrs
Ground water hydrology: Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, safe yield of basins, hydraulics of wells under steady flow in confined and unconfined aquifers, well loss, specific capacity of well, well irrigation: introduction to tube wells and open wells. Water logging and drainage: Causes, preventive and curative measures of water logging, design and spacing of the tile-drains.		
Unit-V	Irrigation methods	10 Hrs
Introduction to irrigation: Necessity, benefits, ill effect, irrigation systems and methods and their classifications. Soil-water-plant relationships: Classification of soil water, saturation capacity, Field capacity, determination of field capacity, quality of irrigation water. Water requirement of crops: Limiting soil moisture condition, depth of irrigation water and frequency, principal Indian crops and their seasons, base period, duty of water and delta, factors affecting & methods of improving the duty of water, intensity of irrigation, peak irrigation, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, calculations of canal capacities, application of water, warabandi, National Water Policy.		

References / Text Books / List of experiments / Assignment

Reference Books

- A Text Book of Water Power Engineering by Sharma R.K. and Sharma T.K., S Chand Publication
- P. Jayaram Reddi, "A Text Book of Hydrology", Laxmi Publications, New Delhi.
- Varshney R.S., Gupta S.C., Gupta R.L. "Theory and Design of Irrigation Structures, Volume I and II", 1979 Fourth edition. New Chand & Bros., Roorki.
- Mutreja, "Applied Hydrology", Tata McGraw Hill Company, New Delhi.

Text Books

- Engineering Hydrology by Subramanya K., Tata McGraw-Hill Publishing Company Limited, New Delhi.
- Irrigation, Water Resources and Water Power Engineering by Modi P.N., Standard Book House, Delhi.
- Irrigation Engineering and Hydraulic Structures by Garg S.K., Khanna Publishers, Delhi.

Program : Civil Engineering	TY BTECH	Semester: VI
Construction Management (22PCCE6040T)		

Course Objectives

1. An ability to understand Construction activities.
2. To identify organization chart of various construction industries with their forms.
3. Analyse network techniques by using PERT, Bar charts, etc
4. Ability to understand Engineering economics; banking systems, profit and loss accounts concepts.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Evaluate the structure of construction organizations and the roles of various team members.	5	Evaluate
CO2	Analyse network techniques for effective planning and scheduling.	4	Analyse
CO3	Analyse material management systems with emphasis on EOQ techniques.	4	Analyse
CO4	Evaluate engineering economics principles for informed decision-making.	5	Evaluate

Course Content

Unit-I	Construction Industry	06 Hrs
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Construction industry, construction team, Construction activities, classification of construction, stages in construction, Need of management in construction, Job layout and value engineering. Leadership and its quality, Organization, meaning and function, forms of organization - line, line and staff, functional, Type A, Type B and Type C

Unit-II	Network Technique	05 Hrs
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Network Technique: - History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity, event, critical path, duration etc Development of networks, network scheduling, to find various times and float, EST, EFT, TF etc Monitoring of Network, Three phases of network technique.

Unit-III	Various Acts Related to Construction Industry	06 Hrs
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Important acts and laws related to constructions Industry- factory act, the employees provident fund Act, minimum wage act, workman compensation act, Indian trade union act, arbitration act, Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork etc.

Unit-IV	Material Management	05 Hrs
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Materials management, its aims and functions, inventory analysis, inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ, material requirement, planning, market research, system of purchase of materials, stock of material at site, Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply, cost concept.

Unit-V	Contract	05 Hrs
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Contract, essentials, types, registration and law of contract, free consent, contract documents, performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, time period of work ,cost of tender form, invitation of tender, concept of e-tendering, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender, extra items , additions and alterations , defect liability , liquidated and un-liquidated damages , escalation of rates, work order

References / Text Books / List of experiments / Assignment

Reference Books:

- B.N.Dutta - Estimating and Costing, UBS Publishers
- M.Chakroborty - Estimating and Costing, EWP
- B.S.Patil - Estimating and Costing -Vol-1& 2, Orient Blackson
- Seetharaman – Construction Engineering and Management, Umesh Publication.
- P.S.Gahlot & B.M.Dhir – Construction Planning & Management-2010

Text Books:

- R.L.Peurifoy - Construction planning, Equipments and Methods.
- Mahesh Verma - Construction equipments and its planning and application, Vikas publication
- U.K. Shrivastava - Construction planning and Management, 3rd edition 2005 reprint 2013
- S.V.Deodhar - Construction equipment and job planning, Khanna publishers, 4th edition 2010 reprint 2012.
- Chitkara - Construction Project Management, TMH, New Delhi, 2009

Program : Civil Engineering	TY BTECH	Semester: VI
Professional Elective Course -II Town & Urban Planning (22PECE6053T)		

Course Objectives

1. Understand the basic concept of Town Planning.
2. To study the development phase of Town Planning
3. To study the importance of layout Patterns
4. Apply the Knowledge of Development control rules and building bylaws.
5. To study the MRTTP acts and Land acquisition act.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the Importance of Town Planning	2	Understand
CO2	Study the contribution of Modern Era Architect	2	Understand
CO3	Learn the development control rule and building bylaws	3	Apply
CO4	Understand the Importance of different Zones	2	Understand
CO5	Understand the Importance of Acts	2	Understand

Course Content

Unit-I	History of Town Planning	08 Hrs
Necessity and scope of Town Planning, Brief history, Greek and Roman Towns, Planning in ancient India – Indus Valley Civilization, Vedic Period, Buddhist Period, Medieval Period, Mogul Period, British Period, Post-Independence Period, Theories in urban and regional planning		
Unit-II	Town Planners in Modern Era	08 Hrs
Town Planners in Modern Era such as Sir Patrick Geddes, Sir Ebenezer Howard, Clarence Stein, Sir Patrick Abercrombie, Le Corbusier, Present Status of Town Planning in India, Efficiency Measures, Planners skills, Integrated Area Planning in India.		
Unit-III	Layouts Patterns	08 Hrs
Layout of Residential Units, Neighborhood Unit Planning, Radburn Plan, Grid Iron Pattern, Shoe String Development, Growth Pattern of Towns, Concentric Satellite, Ribbon Development, Scattered growth		
Unit-IV	Town Planning Zones	10 Hrs
Elements of Town, Various Zones, Development Control Rules and Building Bye Laws, Urban Roads: Objective, Classification, Road Networks, Data Collection Surveys, Analysis of data, Town aesthetics, Landscape Architecture, Suitability of Trees, Treatment of Traffic Islands, Open Spaces Walkways Public Sit-outs, Continuous Park System, Green ways.		
Unit-V	M.R.T.P. Act	08 Hrs
Town Planning works with reference to M.R.T.P. Act, Land Acquisition Act, Necessity and procedure of Acquisition		

References / Text Books / List of experiments / Assignment

Reference Books:

- Lewis Kuble, “Town and Country Planning”
- Gallion, “The Urban Pattern”, Eisner

Text Books:

- Gandhi N.K., “Town and Country Planning”,
- Rangawala S.C., “Town Planning”, Charotar Publications, Anand
- Sundaram K.V., “Urban and Regional Planning in India”, Vikash Publishing House Pvt. Ltd.
- MRTP Act 1966
- Land Acquisition Act - 1894
- Misra S.N., “Rural Development Planning-Design and Method”, Satvahan Publications, N. Delhi

Program : Civil Engineering	TY BTECH	Semester: VI
Professional Elective Course -II Traffic Engineering and Management (22PECE6051T)		

Course Objectives

1. To set a compact foundation in the field of traffic engineering, its management in order to achieve the safety to the road users.
2. To enable the students to apply the basic principles of traffic engineering in the design of traffic facilities based on traffic flow theory.
3. To have an overall knowledge of the traffic components and assess the traffic characteristics and related problems.
4. To develop a strong knowledge base of traffic planning and its management in any transportation area.
5. To provide knowledge of traffic control devices and its techniques in transportation interaction

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Determine the traffic flow parameters for traffic management to predict the future traffic demand for the urban and rural area.	5	Evaluate
CO2	Plan the parking plots as per the traffic availability in the urban area.	6	Create
CO3	Design the various types of intersection in the urban area.	4	Analyse
CO4	Propose the different types of traffic system management technique.	3	Apply
CO5	Evaluate the capacity and level of service on the streets of rural and urban area.	5	Evaluate

Course Content

Unit-I	Basic traffic flow parameter and Traffic Surveys	08 Hrs
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Introduction: Traffic engineering administration and functions, Organization of the traffic engineering department, Road user and vehicular characteristics. Basic traffic flow parameter and Traffic Surveys: Definition – Flow, Volume, Speed, Space headway, Time headway, Density. Relationship between Flow, Speed and Density, Traffic Surveys: Speed, Journey time and Delay surveys, classified volume count survey, Vehicle occupancy survey, Origin – Destination survey, Parking Survey, Use of photographic techniques in traffic survey.

Unit-II	Lighthill and Witham's Theory and Traffic Forecasting	08 Hrs
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Lighthill and Witham's Theory: General, Assumption, Theory, Approach to signalized intersection, Bottleneck, Car following theory, Queuing theory concept Traffic Forecasting: Need for traffic forecasting, Types of traffic, Forecasts based on past trends and extrapolation, period for forecasting.

Unit-III	Parking Studies and Design of Intersection	08 Hrs
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Parking studies: Traffic and parking problems, Ill effects of parking, Zoning and parking space requirement standards, Design standards for on street parking, Off street parking facilities, Peripheral parking system. Design of Intersection: Design of at grade & grade separated intersection – rotary intersection – capacity of rotary intersection – Traffic signals, Advantages and disadvantages, Types of signals, Methods of setting signal timings, Warrants for signals, Coordinated control of signals, Necessity of signal coordination, Types of coordinated signal system.

Unit-IV	Traffic Safety and Traffic System Management	10 Hrs
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Traffic Accidents: Causes and prevention: Accident situation in India, Collection of accident data, Statistical methods for analysis of accident data, Road and its effect on accidents, Skidding, Speed in relation of safety, Traffic management measures and their influence on accident prevention, Condition and collision diagram and its utility, Legislation, Enforcement, Education and Propaganda. Traffic system management: Introduction, Travel demand management, Traffic management measures, Restrictions to turning movements – one way streets – tidal flow operations-Traffic segregation –Traffic calming- Exclusive bus lanes, conflict point diagram for various types of streets, Introduction to ITS in traffic management.

Unit-V	Highway Capacity	08 Hrs
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Highway Capacity: Importance of 'Capacity' in Highway transportation studies, Capacity of uninterrupted flow conditions as per Indo-HCM, PCU in reference to Indo-HCM in urban and rural area, Determination of theoretical capacity, Level of service, Factors affecting capacity and level of service

References / Text Books / List of experiments / Assignment

Reference Books:

- Martin Whol, Brian V Martin , Traffic system Analysis for Engineers and Planners, McGraw Hill, NY, 1967
- HCM 2010 (3 volume set), TRB Publications, 2010
- Kadiyali L. R. and Lal, N. B., Principles & Practice of Highway Engineering, Khanna Publishers, Delhi.
- Chakraborty Partha, Das Animesh, Principles of Transportation Engineering Indo-Highway Capacity Manual, 2018
- Martin Whol, Brian V Martin , Traffic system Analysis for Engineers and Planners, McGraw Hill, NY, 1967
- IRC-SP -12 2015 Parking facilities in Urban Roads
- IRC SP - 41 Guidelines for the Design of At-Grade Intersection
- IRC 35 - 2015 Code of Practice for Road Markings – Second Revision
- IRC 67 - 2001 Road Signs
- IRC 108 - 2015 Guidelines for traffic forecast on Highways
- IRC 119 - 2015 Guidelines for traffic safety Barriers
- IRC 65 - 1976 Traffic Rotaries
- IRC 93 - 1985 Design & Installation of Road Traffic Signals
- NPTEL Course on Traffic Engineering and Management.

Text Books:

- Kadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers, 2011
- Khanna O.P and Justo C.G; Highway Engineering, Nem Chand Publishers, 9e.
- Donald Drew, Traffic Flow Theory Chapter 14 in Differential Equation Models, Springer, 1983
- 2. Dr. Sharma S. K., Principles, Practice and Design of Highway Engineering (Including Airports), S. Chand & Company Ltd.
- Chakraborty Partho, Das Animesh, Principles of Transportation Engineering, PHI
- Bindra S.P., A course in Highway Engineering, Dhanpat Rai Publications

List of Traffic Survey:

1. Spot speed survey
2. Moving car method of survey for journey time
3. Delay studies survey
4. Classified volume count survey
5. Vehicle occupancy survey
6. Origin – Destination survey
7. Parking survey

Program : Civil Engineering	TY BTECH	Semester: VI
Professional Elective Course -II Geographical Information System (22PECE6052T)		

Course Objectives

1. Understand the basic concept of GIS and its applications, know different types of data representation in GIS
2. Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer are
3. Apply knowledge of GIS software and able to work with GIS software in various application fields
4. Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems
5. Apply knowledge of GIS and understand the integration of Remote Sensing and GIS

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will able to understand GIS applications and learn different types of data representation in GIS	3	Learn
CO2	Students will able to develop models for GIS spatial Analysis	3	Analyse
CO3	Students will able to work with GIS software in various application fields	2	Understand
CO4	Students will able to understand the map projections and coordinates systems	2	Understand
CO5	Students will able to understand the integration of Remote Sensing and GIS	2	Understand

Course Content

Unit-I	Introduction to GIS	08 Hrs
Definition, sources of data, types of data, concept of space and time in GIS, spatial information theory, history of GIS, elements of GIS, objectives of GIS, hardware and software requirements of GIS, application of GIS. .		
Unit-II	Data models of spatial information	08 Hrs
Layers and coverage, conceptual models of spatial information, representation of spatial data models in computer: raster and vector models, comparative overview between raster and vector models.		
Unit-III	Data models of non-spatial information	08 Hrs
Database management systems, hierarchical structure, network structure, relational structure		
Unit-IV	GIS Mapping and DEM	10 Hrs
Digitizing: manual, semiautomatic and automatic, editing: error detection and correction, tolerances, topology creation, attribute map generation Digital Elevation Model: Need of DEM, Various structures of DEM: line, TIN, grid		
Unit-V	Application of remote sensing and GIS	08 Hrs
Forest resource management, agriculture and soil management, water resource management, land use and land suitability, disaster management		

References / Text Books / List of experiments / Assignment

Reference Books:

1. Geographic Information Systems and Science, Second Edition 2005: Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind, John Wiley & Sons, New York.
2. Modeling Our World: The ESRI Guide to Geodatabase Design: Zeiler, M. 1999. ESRI Press, Redlands, California
3. GIS, Spatial Analysis and Modeling: Maguire, D., M. Batty, and M. Goodchild. 2005, ESRI Press.
4. Introduction to geographic Information Systems: Kang-tsung Chang, Tata mcgraw Hill.
5. Advanced Surveying (Total Station, GIS and Remote Sensing) First Edition 2007: SatheeshGopi, R. Sathikumar, N. Madhu

Program : Civil Engineering	TY BTECH	Semester: VI
Professional Elective Course -II Advanced Design of RC Structure (22PECE6054T)		

Course Objectives

1. To introduce fundamentals of reinforced concrete and pre-stressed concrete structure.
2. To apply principles of pre-stressing for design of simply supported girders.
3. To introduce limit state of collapse compression and torsion.
4. To understand IS Code methods for design and analysis of heavy structures such as retaining wall and combined footing.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will be able to understand fundamentals of reinforced concrete and pre-stressed concrete structure.	2	Understand, Apply
CO2	Students will be able to do load calculation and design pre-stressed concrete structure.	3	Evaluate, Create
CO3	Students can able to do design and detailing of structures based on limit state of collapse compression and torsion.	2	Analyze
CO4	Students can able to calculate load and design heavy miscellaneous reinforced concrete structures such as retaining wall, combined footing.	3	Evaluate
CO5	Students will be able to understand fundamentals of reinforced concrete and pre-stressed concrete structure.	2	Understand, Apply

Course Content

Unit-I	Introduction to Pre-stressed Concrete	12 Hrs
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a) Introduction to pre-stressed concrete, methods of pre-stressing, general principal of pre-stressing, differentiation of pre-stressed concrete members and reinforced concrete members, types, systems. b) Stress Analysis: Stress analysis of pre-stressed concrete member, load balancing concept, Losses in Pre-stressing for Pre-tensioned & Post tensioned members

Unit-II	Post Tensioned flexural member	10 Hrs
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Design of post tensioned flexural member– Cable profile, Design of flexural reinforcement, Design of shear reinforcement, Design of end block.

Unit-III	Limit State of Collapse Compression and Torsion	10 Hrs
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a) Limit State of Collapse (Compression)-Introduction, IS code specifications for limit state of collapse-compression, types of columns, criterions for design of columns, column interaction curve, design of uniaxially loaded column. b) Limit State of Collapse (Torsion) – Introduction, IS code specifications for limit state of collapse-torsion, classification of torsion, design of sections subjected to combined bending and Torsion.

Unit-IV	Miscellaneous R. C. Structures	10 Hrs
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a) Introduction, types of retaining wall, detail design of cantilever retaining wall b) Introduction, necessity, design of rectangular combined footing.

References / Text Books / List of experiments / Assignment

Reference Books:

- N. Krishna Raju, “Prestressed Concrete”
- T. Y. Lin, “Design of prestressed concrete structure”.
- S.R. Karve & V. L. Shah, “Limit State Analysis & Design of Reinforced Concrete”, Structures Publications R.C.C. Structures.
- Punmia, Jain & Jain, “Comprehensive R.C.C. Design”, Laxmi Publications.
- S. K. Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press.
- N. C. Sinha & S. K. Roy, “Fundamentals of Reinforced Concrete”
- S. Unnikrishna Pillai, Devdas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publication.
- S. Ramamrutham, “Design of Reinforced Concrete Design”, Dhanpat Rai Publishing Company.
- B. C. Punmia, “Reinforced Concrete Structures”, Laxmi Publication.

Reference IS Codes

IS 456-2000 Plain and Reinforced Concrete - Code of Practice.

IS 1343 Code of Practice for Pre-stressed Concrete?

Program : Civil Engineering	TY BTECH	Semester: VI
Project Stage-I (22PJCE6060L)		

Course Objectives

1. To implement the solution as per the problem statement.
2. To develop the team building, writing, logical reasoning and management skills.
3. To provide the connections between the designs and concepts across different disciplinary
4. Boundaries.
5. To encourage students to become independent personnel, critical thinkers and lifelong learners

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyse the problem statement and produce solution of the problem considering cultural, social, environmental and economic factors using appropriate tool and method.	4	Analyse
CO2	Interpret project based learning that allows students to transfer existing ideas into new applications.	2	Understand
CO3	Apply the ability to work in teams and manage to conduct the project development activity.	3	Apply
CO4	Use different perspectives from relevant disciplines which help them to get internships, jobs, and admission for higher studies.	3	Apply
CO5	Explain the project development in the form of technical writing, and interpret what constitutes plagiarism and the use of proper referencing styles.	2	Understand

Course Content / Guidelines

Syllabus:

Domain knowledge (any beyond) needed from the following areas for the effective implementation of The project Experimental design / Theoretical Analysis/ software analysis / Fabrication of model, structural design, Hydraulic design, construction management, Environmental studies, sustainable development, Smart city planning, Advanced Transportation system, Structural audit, comparative study, case study, field/ market survey, Smart material, Economical study etc.

Guidelines:

The main purpose of this activity is to improve the students' technical skills, communication skills by

Integrating writing, presentation and teamwork opportunities.

- Each group will be reviewed twice in a semester and marks will be allotted based on the various
- Points mentioned in the evaluation scheme.
- In the first review of this semester, each group is expected to complete 30 % of project.
- In the second review of this semester, each group is expected to complete 50 % of project.
- Interaction with alumni mentor will also be appreciated for the improvement of project.

Assessment Criteria:

- At the end of the semester, after confirmation 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 stage I (at the end of the semester) will be done by the departmental
- Committee (including project guide).
- Oral examination should be conducted by Internal and External examiners. Students have to
- Give presentation and demonstration based on their project.

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 stage I Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Each group will be reviewed twice in a semester by faculty guide and faculty coordinator based on the following criteria:

Project progress

- Documentation/Technical paper writing
- Key findings

- Validation of results

Each review consists of 25 marks. Average of the marks scored in both the two reviews will be

Considered for final grading. The final certification and acceptance of TA ensures the satisfactory

Performance on the above aspects.

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	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	Name of Student	Project Selection	Design simulation/Logic	Hardware programing/ Experimental work	Result verification	Presentation	Total
			5	5	5	5	5	25

Program : Civil Engineering	TY BTECH	Semester: VI
Computer Aided Civil Engineering Drawing (22ESCE6070L)		

Course Objectives

1. To introduce the basic commands of Auto Cad.
2. Able to prepare a simple building drawing file using basic commands.
3. To Understand and demonstrate dimensioning concepts and techniques.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the fundamental concepts of AutoCAD software.	3	Apply
CO2	Create various types of engineering drawings using AutoCAD software.	6	Create
CO3	Design detailed 2D building drawings using AutoCAD tools and standards.	6	Create

Course Content

Unit-I	Introduction to AutoCAD	03 Hrs
a) Introduction to CAD, Introduction to drafting software. b) Explanation to precision Drawing & Drawing tools, Geometric Shapes, Basic Printing, Editing Tools.		
Unit-II	Basic Sign and Conventions	03 Hrs
Different Materials symbols, Architectural, Structural, Electrical and Plumbing symbols. Drawing symbols, dimensioning standards.		
Unit-III	2D Building Drawing	03 Hrs
Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential and public building drawing.		
Unit-IV	Introduction to 3D Drawing	05 Hrs
Introduction to 3D Drawing Terms, Elements required for drawing. Draw the basic Object, Residential building drawing.		

References / Text Books / List of experiments / Assignment

Reference book

- Subhash C Sharma & Gurucharan Singh (2005) “Civil Engineering Drawing”, Standard Publishers
- Ajeet Singh (2002) “Working with AUTOCAD 2000 with updates on AUTOCAD 2001”, Tata-McGraw-Hill Company Limited, New Delhi
- Sham Tickoo Swapna D (2009) “AUTOCAD for Engineers and Designers”, Pearson Education
- Venugopal (2007) “Engineering Drawing AUTOCAD”, New Age International Pvt. Ltd.

List of Experiments

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

1. To Study the basic commands and Initial settings of AutoCAD drawing files.
2. To draw the basic shapes of 2D and Line Plan of Residential/Public building drawing.
3. To draw the detailed drawing Plan of Residential building
4. To draw the above plan Elevation, section, site plan schedules of opening etc.
5. To draw the 3D drawing of basic shapes
6. To developed the 3D views of building

Program : Civil Engineering	TY BTECH	Semester: VI
Environmental Studies (22MCCE6080T)		

Course Objectives

1. Understand environmental issues such as depleting resources, pollution, ecological problems and the renewable energy scenario.
2. Familiarize environment related legislation.
3. Understand and compare solar energy

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe how human activities affect environment.	2	Understand
CO2	Describe the various technology options that can make a difference.	2	Understand

Course Content

Unit-I	Social issues and Environment	05 Hrs
a) Ecological footprint and Carrying Capacity b) Depleting nature of Environmental resources such as soil, water minerals and forests		
Unit-II	Technological growth for Sustainable Development	05 Hrs
a) Social, Economic and Environmental aspects of Sustainable Development b) Renewable Energy Harvesting		
Unit-III	Solar Energy	04 Hrs
a) Basic concept of Solar Radiation b) Study of Solar panels		

References / Text Books / List of experiments / Assignment

Text books:

- Environmental Studies from Crisis to Cure, R. Rajagopalan, 2012
- Textbook of Environmental Studies for Undergraduate Courses, Erach Bharucha
- Solar Engineering, Sukhatme

