CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE Model Curriculum with effect from AY 2023-24

B.E (Civil Engineering)

SEMESTER-VII:

Sl No	Course code	Title of the Course	Scheme of instruction			Scheme of Examination			Credits
			Hours per week						
			L	T	P	Duration of SEE in hours	Max marks		
							CIE	SEE	
1	20CE C28	Construction Engineering And Management	3	-	-	3	40	60	3
2	20MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
3	-	Professional Electives-4 (PE-4)	3	-	-	3	40	60	3
4	-	Professional Electives-5 (PE-5)	3	-	-	3	40	60	3
5	-	Open Electives - 3 (OE-3)	3	-	-	3	40	60	3
6	20CE C29	Concrete Technology Lab	-	-	2	3	50	50	1
7	20CE C30	Computer Applications Lab	-	-	2	3	50	50	1
8	20EGM03	Gender sensitization (MC)	2	-	-	3	-	50	NC
9	20CE C31	Project Part 1	-	-	4	-	50	-	2
10	20CE I03	Internship	4-6 weeks / 180 hours						3
		Total	17	-	8		350	450	22
	Clock Hours per week: 25								

L: Lecture **T: Tutorial** **P: Practical/Drawing/Seminar/Project**

CIE: Continuous Internal Evaluation **SEE: Semester End Examination**

Professional Electives-4 (PE-4)

20CE E13	Finite Element Methods
20CE E14	Applications of Data Analytics in Civil Engineering
20CE E15	Design of Hydraulic Structures
20CE E16	Concrete Technology & Special Concrete

Professional Electives-5 (PE-5)

20 CE E17	Railway and Airport Engineering
20CE E18	Applications of Block Chain Technology in Civil Engineering
20CE E19	Design of Steel Structures II
20CE E20	Advanced Environmental Engineering

Open Electives - 3 (OE-3)

20CS O07	Basics of Machine Learning
20AD O01	Introduction to Python Programming
20IT O02	Principles of IoT

20CE C28

CONSTRUCTION ENGINEERING AND MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes: After completion of the course, students will be able to

1) Build an Organization and Select a suitable type of project delivery method for successful project implementation.
2) Plan the construction project making use of a suitable technique for the project under consideration.
3) Determine optimized project time and cost with the exercise of proper monitoring and control in construction projects
4) Plan and implement suitable construction safety measures and quality management systems in construction projects.
5) Choose proper equipment for the execution of various operations in construction and analyze various issues of contracting.

	POs												**PSOs**		
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	-	1	-	-	1	-	1	2	2	3	1	2	3	-
2	2	-	-	-	2	-	-	-	1	1	-	1	-	-	3
3	2	-	1	-	1	-	-	1	-	1	2	-	-	3	-
4	-	-	3	2	-	2	-	1	1	2	-	1	-	-	3
5	1	-	-	-	-	1	-	2	1	2	1	1	-	2	-
Average	**1.75**		**1.66**	**2**	**1.5**	**1.33**		**1.25**	**1.25**	**1.6**			**2**	**2**	**1.5**

UNIT-I:

Introduction to Construction and Construction Management: Construction and unique features of construction, construction projects-types and features, phases of a construction project, agencies involved and their methods of execution- Project Delivery Methods: BOT, SBOO, BOOT; Public Private Partnership (PPP); Significance of construction management, Construction Team. Organization – principles and types.

UNIT-II:

Construction project planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, Types of Project plans- Time plan, man power plan, material plan, construction equipment plan; Work break-down structure- Techniques of planning- Bar charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths. PERT- Assumptions underlying PERT analysis.

UNIT-III:

Project Monitoring & Control: Introduction – Supervision, record keeping, periodic progress reports. Updating of plans: purpose, frequency and methods of updating- using bar charts, PERT/CPM, Resource Leveling and Precedence network. Schedule/time progress control; Cost control- Classification of costs, time-cost trade-off in construction projects

UNIT-IV:

Construction Safety and Quality Management Safety: Significance of construction Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health; Quality control: construction quality, Quality control and Quality Assurance in construction projects, ISO Standards-Benefits of ISO 9000, Principles of quality management systems, ISO 9000 -2000 family of Standards.

UNIT-V:

Construction Equipment and Contracts: Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.

Contracts**:** Introduction, types of construction contracts and their advantages and disadvantages, conditions of contracts, Tender: Tender form, Tender Documents, Tender Notice, Work Order. Delays, penalties and liquid4.ated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Text Books:

1) Jha, Kumar Neeraj., Construction Project management, Theory & Practice, PearsonEducation India, 2015.
2) Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, LaxmiPublications, 2016.
3) P.S. Gahlot, B. M. Dhir Construction Planning And Management

Reference Books:

1) Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
2) Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
3) Dr.S.Seetharaman, Construction Planning And Management

20MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	1	3	1	1	1	1	1	1	1	-	-	1	-	1
2	2	2	2	2	-	1	1	1	-	1	-	1	2	1	2
3	1	2	1	2	2	-	2	1	-	1	-	-	1	2	2
4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	1
5	1	3	1	2	1	1	2	-	-	1	2	1	2	1	2
AVERAGE	**1.4**	**2**	**1.6**	**1.8**	**1.5**	**1**	**1.4**	**1.5**	**1**	**1**	**2**	**1**	**1.5**	**1.33**	**1.6**

Unit-I

Introduction to Managerial Economics

Introduction to Economics and its evolution – Managerial Economics – its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics – Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II

Demand and Supply Analysis

Demand Analysis – Concept of Demand, Determinants, Law of demand – Assumptions and Exceptions; Elasticity of demand – Price, Income and Cross elasticity – simple numerical problems; Concept of Supply – Determinants of Supply, Law of Supply; Demand Forecasting – Methods.

Unit-III

Production and Cost Analysis

Theory of Production – Production function – Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV

Accountancy

Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods – Numerical problems.

Text Books:

1. Mehta P.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.

Suggested Readings:

3. Panday I.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.
4. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
5. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
6. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20CE E13

FINITE ELEMENT METHODS

Instruction:	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination:	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits:	3

Course Outcomes: At the end of the course, student will be able to

1. Apply the fundamentals of FEM, elements of theory of elasticity for 2D, 3D and axisymmetric problems.
2. Apply Principle of minimum potential energy and Principle of Virtual work; analyze simple problems using Rayleigh Ritz Method and Galerkin's method.
3. Formulate the local and global stiffness matrix, load matrix for 1D bar elements and 2D truss elements and analyze simple problems.
4. Develop the stiffness matrix for beams and rigid jointed plane frames and solve problems with degree of freedom not exceeding three.
5. Select displacement functions, formulate the stiffness matrix, load matrix for CST elements. Use Iso-parametric elements and quadrilateral elements, and evaluate definite integral by Gauss Quadrature.

CO	PO's												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**
2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**
3	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**
4	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**
5	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**
Average	**2.4**	**2.4**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**-**

UNIT- I:

Introduction to FEM: General description of the method, brief history of the method, applications of the method, advantages of the finite element method, steps in the finite element method. Types of elements, Types of forces, and Boundary conditions. Strain displacement, and stress- strain relations for 2-D, 3-D problems & Axisymmetric elements. Equations of equilibrium and compatibility conditions for 2-D and 3-D problems. Plane stress and plane strain situations and derivation of elasticity matrices.

UNIT- II:

Finite Element Formulation: Principle of minimum potential energy, Principle of virtual displacement, Raleigh Ritz method, Weighted Residual method- Galerkin's method. Coordinate system - Global coordinate, local coordinate and natural coordinate system.

UNIT- III:

Bar Elements: Shape functions, stiffness matrix for a 2- noded bar element, axial bar subjected to point loads, surface forces and body forces - constant cross section and varying cross section bar.

Truss Elements: Transformation matrix, Stiffness matrix of truss member in local and global coordinates, analysis of trusses with kinematic indeterminacy not exceeding three.

UNIT- IV

Beam Elements: Shape functions, beam element stiffness matrix, element load vector, and analysis of continuous beams with kinematic indeterminacy not exceeding three. Plane Frame elements: Element stiffness matrix in local coordinates, Transformation or Rotation matrix, and stiffness matrix and load vector in global coordinates.

UNIT-V:

Displacement models: Selection of displacement models, geometric invariance, conforming and non-conforming elements.

2-D Triangular Elements (CST) and Rectangular Elements: Determination of strain-displacement matrix, shape functions, determination of element stiffness and load matrices, assembling global stiffness and load matrices.

Iso-parametric elements: Iso-parametric concept, Iso-parametric, Sub parametric and Super parametric elements. Gauss Quadrature of numerical integration.

Text Books:

1. David V. Hutton, "Fundamentals of Finite Element Analysis", McGraw Hill Education (India) Private Limited, Delhi, 2014.
2. P. N. God bole," Introduction to Finite Element Method", I. K. International Publishing House Pvt. Ltd. New Delhi, 2013.
3. P. Seshu, "Finite Element Analysis", Prentice Hall of India Private Limited, New Delhi, 2010.

Suggested Reading:

1. T. R. Chandrupatla and A. D Belegundu, "Introduction to Finite Elements in Engineering", Prentice –Hall of India Private Limited, New Delhi, 2009
2. Daryl L, Logan, "A first course in the Finite Element Method", Third Edition, Thomson Brook, Canada Limited, 2007.
3. R. D. Cook, "Concepts and Applications of Finite Element Analysis", John Wiley and sons, 1981.
4. O. C. Zienkiewicz and R. Taylor, "The Finite Element Method", Vol.1, McGraw Hill Company Limited, London, 1989.

20CE E14

APPLICATIONS OF DATA ANALYTICS IN CIVIL ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation Marks	40
Credits	3

Course Outcomes: On successful completion of this course, student will be able to

1. define the descriptive, predictive and prescriptive models and select suitable tools or techniques for application in civil engineering problems
2. identify the discrete and continuous random variables and select appropriate mathematical models which support decision making under uncertainty
3. design data collection process required for descriptive and exploratory models for problems in civil engineering
4. relate estimators and estimates to process of estimation and thus implement the various modeling techniques to uncover the patterns in the civil engineering related data
5. formulate hypothesis and their corresponding confidence intervals for various count data based and discrete choice models along with goodness of fit measures

CO	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1.	2	2	1	-	-	-	-	-	-	-	-	-	1	-	-
2.	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	2	2	2	1	1	-	-	-	-	-	-	-	1	1	1
4.	2	2	-	-	1	-	-	-	-	-	-	-	-	-	-
5.	1	1	1	1	-	-	-	-	-	-	-	-	1	-	-
Average	1.8	1.8	1.33	1	1	-	-	-	-	-	-	-	1	1	1

UNIT I:

Introduction: Fundamentals and the context of data analytics, descriptive, predictive and prescriptive models of data analytics, evolution of data analytics solutions such as SQL analytics, visual analytics, big data analytics, and cognitive analytics. Data analytics tools and techniques used in civil engineering.

UNIT II:

Random variables: Sample, population, sample space, frequentist and Bayesian notations of probability, discrete and continuous random variables and their distributions.

Statistical Modelling: Overview, application, desirable features, issues and pitfalls of statistical models, framework for developing models, basic steps in model building and decision making under uncertainty.

UNIT III:

Experimental and observational study design: sample selection, recruitment, and data collection method selection. Descriptive and exploratory data analysis, including: measures of central tendency, histograms, density distributions, and box plots. Examples of descriptive and exploratory analysis for civil engineering related problems.

UNIT IV:

Estimation, estimators and estimates; criteria for assessing estimators, asymptotic properties. Estimation techniques: method of moments, ordinary least squares (OLS) regression, log likelihood estimation. OLS – assumptions of linear regression, linear relationship, and estimation of coefficients. Log likelihood estimation - definition of likelihood and log likelihood, parameter estimation using maximum likelihood estimation technique, desirable properties of maximum likelihood estimators.

UNIT V:

Statistical inference of models including tests, confidence intervals and hypothesis testing. Statistical models of independent data including simple and multiple linear regression. Count data and discrete choice models: Binary, multinomial logit models, and count data models with applications in travel choice and transport safety. Process of model selection, goodness of fit and sensitivity analysis.

Text Books:

1. Mashrur Chowdary, Amy Apon and Kakan Dey, Data Analytics for Intelligent Transportation Systems, 2012
2. Subhashish Samaddar and Satish Nargundkar, Data Analytics: Effective methods for Presenting Results, CRC press, 2012.

Suggested Reading:

1. S.M Yadav, Application of soft computing techniques in civil engineering, 2018.
2. V.K.Jain, Data Science and Analytics, Khanna Publishing, 2018.
3. . http://nptel.ac.in/courses/106106126/

20CE E15

DESIGN OF HYDRAULIC STRUCTURES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation Marks	40
Credits	3

Course Outcomes: on completion of the course, students will be able to

1. Design Surplus weir
2. Design various components of direct sluice
3. Design of glacis type canal drop
4. Design of cross regulator
5. Design of spillways and energy dissipaters

COs	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	-	-	1	-	-	-	-	-	1	1	-	2
2	3	2	2	-	-	1	-	-	-	-	-	1	1	-	2
3	3	2	2	-	-	1	-	-	-	-	-	1	1	-	2
4	3	2	2	-	-	1	-	-	-	-	-	1	1	-	2
5	3	2	2	-	-	1	-	-	-	-	-	1	1	-	2
Average	**3**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**2**

UNIT - I:

Diversion head works-Weir: types of weirs, components of diversion head works, crest level of weir, afflux, design of surplus weir, design for surface flow and sub - surface flow, length, level and thickness of downstream apron, upstream and downstream cut-offs, protection works.

UNIT- II:

Direct Sluice: -Hydraulic particulars of mail canal and distributary, general arrangements of various components- Design of vent way, Sluice barrel, Head walls, Wing Walls and return walls.

UNIT- III:

Canal Falls: Definition, types of falls.

Glacis type Canal Drop: Components, General arrangements, Fluming ratio, fixing the crest level, length of weir, U/S and D/S glacis, Transitions - Protection works -Curtain wall, Energy dissipation arrangements.

UNIT- IV:

Cross Regulator: General design principles - General arrangements of various components - design of vent way by drowning ratio - arrangements of energy dissipation - U/S & D/S protection works.

UNIT- V:

Spillways: Spillways, Ogee spillway and design of its components. Design of Energy Dissipation structures, Bucket type and cistern type.

Text Books:

1. B.C. Punmia, "*Irrigation & Water Power Engineering*", Lakshmi Publications, Delhi, 2016.
2. Ch. S. N. Murthy, "*Water Resources Engineering: Principles and Practice",* New Age International Publishers, Delhi, 2002.

Suggested Reading:

1. R S Varshney, S C Gupta, R L Gupta, "*Theory & Design Of Irrigation Structures Vol. 1*", Nem Chand & Brothers, 1992
2. S. K. Garg, "*Irrigation Engineering and Hydraulic Structures"*, Khanna Publishers, New Delhi, 2017.
3. Sharma, S. K. Irrigation Engineering and Hydraulic Structures. S. Chand Publishing, 2017.

20CE E16

CONCRETE TECHNOLOGY AND SPECIAL CONCRETES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation Marks	40
Credits	3

Course Outcomes: At the end of the semester student should be

1. Able to understand the physical and chemical properties of concrete and should have knowledge on tests on cement and aggregates.
2. Able to explain the properties of both fresh and hardened concrete.
3. Able to apply the knowledge on chemical and mineral admixtures of cement.
4. Design the mix proportions for the specific work for required strength and workability with available materials at workplace.
5. Be familiar with the special concerts used in construction for various purposes

COs	PO's												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
1	2	1	2	1	1	1	2	-	-	-	-	1	2	2	2	2
2	2	1	2	1	1	1	2	-	-	-	-	1	2	2	2	2
3	2	1	2	1	1	1	2	-	-	-	-	1	2	2	2	2
4	2	1	2	1	1	1	2	-	-	-	-	1	2	2	2	2
5	2	1	2	1	1	1	2	-	-	-	-	1	2	2	2	2
Average	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**	**2**	**2**

UNIT-I:

CONCRETE CONSTITUENT MATERIALS: Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, testing of cement as per Indian standard. **Aggregates** - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements, sampling & testing as per Indian Standards. **Water** - Quality of water for use in concrete & limiting values of impurities.

UNIT-II:

FRESH AND HARDENED STATE PROPERTIES OF CONCRETE: Methods of Batching and mixing, Workability – factors affecting workability - Tests for workability of concrete – Segregation and Bleeding, Curing and its necessity, various methods of curing, micro-cracking.

Hardened state Properties of Concrete: Compressive and tensile strengths and their relationship, Introduction to aspects of elasticity, shrinkage and creep, Tests for Compressive, Split tensile and Flexural strengths as per IS and ASTM, non-destructive tests-Rebound hammer and UPV tests, Factors affecting strength – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Stress-strain curve for concrete – Modulus of elasticity, durability of concrete – water absorption, permeability, corrosion test and acid resistance.

UNIT-III:

CONCRETE ADMIXURES: Mineral Admixtures - Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline, Effects on concrete properties; Chemical Admixtures- Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers.

UNIT-IV:

PROPORTIONING OF CONCRETE MIX: Nominal and design mixes, Principles of mix proportioning, Physical properties of materials required for Mix Design, probabilistic parameters, factors governing selection of mix. DOE, ACI and IS methods of concrete mix design, Mix Design Examples.

UNIT-V:

SPECIAL CONCRETES: Light weight concrete, Heavy weight concrete, High strength concrete, Fibre reinforced concrete, SIFCON, Ferro cement, High performance concrete, Self-compacting concrete, Self-curing concrete, Geo-polymer Concrete, vacuum concrete, Ready mix concrete (RMC), Shotcrete, Polymer concrete and Precast concrete.

Suggested Reading:

1) Properties of Concrete, AM Nevelli, Prentice Hall Publishers, 2012, 5th Edition
2) Concrete Technology: Theory And Practice, M. S. Shetty and A. K. Jain, S Chand & Co., Publishers, 2018.

20CE E17

RAILWAY AND AIRPORT ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course outcomes: At the end of the course, the students will be able to:

1. Understand the role played by various components of permanent way
2. Apply engineering knowledge to geometric design of a railway track as per the standards and understand the importance and components of points and crossings
3. Create facilities for railway passengers and goods, identify procedures to be followed for maintenance of track and understand various types of railway signals and their functions, need and requirements of drainage system in railway tracks
4. Understand the structure of airport system, components of aircraft and airport and apply engineering knowledge for selection of airport sites.
5. Plan airports and facilities as per international standards and also understand the corrections to be applied for runaway and design airports as per ICAO standards and develop the facilities required for passengers and aircrafts.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1			1	-	-	-	-	-	-	-	-	-	-	-
2	1	-	-	-	-	-	-	-	-	-	1		1	-	-
3	1	-	-	-	-	-	-	-	-	-	1	-	-	1	2
4	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
5		1		1	1	-	-	-	-	1	-	1	-	1	2
Average	**1**	**1**		**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**1**	**2**

UNIT-I:

Introduction of railway engineering: History of development of railway engineering, brief introduction of railway zones, classification of Indian railway, Permanent way – rail gauges – types, uni-gauge policy, ideal requirements, Rails, types of rails, rail fastenings, rail joints creep – causes, measurement, remedial measures for rectification of creep, adzing of rails. Sleepers – function of sleepers, requirements of sleepers, sleeper density, types of sleepers. Ballast-functions of ballasts, requirements of ballasts, screening of ballasts, size and quantity of rail ballasts.

UNIT-II:

Geometric design of track: Curvature of track, designation of curves, types of curves, design of transition curves, cant concept, cant deficiency, cant excess, speeds of trains on curves, types of gradients, and grade compensation.

Points and crossings: Introduction of right- and left-hand turn outs, terms used in points and crossings, components, length of stock rail, heel clearance, Crossings-types of crossings – ordinary and double

crossings, theoretical and actual nose of crossings, crossing angle, types of leads calculations, Design and maintenance of points and crossings.

UNIT-III:

Construction and maintenance of railway track: Necessity for maintenance of track, maintenance of track proper, maintenance of railway bridges, maintenance of rolling stock, signaling during maintenance, tools required during maintenance. Definition of station, selection of site for railway station, features of railway station, Dimensions of platform, definition of a yard, types of yard. Drainage system– Significance of drainage system, requirements of drainage system.

UNIT-IV:

Introduction of air transport system: Roles and responsibilities of director of Civil Aviation and National Airport Authority, International Airport Authority of India, Airports Authority of India, ICAO. Aircraft Characteristics, components of an aircraft. Airport Master Plan – FAA and ICAO recommendations, regional planning, airport site selection, airport location.

UNIT-V:

Airport planning: Typical layout of a terminal areas and airport incorporating airport components – terminal building, apron, hangar, Runway design – runway orientation, wind rose diagrams, basic runway length, connections to runway lengths, airport classifications and airport obstructions.

Airport capacity: Factors influencing runway capacity, methods for practical capacity determination, gateway, capacity, taxiway capacity, airport configuration – single runway, parallel runway, intersecting and non-intersecting runway, taxiway design, factors controlling taxiway layout and geometric design standards, exist taxiways.

Text Books:

1. S.P. Aroor, Prof. S.C. Saxena, “Railway Engineering”, DhanpatRai Publications Pvt. Ltd. New Delhi, 2010
2. S.C. Rangwala, “Railway Engineering”, Charotar Publishing House Pvt. Ltd. (2017)

Suggested Reading:

1. Satish Chandra, M.M. Agarwal, “Railway Engineering”, Oxford, second edition, 2013
2. K.P. Subramanian, “Highway, Railway, Airport and Harbour Engineering”, 2015, Scitech Publications (India) Pvt. Ltd., R. Srinivasa Kumar, “Airport, Railway, Docks & Harbors”. Universities Press, 2014

20CE E18

APPLICATIONS OF BLOCK CHAIN TECHNOLOGY IN CIVIL ENGINEERING

Instruction	3LHoursperweek
Duration of Semester End Examination	3Hours
Semester End Examination	60Marks
Continuous Internal Evaluation	40Marks
Credits	3

Course outcomes: At the end of course, students would be able to:

1) Gain a clear understanding of the concepts that underlie Block chain and Block chain and types of Block chain.
2) Understand key mechanisms like decentralization, transparency and trust, immutability.
3) Understand the importance of Block chain in construction industry apply the concepts of smart contracts using Block chain technology.
4) Understand and apply the project management systems using Block chain technology.
5) Apply the concepts of building information modeling using Block chain technology.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	-	-	1	-	2	-	-	-	-	1	-	-	1
2	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1
3	-	-	-	-	1	-	1	-	-	-	-	1	-	-	1
4	-	-	-	-	3	-	1	-	-	-	-	1	-	-	1
5	-	-	-	-	3	-	-	-	-	-	-	1	-	-	1
Average	**-**	**-**	**-**	**-**	**2**		**1.25**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**

UNIT 1:

Introduction to Block chain: Introduction to centralized, decentralized and distributed system, History of Block chain, Various technical definitions of Block chain. **Generic elements of a block chain:** Block, Transaction, Peer to peer network, Node, Smart contract, Why it's called block chain. **Types of block chain:** Public Block chains, Private Block chains, Semi-private Block chains, Side chains, Permissioned ledger, Distributed ledger, shared ledger, Fully private and proprietary Block chains, Tokenized Block chains, Token less Block chains, CAP theorem and Block chain

UNIT II:

Concepts of Block chain Technology: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, and Structure of Block chain. Applications of Block chain technology, Tiers of Block chain technology: Block chain0, Block chain 1, Block chain 2, Block chain 3, generation of Block chain X.

UNIT III:

Applications of Block chain technology in Civil Engineering: Importance of Block chain in construction industry. Block chain in operation, public and Private Block chain types, Smart contracts on the Block chain to enhance efficiency, Ideal solution for the construction industry.

UNIT-IV:

Payment and Project Management: Block chain enabled project collaboration, Transparency in construction industry, Procurement and Supply Chain Management, Sustainable procurement in the construction industry enabled by Block chain, Fostering enhanced and trust in the supply chain.

UNIT V:

Building Information Modelling (BIM) – BIM and block chain. Project delivery 'designed' to 'as built'. Smart Asset Management through BIM. Challenges and Implementation – Stages of implementation in the industry.

Crypto Currency: Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, Bitcoin Currency units.

Text books:

1) Imran Bashir, "Mastering Block chain", Packt publishing Limited, 2nd edition 2018
2) Narayan Prusty, "Building Block chain Projects", Packt Publishing, 1st edition 2017.

References:

1) Block chain for dummies, IBM Limited Edition, John Wiley & Sons, Inc.
2) Block chain Technology in the Construction Industry – Digital Transformation for High Productivity, 2018.

20CE E19

DESIGN OF STEEL STRUCTURES – II

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Codes required: IS 800 – 2007, steel tables, Bridge rules, Bridge Code (RDSO)

Course Outcomes: At the end of the course, the students will be able to

1) Design welded plate girders and the secondary components, understand the phenomenon of shear buckling in girders.
2) Estimate the loads on gantry girders, Design gantry girder including connections.
3) Identify the suitability of bridge type, Design Roller & Rocker bearings for railway bridges
4) Develop the layout of deck type riveted plate girder bridges and design the bridges for loads including wind effects
5) Choose the appropriate truss configuration, develop layout of the bridge, and design and detail truss girder bridges

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	-	-	-	-	-	-	-	1	2	1	2
2	3	3	3	2	-	-	-	-	-	-	-	1	2	1	2
3	3	3	3	2	-	-	-	-	-	-	-	1	2	1	2
4	3	3	3	2	-	-	-	-	-	-	-	1	2	1	2
5	3	3	3	2	-	-	-	-	-	-	-	1	2	1	2
AVERAGE	**3**	**3**	**3**	**2**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**1**	**2**	**1**	**2**

UNIT- I:

Design of Welded Plate girders: Design of welded plate girder for static loads–Economical Depth, Design of Cross Section, Flange curtailment, intermediate and bearing stiffeners, connections- As per IS 800-2007.

UNIT- II:

Design of Gantry girders: Basic principles and applications, Loads, Codal provisions, Gantry girder cross sections, Analysis, Design of Cross section and connections

UNIT- III:

Introduction to Railway Bridges and Design of bearings: Bridges: Deck and through type bridges – Economical span – Indian standard railway broad gauge train loadings – permissible stresses. Detailing; General layout of Plate Girder and Truss girder bridges.

Bearings: Types and general description of various bearings, Design of Rocker and roller bearings for railway bridges.

UNIT- IV:

Design of Deck type riveted plate girder railway bridges: Economical depth, detailed design of Cross section, connections, intermediate and bearing stiffeners, Wind effects-Design of Cross frames

UNIT- V:

Design of Through type riveted truss girder railway bridges: Truss configurations, Design of stringer beams, Cross girders; Wind effects- Design of top lateral and bottom Lateral bracing, Portal and sway bracings; Design of Truss girders

Text Books:

1) S. K. Duggal, "Limit State Design of Steel Structures", 3rd Edition, Mc Graw Hill HED, 2019.

2) N. Subramanian "Design of Steel Structures: Limit state method" 3rd Edition, Oxford University Press, 2018.

3) B.C. Punmia and Ashok Kumar Jain, "Comprehensive Design of Steel Structures", Laxmi Publications, 2015.

Suggested Reading:

1) A.S. Arya and J.L Ajmani "Design of Steel Structures", Nem Chand & Bros. 2014.
2) M.R. Shiyekar, "Design of Steel Structures, (Limit State Method", Second Edition, PHI Learning Pvt Ltd. 2013
3) Ramachandra and Virendra Gehlot, "Design of Steel Structures", Volume – 2, Scientific Publishers, 2008.

20CE E20

ADVANCED ENVIRONMENTAL ENGINEERING

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation Marks	40
Credits	3

Course Outcomes: At the end of the course, the student will be able to

1) Characterize the effluents, analyze the effects of industrial effluents on the human health & thoroughly practice environmental legislation
2) Apply the methods of Industrial waste water management and treatment.
3) Evaluate, monitor and analyze ambient air quality.
4) Apply the methods of air pollution control to field situations.
5) Evaluate the impact of road project, industry and a dam on the surrounding environment.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	2	-	-	3	-	-	-	-	-	-	2	-	1
2	3	1	1	-	-	-	-	-	-	-	-	-	1	-	1
3	1	2	-	-	-	1	-	1	-	-	-	-	1	-	-
4	3	-	-	-	-	1	2	-	-	-	-	-	1	1	1
5	-	-	-	-	-	2	3	-	1	1	1	-	1	-	-
AVERAGE	**2.3**	**1.5**	**1.5**	**-**	**-**	**1.75**	**2.5**	**1**	**1**	**1**	**1**	**-**	**1.2**	**1**	**1**

UNIT–I:

Industrial waste Management: Types of industries, characteristics of Industrial wastes, effects of industrial effluents on streams, land and human health. Environmental legislation related to Industrial effluents and hazardous wastes. Self-purification of water bodies, Streeter Phelps Equation.

UNIT–II:

Industrial Waste Water treatment: Manufacturing process, waste water characteristics and effluent treatment of the following industries- leather tanning, dairy, pulp and paper, pharmaceutical, textiles, steel plants, thermal power plants, fertilizer, cement, sugar and distilleries.

UNIT–III:

Air pollution: Sources, classification and effects of air pollutants, Meteorology of air pollution, wind rose diagrams, lapse rates, atmospheric stability an dispersion of air pollutants, stack height calculation, ambient air quality monitoring, stack sampling, analysis of air pollutants.

UNIT-IV:

Air Pollution Control: Air quality standards, methods of air pollution control – zoning, source correction, control of suspended particulate meter by equipment (gravitation, centrifugation, filtration, scrubbing), selection of proper equipment, gaseous pollutant control by adsorption, condensation, combustion.

UNIT–V:

Environmental Impact Assessment: Need for environmental impact assessment (EIA), objectives of EIA, EIA capabilities and limitations. Legal provisions of EIA, Base line at a collection required for EIA, Evaluation of impacts, Prediction of impacts, Preparation of Environmental Management Plan, Preparation of EIAs of road project, Industry, and dam. Issues related to rehabilitation of affected people, Preparation of Environment, Impact statement and Environment Management Plan.

Text Books:

1. M. N. Rao and Dutta, "*Waste Water Treatment",* Oxford and IBMPublications Ltd., 2017.
2. W. W. Eckenfelder, "*Industrial Water Pollution C*ontrol", Mc GrawHill India, 2005.
3. M.N. Rao, H.V.N. Rao, "*Air Pollution Control*", Tata Mc Graw Hill,2017

Suggested Reading:

1. C. S. Rao, "*Environmental Pollution Control Engg",* New AgeInternational Publishers, 2018.
2. Peavy and Rowe, "*Environmental Engg",* McGraw Hill Publications,2017.
3. Keiley, "*Environmental Engg*", Mc Graw Hill Publishers, 2003.

20CS O07

BASICS OF MACHINE LEARNING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are,

1. To learn Machine Learning algorithms.
2. To learn to work with data's, preparing datasets for real world problems
3. To study various machine learning algorithms.
4. To analyze data using machine learning techniques.
5. To become familiar with usage of time series and deep learning approaches.

Course Outcomes: On Successful completion of this course, student will be able to,

1. Define the basic concepts related to Python and Machine Learning
2. Describe the feature engineering methods, regression techniques and classification methods
3. Apply Python packages for data visualization, text and time series data analysis using NLP toolkit
4. Evaluate and interpret the results of the various machine learning techniques
5. Solve real world problems using deep learning framework.

UNIT - I

Introduction to Machine Learning: Introduction, types of learning, Machine Learning process.
Introduction to Python: Features, sources and installation of Python, IDEs, Basics of Python, Data Structuresand loops.

UNIT - II

Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python. Principal component analysis (PCA).
Data Visualization: Various charts, histograms, plots.

UNIT - III

Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression,Lasso regression, non-parameter regression.

Classification: Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes, SupportVector Machines (SVM).

UNIT - IV

Unsupervised Learning: Clustering, types of clustering, K-Means clustering, Hierarchical clustering.

Text Analysis: Basic text analysis with Python, regular expressions, NLP, text classification.

Time Series Analysis: Date and time handling, window functions, correlation, time series forecasting

UNIT - V

Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework.

Recommender System: Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018.
2. Tom Mitchel "Machine Learning", Tata McGraw Hill, 2017.

Suggested Reading:

1. Marsland, S. "Machine Learning: An Algorithmic Perspective" 1st Edition, Chapman and Hall/CRC,2009. https://doi.org/10.1201/9781420067194
2. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017.

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/

20AD O01

INTRODUCTION TO PYTHON PROGRAMMING

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To introduce the python programming environment.
2. To impart knowledge basics data types and operation.
3. To familiarize with function, tuple, dictionary to process the data.
4. To introduce various packages in python
5. To familiarize class, object, exception handling and working with files.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explore data operations on list, tuple and dictionary in python.
2. Understand deployment of models on different datasets.
3. Apply supervised, unsupervised, resembling and NLP models on different datasets.
4. Perform data analysis using python packages.
5. Build and evaluate the models using python programming.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	-	-	-
CO2	2	1	2	1	2	-	-	-	-	-	1	-	-	-	-
CO3	2	1	2	2	1	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
CO5	2	1	1	1	1	-	-	-	-	-	-	1	-	-	-
Average	2	1.4	1.8	1.2	1.2	-	-	-	1	1	1	1	-	-	-

UNIT-I:

Introduction: Historical introduction to python, Installing Python, python interpreter and its environment: Argument passing and interactive mode, source encoding; Informal introduction to python: Python as calculator: Numbers, Strings, Lists, Programming steps.

UNIT - II

Control Statements and functions: control flow tools: if statement**,** for statements, range function, break and continue statements, else clauses on loops, pass and match statements; Defining function: default and keywords argument values, special parameters: positional-or-keywords arguments, positional parameters, keywords arguments, function examples, Arbitrary and Unpacking argument lists, lambda expression, documentation strings, function annotations, coding style, Input and output, reading and writing files.

UNIT - III

Data structures and Modules: More on lists: Lists as stack and queues, list comprehensions, nested list comprehensions, del statement, Tuples and sequences, sets and operations, Dictionaries, looping and conditional statements on dictionary; Modules: Executing modules as scripts, module search path, compiled python files, standards modules, dir() function, packages: Importing * from packages, intra packages references, packages in multiple directories, error and exception handling.

UNIT - IV

Design with Classes: Classes and Objects, python scopes and namespaces, class defining syntax: class objects, instances, method objects, instances variables, Inheritance, private variables, odds and ends, Iterators, generators and their expressions, standards library: OS interfaces and string pattern matching, virtual environment and packages, pip, floating point arithmetics: issue and limitations, error representation.

UNIT - V

Graphical User Interfaces: GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons. Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional Shapes, Colors and RBG System, Image Processing, GUI case studies.

Text Book:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. 2. Think Python First Edition, by Allen B. Downey, O'reilly publishing

Suggested Reading:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3,The Pragmatic Bookshelf, 2nd edition (4 Oct. 2013)

Web Resources:

1. https://python.org/tutorial/
2. Joy of computing Nptel course by prof. SudersanIyengar, IIT Roper
3. https://www.udemy.com/course/python-programming-beginner-to-advanced/

20IT O02

PRINCIPLES OF INTERNET OF THINGS

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives:

1. To provide an overview of Internet of Things, building blocks of IoT and real-world applications.
2. To explore various IOT enabling technologies.
3. To facilitate students, understand Python scripts for IoT platform.
4. To identify steps in IOT design Methodology.
5. To introduce about the Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes:

Upon completing this course, students will be able to:

1. Comprehend the terminology, protocols and communication models of IoT.
2. Define the various IoT enabling technologies and differentiate between M2M and IoT.
3. Acquire the basics of Python Scripting Language used in developing IoT applications.
4. Describe the steps involved in IoT system design methodology.
5. Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	2	1	1	1	-	1	-	-	-	-	1	-	-	-
2	1	2	2	1	-	2	1	-	-	1	-	-	-	-	-
3	2	2	2	2	1	2	2	1	1	1	1	1	-	-	-
4	2	1	2	2	1	-	2	1	-	1	2	2	-	-	-
5	1	2	2	1	-	2	1	-	1	1	-	-	-	-	-
Average	**1.4**	**1.8**	**1.8**	**1.4**	**0.6**	**1.2**	**1.4**	**0.4**	**0.4**	**0.8**	**0.6**	**0.8**	**-**	**-**	**-**

UNIT-I

Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IOT-Physical Layer, Network Layer, Transport Layer, Application Layer, Things in IoT, IoT Protocols, Logical Design of IOT-Nonfunctional Blocks, IoT Communication Models-Requestreponse,Publisher-Subscriber, Push-Pull, Exclusive Pair, IoT Communication APIs-REST API, Websocket API,

UNIT-II

IOT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates. Differences and similarities between IOT and M2M, Domain Specific IoT's – IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT-III

Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flowif, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling,

UNIT-IV

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT-V

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi about the Raspberry Pi board, Raspberry Pi interfaces-Serial, SPI, I2C, Other IoT Devices pcDuino, BeagleBone Black, Cubieboard. Python Web Application Framework: Django Framework-Roles of Model, Template andView

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach, Universities Press, 2015.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

Suggested Reading:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From
2. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
3. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, Willy Publications.

Web Resources:

1. The Internet of Things - Articlehttps://dl.acm.org/citation.cfm?id=1862541
2. Internet of Things - Tutorial

http://archive.eurescom.eu/~pub/abouteurescoiem/message_2009_02/Eurescom_message_02_2009.pdf

20CE C29

CONCRETE TECHNOLOGY LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50
Marks	
Credits	1

Course outcomes: At the end of the course, the student will be able to

1) Determine the properties of given cement sample and assess its suitability for use in construction.
2) Determine the properties of fine and coarse aggregate samples to assess their suitability for use in construction works.
3) Measure the workability of concrete and recommend its suitability for structural works.
4) Design a suitable concrete mix proportion as per the code provisions for the specified grade.
5) Conduct destructive and non-destructive tests to evaluate the quality and strength of concrete.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	-	-	-	1	-	-	1	1	-	1	1	-	-
2	2	1	-	-	-	1	-	-	1	1	-	1	1	-	-
3	2	1	-	-	-	1	-	-	1	1	-	1	1	-	-
4	2	1	-	-	-	1	-	-	1	1	-	1	1	-	-
5	1	1	-	-	-	1	-	-	1	1	-	1	1	-	-
Average	**1.8**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**-**

List of Experiments:

1) Determination of the specific gravity of the given cement sample
2) Determination of the standard consistency of the given cement sample
3) Determination of the initial setting time of the given cement sample
4) Determination of the bulking of Fine Aggregate
5) Determination of the bulk density, void ratio, porosity and specific gravity of given Fine and coarse Aggregate
6) Determination of the fineness modulus of Fine Aggregate & Coarse Aggregate
7) Determination of the slump & compaction factor of concrete mix
8) Determination of the compressive strength of concrete cubes and splittensile strength of concrete cylinders
9) Mix design as per IS:10262-2019
10) Demonstration of Non-destructive testing of concrete specimen

Reference books:

1. M.S.Shetty,"ConcreteTechnology-Theory&Practice",S.Chand&CompanyPublishers.
2. IS10262:2019, "IndianStandardConcreteMixProportioning–Guidelines".

20CE C30

COMPUTER APPLICATIONS LAB

Instruction	2P Hours per week	
Duration of semester End Examination	3 Hours	
Semester end examination	50 Marks	
Continuous Internal Evaluation		50 Marks
Credits	1	

Course Outcomes: At the end of the course the students will be able to

1) Develop a model of framed structure and analyze using STAAD – Pro.
2) Design the components of a framed structure including isolated footings using STAAD-Pro and STAAD Foundation.
3) Evaluate stability of slope using Slip Circle method and design a cantilever retaining wall using GEO5
4) Analyze pipe networks using EPANET and sewer networks using SEWER Gems.
5) Develop geo-referenced thematic maps and carry out overlay analysis using Arc GIS/QGIS

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	3	1	-	-	-	-	-	1	3	1	-
2	3	3	3	3	3	1	-	-	-	-	-	1	3	1	-
3	3	3	3	3	3	1	-	-	-	-	-	1	3	1	-
4	3	3	3	3	3	1	-	-	-	-	-	1	3	1	-
5	3	3	3	3	3	1	-	-	-	-	-	1	3	1	-
Average	**3**	**3**	**3**	**3**	**3**	**1**						**1**	**3**	**1**	

List of Exercises:

1) Modeling and analysis of plane frames using STAAD-Pro.
2) Modeling and analysis of space frames using STAAD-Pro
3) Design structural components of a RC building using STAAD-Pro.
4) Design of isolated footing using STAAD Foundation.
5) Analysis of a slope for stability by Slip Circle method using GEO5 (Slope Stability module)
6) Design of cantilever retaining wall using GEO5 (Cantilever Wall module)
7) Steady state analysis of pipe networks (open/looped) using EPANET.

References:

1) STAAD Pro V8i (SELECT Series 4) manual on staad exercise, July, 2019
2) EPANET 2 Users Manual Paperback – Import, 30 January 2013 by U S Environmental Protection Agency (Creator)
3) Instructional Guide for The AreGIS Book 1st Edition, Kindle Edition by Kathryn Keranen (Author), Lyn Malone (Author), Esri Press: 1 Edition (June 21, 2016)
4) Design of Sewer Network using Sewer GEMS Software Paperback – September 17, 2018 by Hinal Sopariya (Author)
5) https://www.finesoftware.eu/engineering.manuals/for GEO5 exercises

20EG MO4

GENDER SENSITIZATION

Instruction	2L Hours per week	
Duration of SEE Examination	2 Hours	
SEE Examination	50 Marks	
Continuous Internal Evaluation		0 Marks
Credits	0	

Course Objectives

This course will introduce the students to:

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes

After successful completion of the course the students will be able to:

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyse the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I

Understanding Gender:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)
Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste .Different Masculinities.

UNIT – II

Gender And Biology:

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10)
Two or Many? Struggles with Discrimination.

UNIT – III

Gender and about:

Housework: the Invisible Labour (Towards a World of Equals: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues Of Violence

Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (Towards a World of Equals: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V

Gender: Co - Existence

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

Textbook:

1. A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook onGender" published by Telugu Akademi, Hyderabad,Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. AbdulaliSohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

20CE C31

TECHNICAL SEMINAR

Instruction	2L Hours per week
Continuous Internal Evaluation	50 Marks
Credits	1

The objective of a seminar is to instil into the students the ability to critical reading, understanding, summarizing, explaining and preparing a state- of- the art report on the topic chosen, in the domain of Civil Engineering, after due consultation with their respective project guides.

Course Outcomes: At the end of the course, the students will be able to

1) Identify their domain interest through critical review of literature.
2) Develop the technical skill in preparing a well-structured report on the chosen topic.
3) Develop the skill of presenting a structured seminar using Power Point presentation tools.
4) Improve communication skills.
5) Defend one's presentation by interactions with the participants.

COs	**PO's**												**PSO's**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	-	1	1	-	-	1	1	2	-	1	3	1	1
2	2	1	2	1	2	1	2	1	1	3	-	1	1	1	1
3	1	1	-	-	1	-	-	-	1	3	-	1	1	1	1
4	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
5	-	-	-	-	-	-	-	-	2	3	-	1	-	-	-
Average	**1.33**	**1.66**	**2**	**1**	**1.33**	**1**	**2**	**1**	**1.2**	**2.8**		**1**	**1.66**	**1**	**1**

The seminar must be clearly structured and the power point presentation shall include following aspects:

1) Introduction to the field of choice.
2) Literature review and critical appraisal.
3) Consolidation and summarization of available information.
4) Conclusions.
5) References

Each student is required to:

1) Submit a one page synopsis on the seminar topic.
2) Make Power Point presentation on the chosen topic for 20 minutes duration, followed by 10 minutes of interaction with participants during Question and Answers session.
3) Submit a spiral bound copy of detailed report on the seminar topic in the format as prescribed by the department.

For the award of CIE marks, students are judged by a committee of three (3) faculty members based on oral and written presentations as well as their interactions during Question-Answer session.

Guidelines for awarding marks		
Sl. No.	**Description**	**Maximum Marks**
1	Contemporary relevance of topic and Content.	10
2	Preparation of PPT slides	05
3	Presentation skills	10
4	Preparation of PPT slides	05
5	Report preparation in a prescribed format	20

Note: Material for the seminar, on the chosen topic, shall be prepared preferably from the recently published peer reviewed journal papers.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE Model Curriculum with effect from AY 2023-24

B.E (Civil Engineering)

SEMESTER: VIII

Sl No	Course code	Title of the Course	Scheme of instruction Hours per week			Scheme of Examination			Credits
			L	P	T	Duration of SEE in hours	Max marks CIE	Max marks SEE	
1	-	Professional Elective - 6	3	-	-	3	40	60	3
2	20CE C32	Technical Seminar	-	-	2	-	50	-	1
3	20CE C33	Project Part 2	4-6 weeks of industry Internship (180 hours)/ 12 hours			Viva-voce Exam	100	100	4
4	20CE C34	Practical Skills in Civil Engineering		2		3	50	50	1
		Total	3	14	2		240	210	9
		Clock Hours per week: 19							

L: Lecture **T: Tutorial** **P: Practical/Drawing/Seminar/Project**

CIE: Continuous Internal Evaluation **SEE: Semester End Examination**

Professional Electives - 6

20CE E21	Pavement management system
20CE E22	Repair and rehabilitation of Structures
20CE E23	Water shed management
20CE E24	Ground Improvement Techniques

20CE E21

PAVEMENT MANAGEMENT SYSTEM

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40
Marks	
Credits	3

Course Outcomes: at the end of the course, student will be able to

1) Differentiate among types of data required for project management system development.
2) Identify the root cause of different pavement distresses and suggest suitable remedial measures for various distresses to improve the pavement surface condition.
3) Interpret the field evaluation data and pavement design data with respect to present and future traffic condition.
4) Analyse and design of pavements based on structural response models and choose optimum design by applying economic evaluation.
5) Optimize the maintenance alternatives based on the benefit and cost ratio of the project alternative and provide the feedback data for updating the pavement performance monitoring system.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1.	1	-	1	-	-	-	-	-	-	-	-	-	1	-	-
2.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	1	-	1	1	1	-	-	-	-	-	-	-	1	1	1
4.	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-
5.	1	1	1	1	-	-	-	-	-	-	2	-	1	-	-
Average	**1**	**1**	**1**	**1**	**1**						**2**		**1**	**1**	**1**

UNIT I:

Introduction: Background, project and network level management, pavement management process. Inventory survey; route number, route type, condition, pavement roughness-surface distress- rutting-skid resistance and structural capacity, traffic, and costs.

UNIT II:

Pavement Management Process & Data Requirements: Application of system concepts to pavement management - Data needs, assessment of pavement performance, evaluation of pavement structural capacity, safety, combined measures of pavement quality, and data management.

UNIT III:

Determining Present and Future Needs: Establishing criteria – development of models for pavement deterioration – determining the future needs – rehabilitation and maintenance strategies – developing combined programmes for maintenance and rehabilitation

UNIT IV:

Project Level Design: Framework for pavement design, characterization of physical design inputs, basic structural response models – variability, reliability and risk – generating alternative design strategies – pavement analysis and design of Asphalt Concrete (AC) and Premix Carpet (PC), - rehabilitation design procedures – economic evaluation of alternate pavement design strategies – selection of optimal design strategy.

UNIT V:

Implementation: Major steps in implementing PMS – pavement construction management and pavement maintenance management – information, research needs – cost and benefit of pavement management – future directions and need for innovations in pavement management.

Text books:

1) R Srinivasa Kumar "Pavement Evaluation & Maintenance Management System", Universities Press (India) Private Ltd., 2014.
2) Haas and Hudson, W. R. "Pavement management systems", McGraw Hill publications.
3) Haas R. C. G., W. Ronald Hudson, John P. Zaniewski, "Modern Pavement Management", Krieger Publishing Company, 1994

Suggested Reading:

1) Shahin, M Y, "Pavement management for airport, roads and parking lots", Chapman and hall, 1994

20CE E22

REPAIRS AND REHABILITATION OF STRUCTURES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60Marks
Continuous Internal Evaluation	40Marks
Credits	3

Course Out comes: At the end of the course the graduate should be able to

1) Interpret SHM as a way of monitoring the health of a structure using smart materials
2) Selectandimplementanappropriatevibrationbasedtechniqueforhealthmonitoringofastructure
3) Select and implement an appropriate capacitive sensing technique
4) Perform condition assessment survey of damaged/existing buildings and to identify possible defects in a concrete structure and suggest necessary repairs
5) Implement various health monitoring techniques for different types of structures for different situations

COs	**POs**												**PSOs**			
1	1	2	1	1	2	2	2	-	2	2	2	1	1	2	1	2
2	1	2	2	1	2	2	2	-	2	2	2	1	1	2	1	2
3	1	2	2	1	2	2	2	-	2	2	2	1	1	2	1	2
4	1	2	2	1	2	2	2	-	2	2	2	1	1	2	1	2
5	1	2	1	1	2	2	2	-	2	2	2	1	1	2	1	2
Average	**1**	**2**	**1.6**	**1**	**2**	**2**	**2**	**-**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**2**

UNIT–I

Maintenance: Definition for Repair and rehabilitation - Facets of maintenance - Importance of maintenance ,Types of Maintenance ,various aspects of inspection – Assessment procedure for evaluating damaged structure -Causes of distress in concrete structures – Construction and design failures – Introduction to structural audit

UNIT -II

Serviceability and durability of concrete: Quality assurance for concrete construction - Concrete properties – Strength - Permeability – Thermal properties and cracking. – Effects due to climate - Temperature - Chemicals - Corrosion – Design and construction errors – Effects of cover thickness and cracking

UNIT–III

Repair materials: Materials and techniques for repair: Special concretes and mortar - Concrete chemicals - Special elements for accelerated strength gain - Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete - Bacterial concrete – Rust eliminators and polymers coating for rebars during repair – Foamed concrete - Mortar and dry pack – Vacuum concrete - Gunite and shotcrete - Epoxy injection - Mortar repair for cracks - Shoring and underpinning -Methods of corrosion protection - Corrosion inhibitors – Corrosion resistant steels - Coating and cathodic protection.

UNIT–IV:

Corrosion of embedded steel in concrete: Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns) Local and Global retrofitting, Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, FRP jacketing. Strengthening Techniques, Beam shear strengthening, Flexural strengthening

UNIT –V

Structural Health: Introduction to Structural health Monitoring, Definition and objective of condition survey, stages of conditions survey–planning, inspections and testing stages, possible defects in concrete structures, qualitycontrolofconcretestructures,NDTtechniques-reboundhammer,infra-redthermography,groundpenetrationtechnique,ultra-sonicpulsevelocitytestandWindsorprobe test, half cell potential test etc,

Text Books:

1) Daniel Balageas and Claus – Peter Fritzen, "*Structural Health Monitoring*", published by ISTELtd.,U.K.2006.
2) V.M. Malhotra, "*InSitu/ Non-destructive Testing of Concrete (Publication, Sp-82)",* published by Amer Concrete Inst 1984.

Suggested Reading:

1) Hua-PengChen,"*StructuralHealthmonitoringoflargeengineeringstructures*",publishedbyWiley-Blackwell,2018.
2) "*Guide book on Non-destructive testing of concrete structures*", training course, series no.17, International Atomic Agency, Vienna2002.
3) Jean Paul Balayssac and Vincent Garnier, "*Non-Destructive evaluation and evaluation of civil engineering structures",* Published by ISTEPress–Elsevier,2017.

20CE E23

WATERSHED MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course outcomes: At the end of the course, the student will be able to

1) Analyze watershed characteristics to take appropriate management action.
2) Identify areas and estimate soil erosion
3) Design rain water harvesting structures
4) Plan watershed management with community participation
5) Apply Principle of integrated Watershed Management and manage Ecosystem.

CO	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1.	3	1	1	-	-	2	1	-	-	-	-	1	-	-	3
2.	3	1	1	-	-	1	1	-	-	-	-	1	-	-	3
3.	3	1	1	-	-	-	1	-	-	-	-	1	-	-	3
4.	3	1	1	-	-	2	1	-	-	-	-	1	-	-	3
5.	3	1	1	-	-	-	1	-	-	-	-	1	-	-	3
Average	**3**	**1**	**1**	**-**	**-**	**1.67**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**

UNIT – I:

Definition and concept of Watershed: Concept of watershed development, History of Watershed management and its relevance to India, objectives of watershed development, different stake holders & their relative importance, need for watershed development in India, selection of watershed, watershed policy issues, Integrated and multidisciplinary approach for watershed management.

UNIT – II:

Characteristics of Watershed: Size, shape, physiographic, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socioeconomic characteristics, Morphometric parameters-linear, areal and relief aspects, Prioritization of watersheds.

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion.

Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion, Hedge barrier, Mixed cropping, Strip cropping, Mulching.

UNIT – III:

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures and Design of harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Roof top water harvesting.

Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

UNIT – IV:

Social Aspects of Watershed Management: Planning of Watershed management activities, community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies.

UNIT – V:

Integrated Watershed Management: Introduction to integrated approach, Integrated water resources management, conjunctive use of water.

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, horticulture, social forestry and afforestation.

Text Books:

1) Murthy, J.V.S.,"*Watershed Management*", New Age International (P), Ltd., New Delhi,1988.
2) Majumdar, D.K., "*Irrigation and Water Management*", Prentice Hall, New Delhi, 2000.

Suggested Reading:

1) Mohan Das, M. and Das Saikia, "*Watershed Management*." PHI Learning (P)., Ltd., New Delhi, 2013.
2) Goswami, M.D.,"*Water shed Management: Theory and Practices*." Ritwik and Gargee (P)., Guwahati, Assam, 2004.
3) Haan, C.T., Johnson, C.T., AND Brakensiek, D.L,. *"Hydrologic Modeling of Small Watersheds*." ASAE, Michigan, 1982.
4) SrinivasaRaju K. and Nagesh Kumar D,"*Multicriterion Analysis in Engineering and Management*", Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi, 2014.

20CE E24

GROUND IMPROVEMENT TECHNIQUES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40
Marks	
Credits	3

Course Outcomes: At the end of the course, the student will be able to

1) Review the importance of ground improvement techniques and types, for different soils.
2) Apply suitable chemical stabilization and grouting techniques to address the field problems.
3) Modify the cohesion less soil properties to required degree by using suitable vibration techniques.
4) Identify suitable ground improvement techniques for cohesive soils in a specific project.
5) Explain different advanced stabilizing techniques for slopes.

COs	POs													PSOs	
	1	**2**	**3**	**4**	5	6	7	8	9	10	11	12	1	2	3
1	3	1	-	-	-	-	-	-	-	-	-	-	3	1	-
2	3	1	-	-	-	-	-	-	-	-	-	-	3	1	-
3	3	1	-	-	-	-	-	-	-	-	-	-	3	1	-
4	3	1	-	-	-	-	-	-	-	-	-	-	3	1	-
5	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Average	3	1	-	-	-	-	-	-	-	-	-	-	3	1	-

UNIT- I:

Introduction: Need for ground improvement, applications, and factors affecting – different mechanical, chemical, static and dynamic techniques – mechanical stabilization – blending of aggregate – Rothfutch Testing. Concept of Soil confinement, Gabion Walls, Crib Walls and Sand Bags.

UNIT – II:

Chemical stabilization: Lime, Cement, Bitumen, Emulsions, Chemicals, factors influencing–Design approach, construction procedure, laboratory testing, additives. Suspension and solution grouts, Principles, method, equipment, applications, compaction grouting, jet grouting, field compaction control.

UNIT – III:

Stabilization of Cohesion less soils: In Situ densification, Vibro techniques– Mechanisms. Factors affecting, suitability number, compacting piles.Vibro replacement process, Vibro flotation process, Terra Probe Method, Dynamic Compaction.

UNIT- IV:

Stabilization of Cohesive soils: In Situ densification, Pre-loading–Dewatering– sand drains. Sand wicks, geo-drains, rope-drains, band-drains, stone columns, and lime piles, thermal and vacuum methods.

UNIT – V:

Ground treatment for Slopes: Different types of in-situ soil stabilization like soil nailing, anchoring, pre-stressed anchoring - construction techniques.

Geo-textiles: Woven and non-woven fabrics. Types, functions and applications– Geo-textiles, geo-grids, tests on geo-textiles, Reinforced earth – Principles and factors governing design.

Text Books:

1) P. Purushothama Raj, "Ground Improvement Techniques", Laxmi publications 2016.
2) K.R Arora, "Soil Mechanics and Foundation Engineering", 5th Edition, Standard Publishers, 2005.

Suggested Reading:

1) Nihar Ranjan Patra, "Ground Improvement Techniques", Vikas publishing house Pvt. Ltd, 2012.
2) R. Hausmann., "Engineering Principles of Ground Modification", McGraw Hill Publishing Co.,2013.
3) H. Fang," Foundation Engineering Hand Book", 2nd Edition, CBS Publication, New Delhi, 2004.
4) G. V. Rao and G. V. S. S. Raju, "Engineering with Geosynthetics", McGraw Hill Education, 1998
5) IRC-SP 58 (2001): "Guidelines for use of fly ash in road embankments".

20CE C32

TECHNICAL SEMINAR

Instruction	2P Hours per week	
Continuous Internal Evaluation		50
Marks		
Credits	1	

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

Course Outcomes:

At the end of the course, the students will be able to

1. Identify their domain interest through critical review of literature.
2. Develop the technical skill in preparing a well-structured report on the chosen topic of Civil Engineering by following ethical practices.
3. Develop the skill of presenting a structured seminar using Power Point presentation tools.
4. Improve communication skills.
5. Defend one's presentation by healthy interactions with the participants.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one-page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks, students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Maximum Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

20CE C33

PROJECT PART 2

Instruction	12P Hours per week	
Semester End Examination	100 Marks	
Continuous Internal Evaluation		100
Marks		
Credits	4	

Course Outcomes

At the end of the course, the students will be able to

1. Examine the chosen problem with a deeper insight and identify a path to problem solving while developing the skill of coordinating with the team.
2. Develop and demonstrate problem solving skills through detailed Analysis/ Modeling/ Simulation/ Experimental works.
3. Evaluate the results based on deeper studies and draw conclusions along with scope for further studies to facilitate continuous learning.
4. Develop the art of technical report writing by following ethical practices.
5. Defend the work through a well-structured presentation.

The object of 'Project Part 2' is to enable the student extend further the investigative study taken up either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a supervisor from the department alone or jointly with a supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the students in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned.
2. Review and finalization of the approach to the problem relating to the assigned topic.
3. Preparing an action plan for conducting the investigation, including team work.
4. Detailed analysis/ Modelling/ Simulation/ Design/ Problem Solving/ Experiment as needed.
5. Final development of product/ process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible.
7. Preparing a dissertation in the standard format for being evaluated by the department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in Continuous Internal Evaluation: (Max Marks: 100)

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
	10	Review 1
	15	Review 2

Department Review Committee	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical/ Programming/ Experimental Skills

Guidelines for the award of marks in Semester End Examination : (Max Marks: 100)

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project Innovations Applications Live Research Projects Scope for future study Application to society
	20	Viva-Voce

20CE C34

PRACTICAL SKILLS IN CIVIL ENGINEERING

Instruction	2P Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50
Marks	
Credits	1

Course Outcomes: At the end of the course, the student will

1. get the ability to carry out land survey and quantity survey for various structures.
2. be able to read and interpret drawings of various structures.
3. be able to handle and manage various on site civil engineering activities.
4. acquire ability to study and interpret R.C structural drawings and also be able to assess the structural health.
5. acquire ability to study and interpret R.C structural drawings and also be able to assess the structural health.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	-	2	1	1	1	-	1	1	2	1	3	2	2
2	2	1	-	2	1	1	1	-	1	1	2	1	3	2	2
3	2	1	-	2	1	1	1	-	1	1	2	1	3	2	2
4	2	1	-	2	1	1	1	-	1	1	2	1	3	2	2
5	2	1	-	2	1	1	1	-	1	1	2	1	3	2	2
Average	**2**	**1**	**-**	**2**	**1**	**1**	**1**	**-**	**1**	**1**	**2**	**1**	**3**	**2**	**2**

UNIT -I:

Surveying: Preparation of Topo sheets - Identifying & locating strategic points on topo sheets - Hydrographic surveying - Quantity surveying for buildings, roads and earth work.

UNIT-II:

Drawing and detailing of Civil Engineering structures: Reading and interpretation of drawings pertaining to buildings, bridges and irrigation structures.

UNIT-III:

Building construction practices: Marking on site as per plans, Quality control checks - Related field tests - Planning and erection of form work - Execution /Construction planning M-book entries.

UNIT-IV:

Concrete Structures: Reading and interpretation of professional drawings of concrete structures (buildings, bridges, water tanks) - Detailing aspects - Detailed study of a distressed structure - NDT - Visit to a structure which is under retrofitting stage - Visit to a prefabricated structure.

UNIT V:

Steel Structures: Reading and interpretation of fabrication drawings and structural drawings of an industrial structure /any other steel structure. Detailed study of marking and execution of steel structure / industrial structure - Detailing of steel structures - Visit to an Industrial / Steel Structure.

Text Books:

1) Practical Civil Engineering by P.K. Jaya Sree, K Balan and V Rani, CRC Press (Taylor & Francis Group) 2021.

Suggested Reading:

1. Practical Civil Engineering, Hand Book by Rahul Nitin Gupta,

OPEN ELECTIVES

(Offered by Civil Engg. Dept. to the other Departments)

Sl. No.	Code	Subject Name	Semester
1	20CE O01	Infrastructure for Smart Cities	Even Semester
2	20CE O02	Disaster Risk Reduction and Management	Odd Semester
3	20CE O03	Rural Water Supply and Onsite Sanitation System	Odd Semester

20CE O 01

INFRASTRUCTURE FOR SMART CITIES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40
Marks	
Credits	3

Course Outcomes: At the end of the course, Student will be able to

1.Understand the necessity of infrastructural development for smart cities.
2.Identify components of infrastructure and Prepare infrastructure plan for smart city.
3.Understand smart transport system for smart cities and its application
4.Study of water resources systems for smart city and its application.
5.Understand National and Global policies to implement for smart city development.

UNIT I

Fundamental of smart city & Infrastructure: 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

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

Intelligent transport systems: Smart vehicles and fuels, GIS, GPS, Navigation system, traffic safety management, mobility services, E-ticketing

UNIT IV

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

UNIT V

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.

Text Books :

1) John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); “Remaking the city: Social science perspective on urban design”; State University of New York Press, Albany (ISBN: 0-87395-678-8)
2) Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
3) Smart City on Future Life - Scientific Planning and Construction by Xianyi Li
4) The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by NicosKomninos 3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony

Townsend
5) Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988 5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997

References:

1) Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
2) Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf
3) "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_-3.12.2014__REVISED_AND_LATEST_.pdf)

20CE O02

DISASTER RISK REDUCTION AND MANAGEMENT

Instruction	3 Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes: Upon completion of this course, the student will be able to,

1. Identify and understand the concepts of hazards, causes and impacts of disasters.
2. Develop a critical capacity to evaluate the principles and practices of disaster risk reduction and management;
3. Develop a deep awareness of disaster resilience, risk mitigation, and recovery policies as they arise from natural hazards around the globe;
4. Apply knowledge about existing global frame work sand existing agreements and role of community in successful Disaster Risk Reduction
5. Evaluate DM study including data search, analysis and presentation as a case study.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	1	2	2	2	2	1	2	2	2	1	1	1	1
2	1	1	2	2	2	3	3	1	2	1	1	1	1	1	-
3	2	2	2	2	2	2	3	2	1	1	2	1	1	-	-
4	2	2	2	2	3	2	1	1	1	1	1	1	-	-	-
5	2	1	2	1	2	3	1	2	2	2	2	1	1	1	1
Average	**1.8**	**1.4**	**1.8**	**1.8**	**2.2**	**2.4**	**2**	**1.4**	**1.6**	**1.4**	**1.6**	**1**	**1**	**1**	**1**

UNIT 1

Fundamental concepts in disaster management: Hazard and disaster-concepts, vulnerability and risk, Hazard and disaster type – Natural, Water- related, pandemic and Human induced hazards disasters. Causes and Impacts of disasters – Impacts on natural eco systems: physical, psychological and social impact. Disaster and financial resilience. GIS and remote sensing. Disaster vulnerability profile of India –Specific to geographical regions and states (as per regional significance)

UNIT 2

Disaster Management Cycle: Rescue, Relief ,Rehabilitation, Prevention ,Mitigation and Preparedness. Disaster risk reduction {DRR). Community based DRR, institutions concerned with safety, disaster mitigation and construction techniques as per Indian standards and Early warning systems

UNIT 3

Disaster Impacts Management: Trauma and stress management, First aid and emergency procedures
Awareness generation strategies for the community on safe practises in disaster (as per regional significance)

UNIT 4

Institutional framework of disaster management in India: NDMA-SDMA, NDRF, civic volunteers, and NIDM. Phases of disaster/risk management and post-disaster responses. Compensation and insurance Applications of remote sensing & GIS in disaster management**.**Components of disaster management.Preparedness of rescue and relief, mitigation, rehabilitation & reconstruction. Institutional frame work of disaster management in India

UNIT 5

Capacity building for disaster/damage mitigation: Structural and Non structural measures forcapacity building for disaster/damage mitigation. Disaster risk reduction strategies and national disaster management guidelines.Disaster management Act -2005. Regional issues as per regional requirement/university can take minimum two topics as per high powered committee

Text Books:

1. Singh, R. (2017), "Disaster management Guidelines for Earth quakes, Landslides, Avalanches and Tsunami". Horizon Press publications.
2. Taimpo (2016), "Disaster management and preparedness". CRC Press Publications

Suggested Reading:

1. Nidhi, G.D. (2014), "Disaster management preparedness" .CBS Publications Pvt. Ltd.

2. Gupta, A.K.,Nair, S.S., Shiraz, A. and Dey, S. (2013), "Flood Disaster Risk Management-CBS Publications Pvt Ltd

3. Singh, R. (2016), "Disaster management Guidelines for Natural Disasters" Oxford University Press Pvt. Ltd.

20CE O03

RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Outcomes: At the end of the course the student will be able to

1) Identify the problems related to rural water supply and sanitation.
2) Develop different stages of water treatment and sanitation system forrural community.
3) Plan wastewater collection system in rural areas and identify compact wastewater treatment units.
4) Develop occupation related onsite sanitation and hygiene system and identify occupational hazards.
5) Design an effluent disposal mechanism; develop solid waste management system in rural areas.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	1	-	-	-	2	2	-	-	-	-	1	1	-	2
2	1	-	2	-	-	1	1	1	-	-	-	-	1	2	-
3	1	-	2	-	-	1	1	1	-	-	-	-	1	2	-
4	-	-	-	-	-	1	2	-	-	-	-	1	1	-	2
5	-	-	2	-	-	-	-	1	-	-	-	1	1	-	1
Average	**1**	**1**	**2**			**1.25**	**1.2**	**1**				**1**	**1**	**2**	**1.66**

UNIT- I:

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies, Relationships between diseases and water quality, hygiene and sanitation.

UNIT- II:

Water Treatment: Need for water treatment, point of use water treatment systems, filters, bio-sand filters, disinfection systems for rural areas, chlorination, solar disinfection systems, removal of arsenic, fluoride and iron, hygiene and sanitation; Low-Cost treatment: Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

UNIT- III:

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas.

UNIT- IV:

Onsite sanitation system: Nexus between water quality and sanitation. Importance of hydrogeology on selection of onsite sanitation systems, Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings, Hospitals- Industrial plant sanitation.

UNIT- V:

Septic tanks: Design of septic tanks, single pit and double pit toilets. small bore systems, bio digesters, constructed wetlands, sludge/seepage management systems, solid waste management: Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Text Books:

1) Gupta, S. "Rural Water Supply and Sanitation", 1st Edition, Vayu Education of India, New Delhi, 2014.
2) Ahluwalia, P. and Nema, A. K., "*Water and Wastewater Systems: Source, Treatment, Conveyance and Disposal"*, S. K. Kataria& Sons, 2014.
3) F. B. Wright, "*Rural Water Supply and Sanitation*", 3rd Revised edition, Krieger Publishing Company USA, 1977
4) V. M. Eulers and E. W. Steel, "*Municipal and Rural Sanitation*", 6th Ed., McGraw Hill Book Company, 1965.

Suggested Reading:

1) A handbook on "*Technological Options for On-site sanitation in rural areas",* Ministry of Drinking water & Sanitation, Govt. of India, New Delhi, June 2016.
2) Guidelines *"Research & Development for Rural Water Supply & Sanitation Sector"*, Ministry of Rural Development, Govt. of India, New Delhi, 2003.
3) P. Juti, S. K.Tapio, and H. Vuorinen, "*Environmental History of Water: Global Views on Community Water Supply and Sanitati*on", IWA Publishing (Intl Water Assoc), 2007.
4) A Guide to the Development of on-Site Sanitation, WHO, 1992.

20CE M01

ENVIRONMENTAL SCIENCE

Instruction	2L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
Continuous Internal Evaluation	0 Marks
Credits	0

Course Outcomes: At the end of the course, student is able to

1) Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.
2) Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3) Contribute for the conservation of bio-diversity.
4) Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5) Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	-	-	-	-	-	3	-	-	-	-	1	1	-	-
2	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
3	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
4	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
5	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
Average	1	-	-	-	-	1	2.2	1	-	-	-	1	1	-	-

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1) Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2) Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1) C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2) S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006

VALUE ADDED COURSE: -

Analysis and Design of Buildings (offering as finishing school)