R 18 Curriculum (VII & VIII Semesters)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Model Curriculum (with effect from 2021-2022)

B.E (CIVIL ENGINEERING)

SEMESTER – VII

S. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	18CE C24	Construction Engineering and Management	3	-	-	3	30	70	3
2	18CE C25	Hydrology and Water Resources Engineering	3	-	-	3	30	70	3
3	18CE C26	Estimation, Specifications and Costing	3	-	-	3	30	70	3
4		Core Elective 5	3	-	-	3	30	70	3
5		Open Elective 2	3	-	-	3	30	70	3
	PRACTICALS								
6	18CE C27	Concrete Technology Lab	-	-	3	3	25	50	1.5
7	18CE C28	Computer Applications Lab	-	-	3	3	25	50	1.5
8	18CE C29	Project Part 1	-	-	4				2
		Total	**15**	**-**	**10**		**200**	**450**	**20**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Core Elective 5:

1. 18CE E18 - Design of Steel Structures-II
2. 18CE E19 - Airport Engineering
3. 18CE E20 - River Engineering
4. 18CE E21 - Water and Air Quality Modeling
5. 18CE E22 -Applications of Data Analytics in Civil Engineering

Open Elective 2:

1. 18ME O07 – Intellectual Property Rights

2. 18EG O02 – Gender Sensitization
3. 18CS O01 – Basics of Artificial Intelligence
4. 18EE O04 – Energy Conservation

18CE C24

CONSTRUCTION ENGINEERING AND MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students

1. Understand different types of construction, execution methods and basics of construction project management.
2. Develop knowledge in respect of project planning and application of different techniques for project planning and control.
3. Analyse the projects in respect of time and cost to result in resource optimization.
4. Understand the various construction safety measures and quality management systems applicable for construction projects.
5. Distinguish various construction equipment used and understand essential contracting systems adopted in construction industry.

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

1. choose a suitable type of construction method and project delivery system for successful project completion.
2. plan the construction project and apply a suitable technique for the project under consideration.
3. optimize project time and cost with the exercise of proper monitoring and control in construction projects
4. recall construction safety and quality management systems to be implemented in construction projects.
5. select proper equipment for the execution of various operations in construction and recall various issues of contracting.

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. Organisation – 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- Methodologies of WBS; estimating durations, sequence of activities, activity utility data; 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, calendaring networks. PERT-Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

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, and Precedence

network. Schedule/time progress control; Cost control- Classification of costs, time-cost trade-off in construction projects; Implement

UNIT-IV:Construction Safety and Quality Management Safety: 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. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.

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. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016..

18CE C25

HYDROLOGY AND WATER RESOURCES ENGINEERING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the students to understand
1. Surface & sub-surface hydrology, rainfall and measurement of rainfall.
2. Runoff, runoff estimation and surface reservoir planning.
3. Groundwater and its occurrence, theory of subsurface flow, flow to wells and yield, and irrigation practices.
4. Canal system, design theories, and canal outlets.
5. Design of Gravity dams, earth dams and seepage analysis, spillways and energy dissipators.

Course Outcomes: On completion of the course, students will be able to
1. analyse the components of hydrologic cycle and determine rain gauge network.
2. interpret various methods to estimate runoff and understand reservoir planning.
3. identify aquifer types , understand the process of sustainable groundwater management and evaluate the performance of irrigation system.
4. understand canal systems and design canals using regime concept.
5. analyse the stability of dams and understand spillways.

UNIT- I:
Introduction: Hydrologic cycle, water-budget equation, world water balance, hydrology applications in engineering, surface water resources of India.
Precipitation: Forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).Infiltration, infiltration capacity, infiltration indices, evaporation, and evapotranspiration.

UNIT- II:
Runoff: Runoff, factors affecting runoff, flow-duration curve, flow-mass curve, hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph.
Reservoirs: Types, selection of suitable site, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation and life of reservoir.

UNIT- III:
Ground water: Types of aquifers, Aquifer parameters, steady radial flow into a confined and unconfined aquifer, Darcy's law, yield of an open well, well hydraulics, Safe yield, Water harvesting structures and augmentation of ground water, Sustainable Ground Water management.
Irrigation: Duty, delta and base period of crops, crop water requirements, methods of applying water to the fields, micro irrigation, irrigation efficiencies, soil-water relationship, depth of irrigation, frequency of irrigation, wilting point, water logging, consumptive use.

UNIT- IV:

Distribution systems : Canal systems, alignment of canals, balancing depth, canal losses, estimation of design discharge. Design of canals- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Lining of canals, types of lining.

Types of Canal outlets, Introduction to diversion head works and its components, canal regulation works.

UNIT- V:

Gravity dams: Types of dams, Forces on gravity dams, causes of failure, stress analysis, elementary and practical profile, and economical height of dam.

Earth dams: Classification, design considerations, control of seepage, slope protection.

Spillways: Types, components of spillways.

Text Books:

1. P. N. Modi, "Irrigation Water Resources & Water Power Engineering", Standard Publishers, 2014.

2. S. K. Garg, "Irrigation Engineering and Hydraulic Structures: Water Resources Engineering - Vol.II", Khanna Publishers, Delhi, 2017.

Suggested Reading:

1. Ch. S. N. Murthy, "Water Resources Engineering: Principles and Practice", New Age International Publishers, Delhi, 2002.

2. G. L. Asawa, "Irrigation and water Resources engineering", New Age International Publishers, Delhi, 2005.

3. VenTe Chow, "Handbook of Applied Hydrology", McGraw-Hill Book Company, New York, 1964.

18CE C26

ESTIMATION, SPECIFICATIONS AND COSTING

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the students understand

1. The working of detailed estimates for different structures.
2. The working of steel quantities of R.C.C Framed works and preparation of BBS.
3. The rate Analysis for different items of works.
4. About TSDSS and Departmental procedures.
5. About Specifications and standard procedure for construction works.

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

1. prepare approximate estimates, detailed estimates for simple and complex buildings.
2. understand the RCC drawings and estimate the steel qualities to prepare BBS of various items of the buildings – beams, columns, slabs, footings and other civil engineering structures.
3. apply engineering knowledge to estimate quantities of roads, culverts, canals and septic tanks.
4. understand the work force required for the quantities estimated, as per TSSDSR and apply rate analysis to compute unit cost for different items of works of buildings, concrete and bituminous road works.
5. understand general and detailed specifications of works and record details of measurements in the M-Book and work force details in muster roll.

UNIT – I:

Introduction to Estimation, objectives of estimation, factors influencing estimation, types of estimates, detailed estimates for Flat roof buildings - load bearing and RCC framed using long wall and short wall method, centre line method.

UNIT – II:

Estimation of steel quantities and preparation of bar bending schedule (BBS) for RCC framed works - slabs (one way and two way), beams and columns, footings, stair case and retaining walls.

UNIT – III:

Detailed estimate of WBM roads, CC roads and Bituminous roads (including earth work), single cell rectangular box culvert, Septic tank and earth work of irrigation canals.

UNIT – IV:

Preparation of analysis of rates and theoretical requirements of materials as per Telangana State Standard Data and Schedule of Rates (TSSDSR) for major items of works of a building, all items of Bituminous and concrete road works.

UNIT – V:
General and detailed specifications of various items of buildings and road works, M-Book and Muster Roll.

Text Books:
1. B. N. Dutta, "*Estimating and Costing in Civil Engineering – Theory and Practice*", UBS, publishers' distributors (p) ltd.-New Delhi 2012.
2. M.Chakraborti, "*Estimating, Costing, Specifications and Valuation in Civil Engineering"*, Chakraborti 2006.

Suggested Reading:
1. Jagjit Singh, "*Estimating and Costing in Civil Engineering*", Galgotia Publications, New Delhi, 1996.
2. B. S. Patil," *Civil Engineering Contracts and Estimation*", Orient Black swan Private Ltd; Fourth edition 2015.
3. Telangana State Standard Schedule of Rates (TSSDSR).

18CE E18

DESIGN OF STEEL STRUCTURES - II

(Core Elective 5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Codes required: IS 800 – 2007, steel tables, Bridge rules, Bridge Code (RDSO), IS: 875 Part-2 & Part-3

Course Objectives: To enable the students

1. Gain exposure to a few basic types of steel structures (Plate Girders,Gantry girders, Trussed girders etc.) and their components, used in Highway bridges, Industrial workshops and Railway bridges .
2. Attain fundamental knowledge of design of plate girder, gantry girder,steel railway bridges (plate girder & truss girder type), rocker &rollerbearings and is able to interpret the specifications of relevant codes.
3. Acquire adequate conceptual knowledge and skills to extend the sameto investigate into critical issues , compare various options &choosebest solution for the problems in the areas of highway , industrial andrailway steel structures
4. Consider economy in the design of these structures without sufferingthe safety, in a given situation.
5. Understand the intricacies of detailing aspects of these structures and their connections

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

1. understand the phenomenon of shear buckling in beams with larger depths, design and detail welded plate girder for various structural actions.
2. estimate the loads on gantry girders, design and detail gantry girder including connections.
3. identify suitable bridge type, design roller & rocker bearings for railway bridges.
4. develop the layout of the bridge, design and detail deck type riveted plate girder bridge including wind effects.
5. choose the appropriate truss configuration, develop layout of the bridge, and design & detail truss girder bridges.

UNIT- I:

Design of 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, Loads, Codal provisions, Detailed Design- Cross section and connections, Drawing- general layout and cross section;

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.

Bearings: Types and general description of various bearings, detailed 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- Detailing; General layout, longitudinal and cross sections

UNIT- V:

Design of Through type riveted truss girder railway bridges: Truss configurations, Detailed design of stringer beams, Cross girders and Truss girders; Wind effects- Design of top lateral and bottom Lateral bracing, Portal and sway bracings; Drawing-General layout , generation of longitudinal and cross sections.

Text Books:

1. S. K. Duggal, "Limit State Design of Steel Structures", 3rd Edition, McGraw Hill HED, 2019.
2. 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 VirendraGehlot, "Design of Steel Structures",Volume – 2, Scientific Publishers, 2008.

18CE E19

AIRPORT ENGINEERING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: to enable the student

1. know the components of airports
2. know the factors effecting different airport component
3. know the site selection for airports
4. understand the design standards applicable in airport engineering
5. get an idea about air traffic management

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

1. understand the structure of airport system.
2. understand the components of aircraft and airport.
3. apply engineering knowledge for selection of airport sites, plan airports and facilities as per international standards and also understand the corrections to be applied for runway.
4. design airports as per ICAO standards and develop the facilities required for passengers and aircrafts.
5. create the facilities required for the airport traffic management and understand the importance of the drainage system and its design in airports.

UNIT- I:

Introduction of Air Transport System: History of air transportation, roles and responsibilities of director of Civil Aviation and National Airport Authority, International Airport Authority of India, Airports Authority of India, ICAO, growth of air transport.

UNIT- II:

Aircraft Characteristics:

General introduction, relationship between aircraft and airport, effects of aircrafts on airports, aircraft characteristics, components of an aircraft.

UNIT- III:

Airport Planning: Airport master plan- FAA and ICAO recommendations, regional planning, airport site selection, airport location, 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.

UNIT- IV:

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, exit taxiways.

UNIT- V:

Air Traffic Management: Visual aids-airport marking, airport lighting, air traffic control– need of air traffic control, concepts of air traffic control network, air communication, air traffic control aids, ILS and installations,

landing aids, airport drainage system– special requirements of airport drainage system, design procedures for surface and sub– surface drainage systems.

Text Books:

1. Khanna. S. K. Arora, M. G. and Jain. S. S, "*Airport Planning and Design*" Fifth edition. Nem Chand & Bros, Roorkee, India, 1999.
2. K. P. Subramanian," *A text book on Highway, Railway, Airport and Harbour Engineering*", Scitech Publications (India) Pvt. Ltd., 2015.

Suggested Reading:

1. Subash C Saxena, " *Airport Engineering Planning and design*", CBS 1st edition, 2010.
2. Norman J.Ashford, Saleh A. Mumayiz and Paul H. Wright "*Airport Engineering Planning - Design and development and Planning- 21st century airports*", Wiley India Pvt. Ltd, 2012.
3. R. Srinivasa Kumar, "*Airport, Railway, Dock and Harbors*", Universities Press, 2014

18CE E20

RIVER ENGINEERING
(Core Elective-5)

Instruction	3 Hours perweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course Objectives: To enable the students to understand

1. The concepts of rivermorphology
2. The methods of stage measurement.
3. Hydraulicriver models.
4. Riverprotectionandtrainingworks
5. Designflood protection structures

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

1. define basic terms and understand the concepts of rivermorphology.
2. determine scour depth of hydraulic structure and identify methods of stage measurement.
3. understand hydraulic river models.
4. identify river training works and understand protective measures.
5. designflood protection structures.

UNIT- I:

Rivermorphology: Behaviourofriverflow,roleofsedimentsinrivers,changes in regimes. Sediment transport mechanics - bed forms, bed load transport, and transport of suspended sediment, critical shear stress, and sediment transport equations.

UNIT-II:

AggradationandDegradation: Localscouratbridgepiersandotherhydraulic structures, measurements in rivers - stage measurements, channel geometry, discharge, and sediment samplers and suspended and bed loadmeasurement.

UNIT-III:

Hydraulicmodellingofrivers: Hydraulicsimilitude,physicalrivermodels-fixed and movable bed models; sectional models, distorted models, mathematical models for aggradations, degradation and localscour.

UNIT- IV:

River Protection and Training Works: Introduction, classification of river training,typesoftrainingworks,protectionforrevetments,dikes,gabions,spurs, bank protective measures and bed controlstructures.

UNIT- V:

Design of river flood protection structures: Diversion and cofferdam, river regulations systems, dredging and disposal, river restoration.

Text Books:

1. P.Y.Julien,"*RiverMechanics*",CambridgeUniversityPress,March 2018
2. S.K.Garg,"*IrrigationEngineeringandHydraulicStructures",* Khanna Publishers, 2017

Suggested Reading:

1. R.J. Gardeand K.G. RangaRaju, "*Mechanics of sediment transportationandAlluvialstreamproblems"*,WileyEasternlimited, 1977
2. Central Board OfIrrigation And Power, "*River BehaviourManagementandTraining(Vol.I&II)",*NewDelhi,1991
3. U.S.ArmyCorpsofEngineers,"*RiverHydraulics*",UniversityPress ofthePacific,2004.

18CE E21

WATER AND AIR QUALITY MODELING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student

1. Understand various systems, models and their development.
2. Learn about the river water quality modelling and Benthal Oxygen Demand of sediments.
3. Get educated on the models for lakes and estuaries & transport mechanisms.
4. Learn about plume characteristics, air pollution modelling and its applications.
5. Understand plume behaviour using Gaussian plume equation for different atmospheric stability conditions.

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

1. develop and validate mathematical models for stream water quality and perform cost benefit analysis.
2. assess water quality of rivers using models such as Streeter Phelps model and determine oxygenation coefficients, oxygen consumption by the sediments in rivers.
3. develop models for estuaries for their continuous quality monitoring and understand transport mechanisms.
4. apply knowledge of plume characteristics and diffusion of stack emissions in modelling.
5. derive models for air quality monitoring, Gaussian plume equation and compute stack height.

UNIT -I:

Introduction to Mathematical Models: Role of mathematical models; systems approach, systems and models, kinds of mathematical models, model development and validation effluent and stream standards; water quality model development, cost: benefit analysis using models, model requirements and limitations; Dissolved Oxygen model for streams sources and sinks of dissolved oxygen.

UNIT -II:

Surface Water Quality Modelling: Historical development of water quality models; rivers and streams water quality modelling, Streeter Phelps model, oxygen sag curve, determination of deoxygenation and re-aeration coefficient, Benthal oxygen demand.

UNIT -III:

Mass transport mechanisms: Models for Estuary and Lakes: Physical chemical and biological processes in estuaries; estuarine transport, net estuarine flow, estuary dispersion coefficient; Lakes and impoundments: Water quality response to inputs; water quality modelling process.

UNIT - IV:

Air pollution Modelling: Chemistry of air Pollutants, atmospheric reactions, sinks for air pollution, transport of air pollutants, meteorological settling for dispersal of air pollutants, vertical structure of temperature and stability, self cleaning of atmosphere, transport and diffusion of stack emissions, atmospheric characteristics significant to transport and diffusion of stack emission, stack plume characteristics.

UNIT - V:

Air quality models: Types of modelling techniques, multiple sources and area sources, fixed box models, Diffusion models, Gaussian plume derivation, modifications of Gaussian plume equation, stack height computation.

Text books:

1. Steven C. Chapra," *Surface Water Quality Modelling*", Tata McGraw Hill New York, 1997.
2. Alex De Visscher, "*Air dispersion modelling: Foundations and applications*", Wiley-Blackwell Publications, Nov 2013.
3. AbhishekTiwary, Ian Williams, "*Air Pollution: Measurement, Modelling and Mitigation*", CRC Press; 4 edition, 2018.

Suggested Readings:

1. R.W. Boubel, D.L. Fox, D.B. Turner & A.C. Stern, "*Fundamentals of Air Pollution*", Academic Press, New York, 2006.
2. P. Zannetti, "*Air pollution modelling*", WIT, Software edition 1990.

18CE E22

APPLICATION OF DATA ANALYTICS IN CIVIL ENGINEERING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To identify the sources and characteristics of civil engineering data
2. To find the hidden patterns within the data by processing the raw data
3. To use the information obtained in order to make civil engineering project decisions
4. Study the applications of data analytics in civil engineering
5. To identify various open source tools and resources related to data analytics

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

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. MashrurChowdary, Amy Apon and KakanDey, Data Analytics for Intelligent Transportation Systems, 2012
2. SubhashishSamaddar and SatishNargundkar,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/

18CE C27

CONCRETE TECHNOLOGY LAB

Instruction		3P Hours per week
Duration of Semester End Examination		3 Hours
Semester End Examination		50 Marks
CIE		25 Marks
Credits	1.5	

Course Objectives:

1. Conduct tests on cement
2. Conduct tests on Fine Aggregate and Coarse Aggregate
3. Conduct tests on concrete in fresh and hardened states.

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.

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 split tensile strength of concrete cylinders
9. Mix design as per IS:10262-2019
10. Demo on Non-destructive testing of concrete specimen

Referencebooks:

1. M.S. Shetty, “Concrete Technology- Theory & Practice”, S. Chand & Company Publishers.
2. IS 10262:2019,”Indian Standard Concrete Mix Proportioning – Guidelines”.

18CE C28

COMPUTER APPLICATIONS LAB

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: Enable the students

1. Explore a few software packages used in various areas of Civil Engineering (Structural Analysis & Design, Soil Mechanics, Water Supply & Sanitary Engineering, and Surveying) and the applications of different software packages.
2. Attain the fundamental knowledge of navigation of software packages.
3. Acquire adequate conceptual knowledge and skills to use software packages in the field in order to provide solutions to civil engineering problems.
4. Provide accelerated/time bound solutions with help of software packages without effecting the accuracy of computations.
5. Understand the rectification of errors while using software packages.

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 ArcGIS/QGIS

List of Exercises:

1. Modelling and analysis of plane frames using STAAD-Pro.
2. Modelling 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.
8. Analysis of sewer networks using SEWER Gems.
9. Digitization of topo-sheets and perform overlay analysis using ArcGIS.

Textbooks/References:-

1. STAAD.Pro V8i (SELECTseries 4) manual on staad exercises, July 2019.
2. EPANET 2 Users Manual Paperback – Import, 30 January 2013 by U S Environmental Protection Agency (Creator)
3. Instructional Guide for The ArcGIS 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 SewerGEMS Software Paperback – September 17, 2018 by HinalSopariya (Author)
5. https://www.finesoftware.eu/engineering-manuals/ for GEO5 execises.

18CE C29

PROJECT: PART-1

Instruction	Hours per week
Continuous Internal Evaluation	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic
2. Working out a preliminary Approach to the Problem relating to the assigned topic
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/ Design/Feasibility
4. Preparing a Written Report on the Study conducted for Presentation to the Department
5. Final Seminar, as oral Presentation before a departmental Committee.

Course Outcomes:

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

1. identify the domain of one's interest through critical review of literature.
2. define a problem in the domain of interest and understand its scope and also develop the skill of coordinating with the team in the form of discussions during the progress of finding the solution.
3. examine various approaches and build a preliminary approach to the problem on chosen topic.
4. defend their approach by healthy interactions with the participants and modify, if necessary and cultivate the culture of ethical practices.
5. develop the technical skill in preparing a well structured report and present.

Guidelines for the award of Marks:

Maximum Marks: 50

Evaluation by	Maximum Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Departmental Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Model Curriculum (with effect from 2021-2022)

B.E (CIVIL ENGINEERING)

SEMESTER – VIII

S. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1		Core Elective 6	3	-	-	3	30	70	3
2		Open Elective 3	3	-	-	3	30	70	3
	PRACTICALS								
3	18CE C30	Technical Seminar (On the latest trends and other than project)	-	-	2	-	50	-	1
4	18CE C31	Project Part 2	-	-	20				10
		Total	**06**	**-**	**22**		**110**	**140**	**17**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Core Elective 6:

1. 18CE E23 - Earthquake Resistant Design of Structures
2. 18CE E24 - Ground Improvement Techniques
3. 18CE E25 - Design of Hydraulic Structures/Irrigation Engineering
4. 18CE E26 - Rural Water Supply and Onsite Sanitation Systems
5. 18CE E27Applications of Block Chain Technology in Civil Engineering

Open Elective 3:

1. 18ME O06 – Nano Materials and Technology
2. 18IT O03 – Principles of Internet of Things
3. 18EE O05 – Waste Management
4. 18EC O08 – Neutral Networks and Fuzzy Logic

18CE E23

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
(Core Elective-6)

Instruction	3L Hours per week		
Duration of Semester End Examination	3 Hours	Semester End Examination	70 Marks
CIE	30 Marks	Credits	3

Course objectives: To enable the student

1. Understand the causes of earthquakes , their Magnitude & effects and various types of earthquake waves
2. Understand the concepts of damped and un damped vibrations and the response of single , two and multi-degree systems to thesevibrations , and concepts of Response spectrum
3. Review various case studies of past earthquakes, and performance of buildings during those earthquakes, understand the concepts of Seismic Design Philosophy and Earthquake Resistant Design of Masonry, RC and Steel structures. Evaluate the seismic loads on the structures using IS 1893 Part I codal provisions.
4. Gain knowledge of Seismic Performance of Engineered and NonEngineered Urban and Rural buildings
5. Understand the basic concepts of Seismic resistant construction, Base isolation techniques and other energy dissipation devices and Concepts of Seismic retrofitting

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

1. relate the fundamentals of engineering seismology, understand the characteristics and effects of strong motion earthquakes.
2. understand the concepts of damped and un-damped vibrations in single and multi-degrees of freedom systems.
3. estimate the seismic loads on structures and analyse using seismic coefficient and response spectrum methods.
4. examine the causes of damages of urban and rural buildings and interpret the design provisions from IS-1893 part - I (2016) and IS - 13920(2016).
5. know the use of various earthquake resistant devices, apply suitable construction techniques for retrofitting.

UNIT – I:

Engineering Seismology& Elements : Causes of Earthquakes–Geological faults,Tectonic Plate theory – Elastic Rebound theory –Focus - Epicentre – Hypocenter,Seismic waves –Primary and Secondary waves, Seismogram - Magnitude, Intensity and Energy release during earthquakes – Magnitude & Intensity Scales, Characteristics of strong earthquake ground motions – Effect of soil properties – Liquefaction of soils.

UNIT – II:

Theory of Vibrations: Introduction to Vibrating Systems – mass, stiffness and damping parameters – Concept of inertia, elastic restoring force and damping –types of damping, difference between static forces and dynamic excitation.

Single Degree of Freedom (SDOF) Systems – SDOF idealization - Formulation of Equation of motion(for mass as well as base excitation) and response for free, forced (harmonic loads only), damped &undamped vibrations, Logarithmic Decrement & Influence of gravitational force on the equation of motion, Natural Time period & Natural Frequency.

Multi Degree of Freedom (MDOF) Systems - Equation of Motion–Mass, stiffness and damping matrices, Modal Analysis -Natural frequencies - generation of modal frequencies and mode shapes, Concept of Response Spectrum – Response Spectrum Curve as per IS: 1893 Part I (2016).

UNIT – III:

Evaluation of Seismic Loads on Structures: Concepts of over strength, Ductility and Redundancy –Determination of earthquake forces on structures – Seismic Co-efficient and Response Spectrum Methods.

UNIT – IV:

Seismic Performance of Buildings: Case Studies of damages to urban and rural buildings during some past earthquakes – Damage Patterns in structural and non –structural elements – Soft storey effect, Design Provisions as per IS – 1893(2016), Ductile detailing as per IS – 13920(2016).

UNIT – V:

Earthquake Resistant Devices &Construction Techniques: Vibration Control Devices - Base isolators, Energy dissipating devices – Dampers, Lateral Displacement Control - Bracing Systems, Shear Walls.

Seismic Retrofitting: Repair, rehabilitation and retrofitting, retrofitting strategies – Importance of Re-analysis, Retrofitting Techniques for RCC, Masonry and rural buildings, IS – 13935(2009) codal provisions for Retrofitting.

Text Books:

1. PankajAgarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd, 2011.
2. S.K Duggal, "Earthquake Resistant Design of Structures", Oxford Higher Education, Second Edition, 2013.

Suggested Readings:

1. A.K. Chopra, "Dynamics of Structures", Pearson Education, Fifth Edition,2017.
2. Jai Krishna, A.R Chandrasekaran, Brijesh Chandra, "Elements of Earthquake Engineering", South Asian Publishers Pvt. Ltd, Second Edition,2014.
3. Steven L Kramer, "Geo-Technical Earthquake Engineering", Pearson Education Ltd, 2013.

18CE E24

GROUND IMPROVEMENT TECHNIQUES
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To make the students able to
1. Understand the importance of ground improvement and learn about various types of ground improvement techniques suitable for given soil conditions.
2. Understand the concepts behind a range of ground improvement and soil remediation techniques by using chemical stabilization and grouting methods.
3. Understand the different concepts of vibration techniques for cohesionless soils stabilization.
4. Select suitable stabilization method for cohesive soils.
5. Understand the Types, functions and applications of Geo-textiles, geo-grid, tests on geo-textiles and Reinforced earth.

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 cohesionless 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.

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: Expansive Soils- parameters of expansive soils and their classification- moisture changes in expansive soils- CNS technique. 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 - design methods and 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. NiharRanjanPatra, “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”.

18CE E25

DESIGN OF HYDRAULIC STRUCTURES
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The student should be able to understand
1. Principles and design of surplus weir.
2. Functioning of sluice, design of various components.
3. Types of canal falls, basic principles of glacis type canal drop and its design.
4. Basic principles of design of cross regulator and its design.
5. Design of spillways.

Course Outcomes: On completion of the course, students will be able to
1. analyse and design surplus weir.
2. analyse and design direct sluice.
3. identify types of falls and design glacis type canal drop.
4. understand and design cross regulator.
5. identify types of spillways and design energy dissipators.

UNIT - I:
Surplus 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 main 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: Design of 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.

18CE E26

RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. Identify the problems pertaining to rural water supply and sanitation.
2. Be conversant about water treatment and sanitation system for rural community.
3. Understand wastewater treatment collection and treatment units in rural areas.
4. Get educated on Industrial hygiene, sanitation and occupational hazards.
5. Design low cost waste management systems for rural areas, plan and design an effluent disposal mechanism.

Course Outcomes: At the end of the course, the student will be able to
1. solve the issues related to rural water supply and sanitation.
2. relate the needs for water treatment and develop different stages of water treatment and sanitation system for rural 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.

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, 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 in schools, public buildings and hospitals; Industrial plant sanitation.

UNIT- V:
Septic tanks: Design of septic tanks, single pit and double pit toilets, small bore systems, bio digesters, reed beds, constructed wetlands, sludge/seepage management systems, stabilization ponds; Solid Waste Management: Biogas plants, rural health, other specific issues and problems encountered in rural sanitation.

Text Books:
1. V. M. Eulersand E. W. Steel, "*Municipal and Rural Sanitation*", 6th Ed., McGraw Hill Book Company, 1965
2. F. B. Wright, "*Rural Water Supply and Sanitation*", 3rd Revised edition, McGraw-Hill Inc.,US, 1977

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

Suggested Reading:

1. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New Delhi.
2. A handbook on "*Technological Options for On-site sanitation in rural areas",* Ministry of Drinking water & Sanitation, Govt. of India, June 2016
3. A Guide to the Development of on-site sanitation, WHO, 1992

18CEE27

APPLICATIONS OF BLOCKCHAIN TECHNOLOGY IN CIVIL ENGINEERING
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To get the terminologies and overview of Blockchain technology
2. To study the concepts and foundation of Blockchain technology
3. To understand the applications of Blockchain technology in civil engineering
4. To design use cases and architecture Blockchain technology
5. To study benefits, limitations and identify application area of Blockchain technology

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

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

UNIT 1:Introduction to Blockchain: Introduction to centralized, decentralized and distributed system, History of Blockchain, Various technical definitions of Blockchain. **Generic elements of a blochchain:** Block, Transaction, Peer to peer network, Node, Smart contract, Why it's called blckchain. **Types of Blockchain:** Public Blockchains, Private Blockchains, Semi-private Blockchains, Sidechains, Permissioned ledger, Distributed ledger, shared ledger, Fully private and proprietary Blockchains, Tokenized Blockchains, Token less Blockchains, CAP theorem and Blockchain.

UNIT II: Concepts of Blockchain Technology: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, and Structure of Blockchain. Applications of Blockchain technology, Tiers of Blockchain technology: Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, generation of Blockchain X.

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

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

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

Crypto currency: Bitcoin, Bitcoin definition, keys and addresses, public keys in Bitcoin, private keys in Bitcoin, Bitcoin currency units.

Textbooks:

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

References:

1. Blockchain For dummies, IBM Limited Edition, John Wiley & Sons, Inc.
2. Lemes, Samir, and LamijaLemes. Blockchain in Distributed CAD Environments". In International Conference "*New Technologies Development and Applications*", pp. 25-32. Springer, Cham, 2019.
3. Blockchain Technology in the Construction Industry-Digital Transformation for High Productivity, 2018.

18CE C30

TECHNICAL SEMINAR

Instruction	2 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

18CE C31

PROJECT: PART-2

Instruction	10 Hours per week
Continuous Internal Evaluation	100 Marks
Semester End Examination	100 Marks
Credits	10

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 student(s) 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/Modeling/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
Department Review Committee	10	Review 1
	15	Review 2
	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 awarding marks in Semester End Examination: (Maximum 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