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S.No.	Course Type	Course Code	Course Title	Hrs./ Week			Credits
				L	T	P	
1	PCC	CE09	Advanced Structural Analysis	2	1	-	3
2	PCC	CE10	Design of RCC Structures	2	1	-	3
3	PCC	CE11	Transportation Engineering	3	-	-	3
4	PCC	CE12	Water Resources Engineering	2	1	-	3
5	HSMC	HS05	Humanities and Social Sciences Open Courses - I	2	-	-	2
6	IFC	CS01	Interdisciplinary Foundation Course-II	1	-	2	2
7	LC	CE09(P)	Advanced Structural Analysis Lab	-	-	2	1
8	LC	CE10(P)	Design of RCC Structures Lab	-	-	2	1
9	LC	CE11(P)	Transportation Engineering Lab	-	-	2	1
10	SBC	CE03(P)	Design Studio-II	-	-	4	2
11	MLC	MLC03	Environmental Studies	1	-	-	Audit
Total Credits							21

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PCC–CE09	**Advanced Structural Analysis**	**2L:1T:2P(5hrs)**	**4 Credits**

Pre-requisite(s)–BasicCivilEngineering

Objectives: To provide a base for structural design. For evaluating whether a structure will be able to withstand external forces and internal stresses & to determine the root cause ofstructural failure

Module 1 Moment Distribution Method (WITH SWAY) and Kani's Method (6Hrs)

ApplicationofMDMtoPortalFramestakingSWAYintoaccount,analysisofboxframes, analysis of portals with inclined members, analysis of beams and frames by Kani's Method **Module 2**

Plastic Analysis (8Hrs)

Stress-Strain curve of steel, Plastic Theory of analysis, Its Comparison with Elastic Theory, Concept ofPlastic Hinge Formation, Static and Kinematic MethodofPlastic Analysis applied to beams and frames

Module3 AnalysisofTallFrames (8Hrs)

Approximate Methods (Portal Method, Cantilever Method), Factor Method, Substitute Frame Method

Module 4 Matrix Method of Structural Analysis (14 Hrs)

Flexibility Matrix Method applied to Beams, Trusses and Frames Stiffness Matrix Method applied to Beams, Trusses and Frames

Module 5 Arches and Suspension Cables (10Hrs)

Three-Hinged and Two-Hinged Arches, Parabolic and Semi Circular Arches, Fixed Arches, Influence Lines, Rib Shortening and Temperature Effects, Suspension Cables

Course Outcomes:

Students will be able to

CO1 To inculcate the further analysis of structures undergoing sway using Moment Distribution Method and Kani's Method

C02 To understand the fundamentals of plastic analysis and use the same for analysis of beams and frames; to perceive the difference from elastic analysis of structures.

CO3 To introduce the concepts of Approximate Methods of Analysis applied to framesundergoing the action of horizontal and vertical loads

CO4Toanalyzeindeterminatestructuresbymatrixmethods

CO5Toimplementtheenvisagingoftwoandthreehingedarches,fixedarchesand assimilate their evaluation

Text Books:

1. Ramamrutham,S.,Narayan,R.,"TheoryofStructures",DhanpatRaiPublishing Company
2. Bhavikatti, S.S.,"StructuralAnalysis-I",VikasPublishingHousePvt.Ltd.
3. Bhavikatti, S.S.,"StructuralAnalysis-II", VikasPublishingHousePvt.Ltd.
4. Reddy,C.S.,"BasicStructuralAnalysis",TataMcGrawHillPublishingCompanyLimited
5. Weaver,W.,Gere,J.M.,"Matrix Methods of Framed Structures",CBS Publishersand Distributors, Delhi

ReferenceBooks:

1. Wang, C. K., "Intermediate Structural Analysis", Tata McGraw Hill Publishing Company Limited
2. Utku , S., Norris, C. H., Wilbur, J. B., "Elementary Structural Analysis", Tata McGrawHill Publishing Company Limited
3. KinneyStering,J.,"IndeterminateStructuralAnalysis",AddisonWesley
4. Hibbeler,R.C.,"StructuralAnalysis"PearsonEducationPublication

SuggestedList ofExperiment:

1. TostudyTwo-Hinged(ParabolicarchandSemi-Circular)

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PCC–CE10	**Design of RCC Structures**	**2L:1T:2P(5hrs)**	**4 Credits**

Pre-requisite(s)–Structural Analysis

Objectives: Students will be able to understand proper load transfer mechanism of a RC frame structure along with proper understanding of design philosophies and will be able to design and detail all structural members such as beams, slab, column, footing and staircase and retaining wall.

Module 1 Design philosophies and Analysis (10Hrs)

Design philosophies of RC structures (WSM,LSM),Structural elements, Loads on structures, Various properties of concrete and reinforcing steel, partial safety factor for load andmaterial,Roleofstructuralengineer,RCsectionsinflexure-theory&analysis-singlyanddoubly reinforced - rectangular and flanged sections, Partial load factors.

Module 2 Designof Slabs (10Hrs)

OnewayandTwoway-simplysupported,cantilever andcontinuous,yieldline theory,

Module3DesignofBeams (10Hrs)

Designofbeams for flexure, shear, bond and torsion: simplysupported,continuous&cantilever, redistribution of moments in continuous beam, Doubly reinforced beam, Flanged beam, Design of Deep beams.

Module 4 Design of Columns and Footings (10 Hrs)

Short & long - axially loaded, uniaxial & biaxial moments. Square, Rectangular and Circular columns. Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Module 5 Designof staircase (08Hrs)

Doglegged andopenwellhavingequalandunequalflights,Slablesstread-riser staircase.

Course Outcomes:

Studentswillbeableto

CO 1.Able to understandthe generalmechanical behavior ofreinforced concrete inaccordance with IS 456:2000. Understanding of proper load transfer mechanism along with design philosophies and role of structural engineer. Able to design for collapse and serviceable conditions.

CO2.Able to analyze and design with detailing of differentslabs.

CO3.Abletoanalyzeanddesignwithdetailingfor differentbeams.

CO4.Ableto analyzeand designwithdetailing ofreinforced concretecompression members &footings.

CO5.Able to analyzeanddesignwithdetailing ofdifferenttype ofstaircase.

Text/ReferenceBooks:

1. ShahV.L.andKarveS.R."LimitStateTheoryandDesignofReinforcedConcrete", Structures Publications, Pune, 2005.
2. Punmia B. C., Jain A. K. and Jain A. K. "Limit State Design of R.C. Structures", Laxmi Publications Pvt. Ltd., 2015
3. S Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Structures" Tata McGraw Hills Publications Third Edition.

SuggestedLab Work

1. Drawingofbeams–simplysupported,cantilever,continuousanddoublyreinforced beam.
2. Drawingofslabs–one wayandtwowayslabs.
3. DrawingofStaircase– Dog legged,OpenwellandFolded platestaircase.
4. Drawing ofcolumn.
5. DrawingofFooting –Isolatedandcombinedfooting

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NewScheme&SyllabusBasedonAICTEFlexibleCurricula **(B.Tech) Civil Engineering Department**

PCC–CE11	**Transportation Engineering**	**3L:0T:2P(5hrs)**	**4Credits**

Pre-requisite(s)–Basic Civil Engineering

Objectives: To provide fundamental knowledge of various conventional and modern planning & design techniques used for highway planning, pavement construction & airport engineering.

Module 1 High way planning, Alignment & Geometric Design (10Hr)

Principlesofhighwayplanning, roadplanninginIndiaandfinancingofroads,classification patterns.Requirements,Engg.Surveysforhighway location.Crosssectional elements-width, camber, super-elevation, sight distances, extrawideningat curves, horizontalandverticalcurves, numerical problems.

Module 2 Bituminous & Cement Concrete Payments (10Hr)

Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surfacedressing, interfacialtreatment- sealcoat,tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, constructionand maintenance. Advantages and disadvantages ofrigidpavements,generalprinciplesofdesign,types,construction,maintenanceandjoints, dowel bars, tie bars. Brief study of recent developments in cements concrete pavement design,fatigue and reliability.

Module3LowCostRoads,DrainageofRoads,TrafficEngg.&TransportationPlanning (10Hr)

Principlesofstabilization, mechanicalstabilization,requirements, advantages, disadvantagesand uses, qualitycontrol, macadamroads-types, specifications, construction, maintenanceandcauses of failures. Surface and sub-surface drainage, highway materials: properties and testing etc. Channelised and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

Module 4 Airport Planning, Runway & Taxiway (10Hr)

Airportsite selection.air craftcharacteristic and their effects on runway alignments,windrose diagrams,basicrunwaylengthandcorrections,classificationofairports.Geometricalelements:

taxiways andrunways,patternofrunway capacity.

Module 5 Airport, Obstructions, Lightning & Traffic control (10Hr)

Zoningregulations,approacharea,approachsurface-imaginary,conical,and horizontal.Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.

Course Outcomes:

CO1 Knowledge of standard procedures used to design principal elements of the highway alignment, and highway cross sections.

CO2To understandthe processofconstructionofdifferent types ofroadsandthe materials involved in itsconstruction. Also to knowthe standard laboratorytesting procedures of the materials.

CO3 To introducethe fundamentalsoftraffic and transportationplanning withemphasison intersections.

CO4 To have a basic understanding of the layout of airports, the geometric elements and design factors.

CO5 To perceive the importance ofair traffic controland understand the different methods of the same.

List of Experiments:

1. AggregateCrushingValue Test
2. Determinationofaggregateimpactvalue
3. DeterminationofLosAngelesAbrasionvalue
4. DeterminationofCaliforniaBearingRatiovalues
5. Determinationofpenetration valueofBitumen
6. DeterminationofViscosityofBituminousMaterial
7. Determinationofsofteningpointofbituminousmaterial
8. Determinationofductilityofthebitumen
9. Determinationofflashpointandfirepointofbituminous material
10. DeterminationofBitumencontentbycentrifuge extractor
11. Determinationofstrippingvalueofroad aggregate

12. DeterminationofMarshallstabilityvalueforBituminous mix
13. Determinationofshapetestsonaggregate

ReferenceBooks:

1. HighwayEngineeringbyGurucharanSingh
2. PrinciplesofPavementDesignbyE.J. Yoder&M.W.Witzech
3. HighwayEngineering byO'Fleherty
4. HighwayEngineeringbyS.K.Khanna&C.E.G. Justo
5. AirportPlanning&DesignbyS.K.Khanna&M.G. arora
6. Foresch,Charles"AirportPlanning"
7. HoronjeffRobert"ThePlanning&DesignofAirports"
8. Sharma&Sharma, PrinciplesandPracticeofHighwayEngg.
9. Haung, AnalysisandDesignofPavements
10. RelevantIRC&IS codes
11. LaboratoryMannual byDr.S.K.Khanna
12. HighwayEngg.ByHews&Oglesby
13. HighwayMaterialbyWalker

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NewScheme&SyllabusBasedonAICTEFlexibleCurricula **(B.Tech) Civil Engineering Department**

PCC–CE12	**Water Resources Engineering**	**2L:1T:0P(3hrs)**	**3 Credits**

Pre-requisite(s)– Fluid Mechanics

Objectives: The objective of this course is to fulfill the essential knowledge of water resources, hydrology of surface & ground water, irrigation requirement, flood estimation and introductionof hydraulic structures.

Module1Hydrology (10Hrs)

Hydro-logical cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydro-graph analysis, unit hydro-graph and its derivation from isolated and complex storms, S- curve hydro-graph, synthetic unit hydro-graph.

Module2IrrigationwaterrequirementandSoil-Water-Crop relationship (10Hrs)

Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Module3GroundWaterandWell irrigation (10Hrs)

Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge-necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes andeffects.Reclamationofwaterloggedandsaltaffectedlands.Typesofwells,well

construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

Module4 Canals and Structures (10Hrs)

Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

Module 5 Floods & Water resources planning and management (10 Hrs)

Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

Water resources in India, Planning of water resources projects, data requirements, economic analysisofwaterresourcesprojectsappraisalofmultipurposeprojects, use of GIS for Water Resources.

Course Outcomes:

Studentswill beable to

CO1.To understandthehydrology, rainfallrunoffprocess anditsdetermination.

CO2.To know the basics of irrigation, methods of irrigation water and soil-water-crop relationship.

CO3. To illustratethe hydraulics of ground water &well, groundwaterrecharge andwater logging.

CO4.Torealizethetheories,Design of canalandintroductionofhydraulicstructures.

CO 5.To estimate flood bydifferent methods, flood routing, flood control measures and water resources planning and management.

Text/Reference Books:

1. K.Subhramanya, "Engineering Hydrology", Tata McGraw Hills Publ. Co, 4thEdition.

2. S.K.Garg,"HydrologyandWaterResourcesEngineering",16thEdition,2005.
3. H.M.Raghunath,"EngineeringHydrology"newage publishers.

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New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Civil Engineering Department

MLC 03	Environmental Studies	1L:0T:0P	0 Credits

Course objective-To provide an introduction to energy resources and an emphasis on alternative energy sources and their application. To study the interrelationship between the living organism and environment. To understand the transformation and degradation of organic pollutants in the environment

Module 1 Energy **(06 hrs)**

Introduction, conventional and non-conventional energy resources - coal, oil, gas, solar energy, wind energy,geothermal energy, Hydropower, Bio-energy, Nuclear energy. Energy survey in India. Current and futureenergy requirements in India and across the world including associated environmental problems.

Module 2 Ecosystem and Biodiversity **(08 hrs)**

Introduction of an ecosystem,Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, rivers, oceans),Biodiversity at global, national and local levels. Threats to biodiversity,Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic andoption values; Endangered and endemic species of India. Conservation of biodiversity: In-Situ and Ex-Situ.

Module 3 Air pollution and Water Pollution **(08 hrs)**

Definition, Cause, effects and control measures of Air pollution;Mobile and stationary sources of air pollutants,effective stack height concept, CO, CO_2, H_2S, SO_x, NO_x emissions, and its control.

Definition, Classification, Cause, effects and control measures of water pollution, Measurement of levels of pollution such as DO, BOD, COD.

Module 4 E-Waste **(06 hrs)**

Definition, Classification, Cause, effects and control measures of e-waste, global trade issues of e-waste, Recycling method of e-waste & its benefit.

Module 5 Environment Impact & Protection Act **(08 hrs)**

Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness. Environmental Impact Assessment. Measuring environmental impacts and policies for the regulation of environmental impacts.

Course outcome-

Student will be able to:

CO1. Ability to understand basic concepts conventional and non-conventional energy resources.

CO2. Ability to understand Ecosystem& Biodiversity.

CO3. To provide knowledgeabout Air pollution & Water Pollution.

CO4. To provide knowledge & reuse of E-Waste.

CO5. Ability to understand basic concepts of Environment Impact & Protection Act.

Text/Reference Book-

1. Environmental Engineering - H.S. Peavy & D.R. Rowe-Mc Graw Hill Book Company, New Delhi
2. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)

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New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Civil Engineering Department

Scheme for Six Semester

S.No.	Course Code	Course Title	Hrs./Week			Credits
			L	T	P	
1	PCC-CE13	Design of Steel Structures	2	1	-	3
2	PCC-CE14	Geotechnical Engineering	2	1	-	3
3	PCC-CE15	Water Supply and Waste Water Engineering	3	-	-	3
4	PCC-CE16	Estimating and Costing in Civil Engineering	2	1	-	3
5	HSMC-HS06	Humanities and Social Sciences Open Courses - II	2	-	-	2
6	Code*	Interdisciplinary Open Course-I	3	-	-	3
7	LC-CE13(P)	Design of Steel Structures Lab	-	-	2	1
8	LC-CE14(P)	Geotechnical Engineering Lab	-	-	2	1
9	LC-CE15(P)	Water Supply and Waste Water Engineering Lab	-	-	2	1
10	LC-CE04(P)	Design Studio-III	-	-	4	2
11	LLC-LLC03	Liberal Learning Course -III	-	-	2	1
12	MLC04	Intellectual Property Rights	1	-	-	Audit
13	PROJ-CE01	Internship-*To be completed anytime during Fifth/Sixth semester (Minimum 15Days/90Hrs.)Its evaluation/credit to be added in Seventh Semester.*				
						23

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(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Civil Engineering Department

PCC–CE13	**Design of Steel Structures**	**2L:1T:2P(5Hrs)**	**4 Credits**

Pre-requisite(s)–Structural Analysis

Objectives: To understand design philosophy related to basic steel and industrial structures.

Module1Connections **(10Hrs)**

Structuralpropertiesofsteel,Designofstructuralconnections-Bolted,RivetedandWelded, Concentric and Eccentric connections.

Module2TensionandCompressionMembers **(10Hrs)**

Design of compression member, Tension member, Roof truss-Angular and Tubular.

Module 3 Built-up Columns and Foundations **(10 Hrs)**

Design of columns-Simple and Compound, Lacing and Battens, Design of footing for steel structures, Grillage foundation.

Module4Design for bending **(10Hrs)**

Designofsimplebeams,Built-UpbeamsLatticegirder,PlategirdersandGantrygirders.

Module5IndustrialandMultiStoriedSteelStructures **(08Hrs)**

Design of industrial building frames, Multistorey frames, Bracing for highrise structures.

Course Outcomes:

Students will be able to

CO1. Understand the behavior and undertake the design of bolted and weldedconnections between elements in simple configurations applying relevant codes of practice (IS: 800 - 2007).

CO2. Understand the behavior and undertake the design of structural steel members to resist tension, compression, bending & shear applying the relevant codes of practice (IS: 800 - 2007).

CO3.Understandtheconceptinvolvedinsteelcolumnandfoundationdesign.

CO4.Understandthebehaviorandundertakethedesignofgirdersandsteelbeamfor bending.

CO5. Analyze the behavior of industrial and multi storey steel structural and undertakedesign at both serviceability and ultimate limit states.

Text/ReferenceBooks:

1. N.Subramanian,DesignofSteelStructures,Oxford Publications,2008.
2. L.S.Negi,DesignofSteelStructures,McGrawHillPublication,2017.
3. S.Ramamrutham,DesignofSteelStructures,DhanpatRaiPubliching Company.
4. S.K.Duggal,DesignofSteelStructures,McGrawHillPublication,2019.
5. RamchandraandV.GehlotDesignofSteelStructures-1,ScientificPublishers13 Revision.

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NewScheme&SyllabusBasedonAICTEFlexibleCurricula **(B.Tech) Civil Engineering Department**

PCC–CE14	**Geotechnical Engineering**	**2L:1T:2P(5hrs)**	**4 Credits**

Objectives: The objective of this course is to introduce students with the essential concepts of the physical properties of soils as a civil engineering material and the fundamental principles of soil mechanics.

Module1Propertiesof Soil (10Hrs)

Introduction–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Three phase soil system, weight volume relationships, indexpropertiesofsoil- methodsofdeterminationand itssignificance, classificationofsoil. Soil structure: single grained and honey combed, flocculated and dispersed. Plasticity Characteristics of Soil

Module2PermeabilityandSeepage (10Hrs)

Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I) - pumping in test and pumping out test. Permeability of layered soils, Seepage forces,Generalflowequation.Flownetanditsapplication.Seepageandseepagepressure

.Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Module3ShearStrength ofSoilandStressDistributioninSoils (10Hrs)

A) ShearStrength Of Soil:-Mohrcircle and its characteristics,principal planes,relation between major and minor principal stresses, Mohr-Coulomb theory, types ofshear tests: direct shear test, meritsofdirect shear test,triaxialcompressiontests,test behavior ofUU, CUand CD tests,pore-pressuremeasurement,computationofeffectiveshearstrengthparameters.

Unconfined compression test, vane shear test. Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

B) StressDistributioninSoils:

Boussinesq theory- point load, pressure distribution due to line load, strip load, pressure bulb, Westergaard's theory, contact pressure, approximate stress distribution method.

Module4 Stability of Slopes (7Hrs)

Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

Module5 LateralEarthPressure (7Hrs)

Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less andcohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls.

Course Outcomes:

Studentswillbeableto

CO1. To Understand the origin of the soil, geological cycle, Characterize and classification of soils.

CO2. To understand basics principles of flow and soil permeability through porous mediaincluding Bernoulli's equation, Darcy's Law, and Hydraulic conductivity.

CO3.To understand how stresses are transferred through soils and be able to compute both geostatic and induced stresses due to point, line, and area loads.

CO4.Tounderstandtheparameterswhichaffectthestabilityofslopesandtosolvereal world problems.

CO5.Basic understanding of Lateral Earth Pressure conceptand theory including Rankinetheory of active and passive earth pressures with and without sloping backfill.

Text/ReferenceBooks:

1. Dr.K.R. Arora,"SoilMech. &Found. Engg."Std.PublishersDelhi.
2. Dr.B.C.Punmia,"SoilMech.&Found"LaxmiPublications, Delhi.
3. Dr.lAramSingh,"ModernGeotechEngg"IBTPublishers,Delhi.
4. .C.Venkatramaiah, "GeotechEngg"NewAgeInternationalPublishers,Delhi
5. S.K.Garg,"SoilMech.&Found. Engg."KhannaPublishers, Delhi.
6. T.W. Lambe, "SoilTestingforEngg"JohnWiley&Soms.Inc.
7. RelevantI.S.Codes

SuggestedList ofExperiment:

1. DeterminationofHygroscopicwatercontent
2. Particle-sizeanalysis
3. DeterminationofSpecificgravityofsoilparticles
4. Determinationofplasticlimit
5. Determinationofliquidlimit
6. Determinationofshrinkagelimit
7. Permeabilitytests
8. Directsheartest
9. Triaxialcompressiontest
10. VaneSheartest
11. TheunconfinedCompressionTest

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New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Civil Engineering Department

PCC–CE15	Water Supply and Waste Water Engineering	3L:0T:2P(5Hrs)	4 Credits

Objectives: To offer knowledge of treatment, analysis of water and waste water, its properties and behavior under various situation of internal and external flows

Module 1 **(10Hrs)**

Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population. Impurities of water and their significance, water-bornediseases, physical, chemicaland bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Module2 **(10Hrs)**

Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment. Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps &pumping stations.

Module3 **(10Hrs)**

Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, ThOD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methodsofwaste water disposali.e. by land treatment &bydilution, selfpurificationcapacityofstream, Oxygen sag analysis.

Module 4 **(8Hrs)**

Unit operations for waste-water treatment: Theory and design of preliminary treatment such as screens, grit chamber, sedimentation and chemical clarification, role of micro-organism in biological treatment.

Module 5 **(10Hrs)**

MethodsofBiologicalTreatment (Theory&Design) –Trickling Filter, Activated Sludge process (ASP), Oxidationditch, Septic tank & imhoff tank, theoryofsludge.Diatomaceous earthfilters,

Ultra filtration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal

Course Outcomes:

Studentswillbeableto

CO1.Toestimatesurfaceandgroundwater,quality,quantityandanalysisofwater, Intake structure.

CO2.Understandthetypesofwatertreatmentmethods,collection,construction& maintenance of sewer.

CO3 Tounderstandthecharacteristicsandanalysisofwastewater.

CO4.Theory, designofpreliminaryandoperationforwastewatertreatment.

CO5.To perceive the theory & design of Biological Treatment .

Text/ReferenceBooks:

1. B.C.Punmia,"Water SupplyEngineering"LaxmiPublicationsLtd, NewDelhi
2. G.S.Birdi,"WaterSupply&SanitaryEngineering" LaxmiPublications Ltd.New Delhi
3. S.K. Husain,"Water Supply&SanitaryEngineering".
4. G.M.Fair &J.C.Geyer,"Water &WasteWater Technology".
5. RelevantIS

SuggestedList ofExperiment:

1. Tostudyofvarious standards ofwater, wastewater&SamplingTechniques.
2. Todetermine the alkalinityofgivensample ofwater.
3. ToDetermine the DissolvedOxygen(D.O.)ofthe givenwatersample.
4. Todetermine the totalhardness ofgivensample ofwater.
5. Todetermine the ConcentrationofChloride ofgivenwatersample.
6. MeasurementofTurbidityofthegivenwatersampleusing turbiditymeter
7. Calibrationofturbiditymeter usinggivensample
8. ApplicationofpHmetertofind acidityand alkalinityofthegivensolution
9. Todeterminetheresidualchlorineingivenwatersample
10. ToperformJartest for coagulationand tocalculatetheoptimumdoseofcoagulation.

MLC-04	Intellectual Property Rights	1L:0T:0P (1hr)	Audit Course

Objectives:

1. To be familiar with the concept of intellectual property.

2. To be familiar with Purpose and function of trademarks
3. To be familiar with Fundamental of copy right law
4. To have clear idea of the trade Secrete.
5. To be familiar with latest development in the field of intellectual property.

Module 1 Overview of Intellectual Property (10 Hrs)

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication. IPR in India.

Module 2 PATENT (08 Hrs)

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board.

Module 3 Copyrights (10 Hrs)

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Module 4 Trademarks (12 Hrs)

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board.

Module 5 OTHER FORMS OF IP (10 Hrs)

Design

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI)

Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection

Course Outcomes:

Students will be able to

CO1. Understand the concept of intellectual property.

CO2. Understand what is trademark and its importance.

CO3. Understand the law of copyright.

CO4. Understand how trade secrete help in competitive market

CO5. Understand the latest trends in intellectual property.

Text/Reference Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

3. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.

4. Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
New Scheme & Syllabus Based on AICTE Flexible Curricula **(B. Tech)**
Civil Engineering Department

PCC–CE16	Estimating and Costing in Civil Engineering	2L:1T:0P(3hrs)	3 Credits

Objective: To study about types of estimation, how to prepare detailed estimate of a project, complete process of tendering, contracts, rate analysis and valuation of construction project.

Module1 Introduction (10Hrs)

Purpose and importance of estimates, principles of estimating. Methods of taking out quantities ofitemsofwork.Modeofmeasurement, measurement sheet andabstract sheet;billof quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Module2Tender (10Hrs)

Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and items, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc

Module 3 Measurementsforvariousitems (10Hrs)

Use ofrelevant IndianStandard Specifications for the same, taking out quantities fromthe given requirements of the work and Preparing detailed estimates of various types of buildings, R.C.C. works and earth work, Bar bending schedules, Mass haul Diagrams,

Module4 Rateanalysis (8Hrs)

Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment Current schedule of rates (C.S.R.).

Module5 Valuation (8Hrs)

Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Course outcome:

Studentwillbeableto

CO 1. Understand the importance of estimation and to know the various types of estimation and prepare the bill of quantity

CO 2. Understand about the process of tendering and types of contracts, settlement of dispute and various term involving in the construction tendering.

CO 3. Prepare the detailed estimate of building, RCC work and earth work, bar bending schedule and mass haul diagram.

CO 4. Understand the purpose and importance of rate analysis and current schedule rate with determination of daily output from various equipments.

CO 5. Understand the purpose and methods of valuation and various term involve in the valuation of construction project like depreciation, sinking fund, scrap value, rent fixation of building etc.

TextBooks/Reference Books:

1. B.N.Dutta,"Estimating AndCosting inCivilEngineering" UBSPublishers'Distributors Pvt Ltd. 2016.
2. MChakravarty, "Estimating,CostingSpecifications&Valuation"Chakraborti2006.
3. JoyP K,Handbookof"ConstructionManagement"MacmillanPublishersIndia 2000.
4. B.S.Patil,"Building&Engineering Contracts"CRCPress2019.
5. D.D.Kohli, Ar.R.C.Kohli"TextbookofEstimatingandCosting(Civil)"SChand Publishing 2013.

SBC-CE03	**Design Studio-II**	**0L:0T:4P (4hrs)**	**2 Credit**

Objectives: Basic necessity for the Design Studio is to develop and enhance practical exposure and approach of students towards field of Construction. Design II is focusing on estimating & costing of proposed Small House.

List of Experiment:

1. Lay out of house.

2. Estimating of Quantities of house.

3. Costing of house.

4. Valuation of house.

5. Electrical & Plumbing details of house.

Course Outcomes:

Students will be able to

CO 1. Understand difficulties in the Lay out part of the house.

CO 2. Understand how to calculate the quantities of building materials.

CO 3. Understand how to calculate the cost of construction.

CO 4. Understand how to evaluate the fare market price of house.

CO 5. Understand how to show Electrical & Plumbing details on drawing of house.

Text Books / Reference Books:

1. B. N. Dutta, “Estimating And Costing in Civil Engineering” UBS Publishers' Distributors Pvt Ltd. 2016.

2. M Chakravarty, “Estimating, Costing Specifications & Valuation” Chakraborti 2006.

3. Joy P K, Handbook of “Construction Management” Macmillan Publishers India 2000.

4. B.S. Patil , “Building & Engineering Contracts” CRC Press 2019.

5. D.D. Kohli, Ar. R. C. Kohli “Textbook of Estimating and Costing (Civil)” S Chand Publishing 2013.

SBC-CE04	**Design Studio-III**	**0L:0T:4P (4hrs)**	**2 Credit**

Objectives: Basic necessity for the Design Studio is to develop and enhance practical exposure and approach of students towards field of Construction. Design Studio III is focusing design part of the proposed Small House manually & with software both.

List of Experiment:

1. Structural Design of a house manually & with software.

2. Structural Drawing of a house using AutoCAD.

Course Outcomes:

Students will be able to

CO 1. Understand Structural Design of various members of the house.

CO 2. Understand how to prepare structural details.

Text/Reference Books:

1. Shah V. L. and Karve S. R.“Limit State Theory and Design of Reinforced Concrete”, Structures Publications, Pune, 2005.

2. Punmia B. C., Jain A. K. and Jain A. K. “Limit State Design of R.C. Structures”, Laxmi Publications Pvt. Ltd., 2015

3. S Unnikrishna Pillai and Devdas Menon “Reinforced Concrete Structures” Tata McGraw Hills Publications Third Edition.