



JSPM's
RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule Pune University,Pune)



Department of Civil Engineering
B. Tech (2019 Pattern)
w.e.f. Academic Year 2022-2023



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B. Tech (Civil Engineering)
Academic Year – 2022-2023
Semester –VII

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks						Credits
		TH	TU	Lab	ISE (15)	MSE (25)	ESE (60)	TW	Lab OR	Total	
CE4101	Quantity Surveying and Contracts and tenders (Core 1)	03	-	02	15	25	60	25	25	150	4
CE4102	Transportation Engineering (Core 2)	03	-	02	15	25	60	25	25	150	4
CE4103	Elective-III	03	-	02	15	25	60	25	25	150	4
CE4104	Project Phase I	-	01	10	-	-	-	50	100	150	6
Total		09	01	16	45	75	180	125	175	600	18

Elective III Course Code	Elective III Title
CE4103A	Construction Management
CE4103B	Advance Design of Steel Structure
CE4103C	Solid Waste Management



Final Year B. Tech. (Department of Civil)
Semester-VIII- Syllabus Structure
Track I –Regular

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks						Credits
		TH	TU	Lab	ISE (15)	MSE (25)	ESE (60)	TW	OR/PR	Total	
CE4105	Project and finance management (Track I)	03	-	-	15	25	60	-	-	100	03
CE4106	Dam Engineering (Track I)	03	-	02	15	25	60	-	50	150	04
CE4107	Elective IV	03			15	25	60	-	-	100	03
CE4108	Project Phase II	-	-	16	-	-	-	100	150	250	8
Total		09	-	18	45	75	180	100	200	600	18



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Final Year B. Tech. (Department of Civil)
Semester-VIII- Syllabus Structure
Track II - Industry Internship and Project

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks							Credits
		TH	TU	Lab	ISE (15)	MSE (25)	ESE	TW	Lab	OR	Total	
CE4109	Industry Internship	-	-	*20	-	-	-	200	-	150	350	10
CE4108	Project Phase II	-	-	16	-	-	-	100	-	150	250	8
Total		-	-	36		-	-	300	-	300	600	18



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Final Year B. Tech. (Department of Civil)
Semester-VIII- Syllabus Structure
Track III – Entrepreneurship

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks						Credits
		TH	TU	Lab	ISE (15)	MSE (25)	ESE (60)	TW	OR	Total	
CE4105	Project and finance management	03	-	-	15	25	60	-	-	100	03
CE4110	Data Analytics in Civil Engineering	03	-	02	15	25	60	-	50	150	04
CE4107	Elective IV	03			15	25	60			100	03
CE4108	Project Phase II	-	-	16	-	-	-	100	150	250	8
Total		09	-	18	45	75	180	100	200	600	18



Final Year B. Tech. (Department of Civil)
Semester-VIII- Syllabus Structure
Track IV – Higher Studies and Research

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks						Credits
		TH	TU	Lab	ISE (15)	MSE (25)	ESE (60)	TW	OR	Total	
CE4111	Research Methodology	03	-	02	15	25	60	-	50	150	04
CE4112	Advancement in Civil Engineering	03	-	-	15	25	60	-	-	100	03
CE4107	Elective IV	03			15	25	60			100	03
CE4108	Project Phase II	-	-	16	-	-	-	100	150	250	08
Total		09	-	18	45	75	180	100	200	600	18

Elective IV Course Code	Elective IV Title
CE4107A	Smart City management of Urban Infrastructure
CE4107B	Integrated Water Resources Planning & Management
CE4107C	Optimization Techniques
CE4107D	Coastal Engineering



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B.Tech (Civil Engineering)

2019 Pattern (SEM-VII)

[CE4101]: Quantity Surveying, Tenders and Contracts

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam :25 Marks End Sem. Exam : 60 Marks Lab Evaluation (TW+OR) : 50 Marks
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Course Prerequisites: Building planning, design and construction (20103)

Course Objective:

To provide the student with the ability to estimate the quantities of items of work involved in building, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

Course Outcome:

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

CO1: Describe the approximate estimate for various Civil engineering structures

CO2: Compute quantities of various items of work from drawing and prepare Abstract of the same.

CO3: Calculate valuation of property using different methods and assess the value of it.

CO4: Prepare suitable specifications and rate analysis of various items of work.

CO5: Interpret working of PWD & prepare documents required for tender.

CO6: Prepare contract document for various civil engineering project.

Course Contents

UNIT-I	Introduction and Approximate Estimates	06 Hours
Introduction to estimates and related terms: Definitions of estimation and valuation. Significance (application) of the Course. Purpose of estimation. Type of estimates, data required for estimation as a pre requisite. Meaning of an item of work, and enlisting the item of work for different Civil Engineering projects. Units of measurement. Mode of measurement. Mode of measurement of building items/works. Introduction to components of estimates: face sheet, abstract sheet (BOQ), Measurement Sheet, Rate Analysis, lead statement. Provisional sum & prime cost items, contingencies, work charge establishment, cent age charges. Introduction to D.S.R		
UNIT-II	Approximate and Detailed estimate	06 Hours

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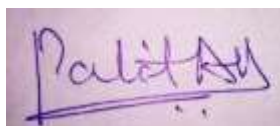
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Approximate Estimates: Meaning, Purpose, methods of approximate estimation of building & other civil engineering projects like roads, irrigation/ water supply, sanitary engineering, electrical works.

Detailed estimates: Factors to be considered while Preparing Detailed Estimate, Detailed estimate of R.C.C framed structures using IS 1200, Concept of Estimation of Load Bearing Structure (PWD & Centre Line Method). Bar Bending Schedule: Preparing Bar Bending Schedule for all RCC members of building.

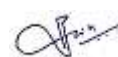
UNIT-III	Valuation	06 Hours
Valuation: Purpose of valuation, Scope of valuation, meaning of price, cost and value. Factors affecting 'value'. Types of values: Only Fair Market Value, Book Value, Salvage/Scrap Value, Distresses Value and Sentimental Value. Concept of free hold and lease hold property. Estimation versus Valuation. Meaning of depreciation & obsolescence.		
UNIT-IV	Specifications and Rate Analysis	06 Hours
Specifications: Meaning & purpose, types. Drafting detailed specifications for materials, quality, workmanship, method of execution, mode of measurement and payment for major items like excavation, stone/brick masonry, plastering, ceramic tile flooring, and R.C.C. work. Rate Analysis: Meaning and factors affecting of an items of work, materials, sundries, labour, tools and plant, overhead & profit. Working out rate analysis for the items mentioned in specifications above. Task work or out turn, factors effecting task work.		
UNIT-V	Tendering and Execution of Works	06 Hours
Tendering and Execution of Works Tenders: Definition, methods of inviting tenders, e-tendering, tender notice, tendering procedure, pre and post qualification of Contractors, tender documents. 3 bid/2 bid or single bid system. Methods of Executing Works: PWD procedure of work execution, administrative approval, budget provision, technical sanction. Methods of execution of minor works in PWD: Piecework, Rate List, Daily Labour. Introduction to registration as a contractor in PWD.		
UNIT-VI	Contracts and Arbitration	06 Hours
Contracts: Definition, objectives & essentials of a valid contract as per Indian Contract Act (1872), termination of contract. Types of contracts: only lump sum, item rate, cost plus. Conditions of contracts: Defect liability period, liquidated damages, retention money, interim payment or running account bill, advance payment, secured advance, final bill. Essentials of legally valid contract, Contract between Engineer & Employers, Contract between Employer & Contractor, Appointment & authority of Engineer for execution of civil construction works, Category of contractor. Introduction to non - conventional contract such as B.O.T, B.O.O.T, B.O.L.T., Arbitration: Introduction to Arbitration as per Indian Arbitration & Conciliation Act (2015), Meaning and need of Arbitration, qualities and powers of an Arbitrator.		



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Term Work

The following exercises should be prepared and submitted:

- . Detailed estimate using CL Method for G + 1, prepare BOQ for all quantities using D.S.R. (Prefer data from working site.) Use any software for detailing.
 - . Bar bending schedule for column footings, columns, beams, a staircase and a slab for assignment no.1.
 - . Rate Analysis of any four items related to assignment no. 1
 - . Estimating quantities for any one of the following:
 - a) A factory shed of steel frame.
 - b) Underground Water Tank
 - c) Pipe Culvert
 - d) Road /Railway track/Runway (Prefer data from working site). Use any software for Detailing.
 - . Drafting detailed specifications of any two items of building and analyzing their rates based on prevailing market.
 - . Drafting of tender notice and collecting minimum three tender notices of Civil Engineering Works
 - . Preparing Valuation of a Residential building and writing report using O-1 form.
 - . Preparation of tender documents for the assignment no. 1
 - a) Tender Notice.
- Schedule A and Schedule B to these principles will consummate our team efforts to the promising boost to the student's academics.

References:

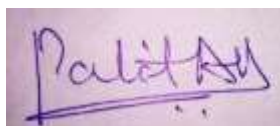
1. Estimating and Costing in Civil Engineering : Theory and Practice : B. N. Dutta – S. Dutta & Company, Lucknow.
2. Estimating, Costing Specifications & Valuation in Civil Engineering: M. Chakraborty.
3. Estimating and Costing : R. C. Rangwala – Charotar Publications House.
4. Theory of Practices of Valuation : Dr. Roshan Namavati- Lakani Publications.
5. Valuation Principles and Procedure: Ashok Nain, Dewpoint Publications
6. Laws for Engineers : Dr. Vandana Bhat and Priyanka Vyas – Published by PRO-CARE, 5/B/Sagarika Society, Juhu Tara Road, Juhu Santacruz (W) , Mumbai-400049.(procure@technolegal.org)

Handbooks:

1. Standard Contract for Clauses for Domestic Bidding Contracts: Ministry of Statics and Programme Implementation, Government of India
2. FIDIC Document: Federation International Des Ingenieurs Counseils i.e. International Federation of Consulting Civil Engineers, Geneva, Switzerland.
3. Indian Practical Civil Engineers- Handbook : P.N. Khanna, UBS publ.Distr. Pvt. Ltd. (UBSDP)

IS Codes:

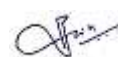
1. IS 1200 (Part 1 to 25): Methods of Measurement of Building & Civil Engg. works.
2. IS 3861-1966: Method of Measurement of areas and Cubical Contents of buildings.
3. S.S.R. (State Schedule rates) for current year.
4. PWD Redbooks, vol 1&2. e- Resources : npTEL.iitm.ac.in



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B. Tech (Civil Engineering)

2019 Pattern (SEM-VII)

[CE4102]: Transportation Engineering

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam: 60 Marks Lab Evaluation (TW+OR) : 50 Marks
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Course Prerequisites : Surveying, Concrete Technology and Infrastructure Engineering

Course Objective:

- To discuss the history of highway development and preparation of Master Plan.
- To impart the knowledge of specifications of geometrical elements of a roadway.
- To introduce fundamental knowledge of traffic engineering.
- To impart practical knowledge on various construction materials used in road construction.
- To enable the students to design the flexible and rigid pavements.
- To introduce the recent advancement in transportation engineering.

Course Outcome:

After successful completion of the course, student would be able to–

CO1: compute the lengths of different category roads and their construction priority.

CO2: design the geometric elements of a roadway.

CO3: analyze traffic characteristics by conducting various traffic studies.

CO4: perform various tests on aggregate, bitumen to access the suitability for road works.

CO5: design the flexible and rigid pavements.

CO6: discuss the recent advancement in transportation engineering

Course Contents

UNIT-I	Highway Development & Planning	6 Hours
Highway Development in India, Road Development Plans – Nagpur, Bombay, Lucknow, Vision 2021, Rural Road Development Vision 2025, Classification of roads, Road Patterns, Planning surveys and preparation of Master Plans based on saturation system.		
UNIT-II	Geometric design of highways	6 Hours
Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; Highway alignment, Bicycle and Pedestrian Facility Design.		
UNIT-III	Traffic engineering & control	6 Hours

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Traffic characteristics, Traffic engineering studies, Parameters characterizing traffic flow, traffic regulation and control devices (signs, signals, islands, road markings); types of road intersections

UNIT-IV

Pavement Materials and Construction

6 Hours

Materials used in Highway Construction and related tests - Stone aggregates, bituminous binders, bituminous paving mixes, viscosity based grading of bitumen, Modified Bitumens (Cutbacks, Emulsions, Crumbed Rubber Modified Bitumen, Polymer modified bitumen, foamed Bitumen, Marshall Stability Mix Design. Cold Mix Asphalt Technology, Warm Mix Asphalt Technology. Construction process of GSB, WBM, WMM, Cemented base, Bituminous Binders, Asphaltic Concrete (AC) or Bituminous Concrete (BC), Bituminous Macadam (BM), Dense Bituminous Macadam (DBM) and premix carpet, Dry lean Concrete (DLC), Pavement Quality Concrete (PQC).

UNIT-V

Pavement Design

6 Hours

Flexible pavements – Computation of design traffic (Vehicle Damage Factor VDF, Lane distribution factor LDF, Traffic growth rate); stresses in flexible pavements; design guidelines for flexible pavements as per IRC 37-2018; rigid pavements- components and functions; factors affecting design; design guidelines for concrete pavements as per IRC 58-2015; joints in pavements.

UNIT-VI

Modern Trends In Transportation Engineering

6 Hours

Recycled/Reclaimed Asphalt Pavement (RAP) (Manual Series -2), Concept of Superpave Mix Design (Superpave Series 2), Non-Destructive Evaluation of Pavements (Falling Weight Deflectometer FWD), GIS Application in Transportation Engineering, Use of Geosynthetics in Road Construction, gabion walls, Road Safety Audit (RSA),

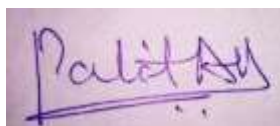
Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Experiments (Any 10)

1	Aggregate Impact Value Test
2	Aggregate Crushing Strength Test
3	Los Angeles Abrasion Test
4	Shape Test (Flakiness Index and Elongation Index)
5	Stripping Value Test
6	Specific Gravity and Water Absorption



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7	Penetration Test
8	Ductility Test
9	Viscosity Test
10	Softening Point Test
11	Flash Point & Fire Point Test
12	Specific Gravity
13	Marshall Stability Test
14	Traffic Volume Count
15	Parking Survey

Text Books:

1. Highway Engineering – S.K.Khanna, C.E.G. Justo and A. Veeraragavan, 2018, Nemchand Publisher, 7th Edition
2. Traffic Engineering and Transport Planning - L R Kadiyali
3. Principles of Transportation Engineering, Partha Chakroborty, Animesh Das, PHI Learning Pvt. Ltd, 2002

Reference Books:

1. A Course in Highway Engineering – S.P. Bindra, Dhanpat Rai and Sons, Delhi.
2. Principles of Transportation Engineering – G.V. Rao Tata MacGraw Hill Publication
3. Highway Engineering – Rangawala, Charotar publishing House, Anand (Gujarat)
4. Principles of Pavement Design - E.F. Yoder (John Wiley & Sons, Inc USA).
5. Fundamentals of Transportation Engineering - C. S. Papacostas.
6. Transportation Engineering – C. Jotin Khisty, B. Kent Lall, Pearson Publication

Other References:

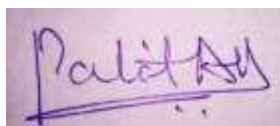
1. National Cooperative Highway Research Program (NCHRP)
2. Federal Highway Authority (FHWA)

Codes:

1. I.S. 1201 TO 1220-1978, IS 73, IS 2386 PART I to V
2. IRC 37-2018, Design of Flexible Pavement
3. I.R.C. 58- 2015, Design of Rigid Pavement
4. Specifications for Road and Bridge works (MORTH) 5th Revision, New Delhi.
5. IRC SP: 88 - 2019, Manual on Road Safety Audit

Resources:

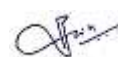
1. www.nptel.iitm.ac.in/courses/iitkanpur
2. www.cdeep.iitb.ac.in/nptel
3. www.fhwa.dot



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VII)
[CE4103A]: Construction Management

Teaching Scheme: TH: - 3 Hours/Week LAB:- 2 Hour/Week	Credit TH:3 PR: 1	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks Lab : 25 Marks
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Course Prerequisites: Basic Civil and Environmental Engineering, Professional Practices in Civil Engineering, Employability Skill Development.

Course Objective:

To familiarize the students with concepts and techniques in Construction projects, the methods used in project planning and analysis. The aim is to make them aware with important acts and laws related to construction industry along with measures for safety and material management.

Course Outcome:

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

CO1: explain various concepts related to construction projects and management

CO2: analyze the project network analysis through various techniques

CO3: perform project cost analysis through various methods

CO4: identify the concept of material procurement and management

CO5: Describe the knowledge of legal aspects involved in construction sector

CO6: Discuss the concept of construction safety management.

Course Contents

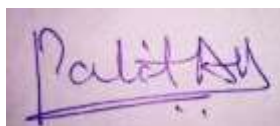
UNIT-I	Construction Management	8Hours
History and Principles of management, construction industry, Construction team, activities, Need and Importance of management in construction. Project Management - Basic forms and functions of organization. Role of planning department in construction projects. Roles and responsibilities of construction managers, Construction Project life cycle, detailed project report.		
UNIT-II	Project Analysis	8Hours
Bar-Charts, S-Curve, Work-breakdown-structure, Network techniques – History, basic terms and advantages. Network Scheduling, monitoring of network, CPM Network: Time estimate, Floats, Critical path. Network compression and updating, Introduction, Time estimates, Floats, Project duration. Introduction to precedence network.		

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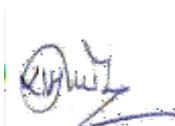
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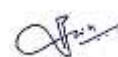
UNIT-III	Project Cost Analysis	8Hours
Cost analysis, cost curve, optimization and crashing of networks, Updating, resource levelling and allocation, Concept of smoothening and levelling, Line of Balance – concept and applications.		
UNIT-IV	Materials Management	8Hours
Importance and functions of Materials Management, Inventory analysis - Inventory Control techniques – Inventory models – ABC analysis, Economic order quantity (EOQ) technique, Just in time model, Material procurement and its management, Market research for material requirement and purchase.		
UNIT-V	Legal aspects: Acts and Laws	8Hours
Important acts and laws related with construction industries - factory act, the employees provident fund act, minimum wages act, workmen's compensation act, Indian trade union act, arbitration act, child labour act.		
UNIT-VI	Safety in construction	8Hours
Construction Safety Management – duties and responsibilities of top management, role of safety officers, responsibilities of general employees, safety committee, safety training, various safety equipments, personal protective equipments (PPE) used on site, First aid on site, Safety awareness programs, introduction to occupational insurance.		
Text Books: T1. Projects planning, Analysis Selection, Implementation and Review, Prasanna Chandra - Tata McGraw Hill, New Delhi, 2005 T2. Construction Project Management Planning, Scheduling and Controlling- Chitakara - Tata McGraw Hill, New Delhi T3. "Safety management" – Girimaldi and Simonds, AITBS, New Delhi		
Reference Books: R1. Construction Project Management Theory & practice --- Kumar Neeraj Jha, Pearson,2012 R2. Construction project scheduling and control ---Mubarak, Wiley India. R3. Real Estate, Finance and investment, Bruggeman. Fishr, McGraw Hill, 2010. R4. Construction Planning, Equipment and methods – Peurifoy-Tata McGraw Hill Publication		



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Lab Contents

Guidelines for Assessment:

Continuous assessment of term work is to be done based on overall performance and assignment performance of students. Each assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, punctuality and neatness.

Assignment/ Lab:

1. Minimum 2 site visits to a Construction project to study following documents and preparing a report

a. Material management

b. Site safety

c. Work culture in public projects

2. Scheduling of a Construction Project using Line of Balance Technique.

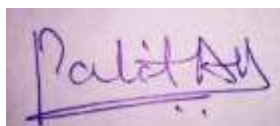
3. Assignment on Work Study on any two Construction Trades.

4. Assignment on EOQ Model and its variation.

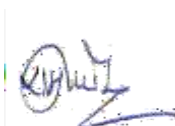
5. Assignment on application of any one software in construction industry.

Oral:

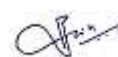
Oral examination shall be based on above assignments



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B. Tech (Civil Engineering)

2019 Pattern (SEM-VII)

[CE4103B]: Advance Design of Steel Structure

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation (TW+OR): 50 Marks
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Course Prerequisites:

Stress strain curve, Knowledge of Design philosophy of steel structure

Course Objective:

The objective of this course is to apply of advanced concepts of design of steel structures to tabular structure, cold form and chimney etc.

Course Outcome:

On completion of the course, student will be able to–

CO1: design the hoarding structures and castellated beams.

CO2: design tower and tubular structures.

CO3: design steel chimneys.

CO4: design of Cold form light gauge section

CO5: Analyze the Pre-Engineered buildings.

CO6: Design the Pre-Engineered buildings

Course Contents

UNIT-I	Hoarding Structures and Castellated beams and Tubular Structures	06 Hours
a) Hoarding Structures: Analysis and design of hoarding structures under dead, live and wind load as per the latest IS: 875 by limit state method. b) Castellated beams: Concept, fabrication of the castellated beam from rolled steel section, design of castellated beam for bending and shears as per latest code by limit state method. c) Tubular Structures: Design of tubular Trusses and scaffoldings using circular hollow, rectangular hollow sections as per code, detailing of joints		
UNIT-II	Towers Structures	06 Hours
a) Microwave Towers: Introduction, structural configuration, function, analysis and design. b) Transmission Towers: Introduction, structural configuration, bracing systems, analysis and design as per code. Use working stress method.		
UNIT-III	Design of chimneys	06 Hours

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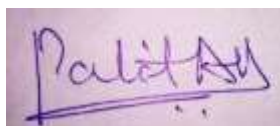
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Introduction, type, joints, lining, ladder, forces acting on chimney, design of thickness of steel plates for self-supporting chimney. Design of anchor bolt, design of foundation and stability of steel chimneys.

UNIT-IV	Cold form light gauge section	06 Hours
Advantage, type of cross section, stiffened multiple stiffened and un-stiffened element, flat-width ratio, and effective design width, design of light gauge compression, tension and flexural members as per code.		
UNIT-V	Analysis of the Pre-Engineered buildings	06 Hours
History Concept, Difference between Conventional Steel Buildings and Pre-Engineered buildings, components of pre-engineered buildings, material and connections used for manufacturing of PEB, Advantages of PEB, Applications of PEB, Pre-Engineered Building Components. Plastic analysis, Analysis for wind load, Seismic analysis.		
UNIT-VI	Design of Pre-Engineered buildings	06 Hours
Design of primary frame, Gable end framing, Secondary framing, Bracing systems.		

References Books:

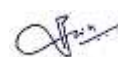
- R1:** R. Chandra, "Design of steel Structures, Volume II", Standard Book House, New Delhi.
R2: B.C. Punmia and A. K. Jain, "Comprehensive Design of steel structure", Laxmi Publication, New Delhi.
R3: M Raghupathi, "Design of steel structures", Tata McGraw Hill, New Delhi.
R4: S. K. Duggal, "Limit state design of steel structures", Tata McGraw Hill Education.
R5: N. Subramanian, "Design of steel structures", Oxford University Press.
R6: IS: 800 - 2007, "Code of Practice for General Construction in Steel", BIS, New Delhi.
R7: IS: 800 - 1984, "Code of Practice for General Construction in Steel" BIS, New Delhi.
R8: IS: 801 - 1975, "Code of Practice for use of cold formed light gauge steel structural members in general building construction", BIS, New Delhi.
R9: IS: 802(Part I and II)-1978, "Code of practice for use of structural steel in overhead transmission line towers", BIS, New Delhi.
R10: IS:806-1988, "Code of practice for use of steel tubes in general building construction", BIS, New Delhi.
R11: IS: 811-1987, "Specification for cold formed light gauge structural steel sections", BIS, New Delhi.
R12: A Newman, "Metal Building Systems Design and Specifications", McGraw-Hill publication, ISBN 978-0-07-177664-6
R13: N Subramanian, "Design of Steel Structures", OUP India publication, ISBN 978-0-19- 567681
R14: K. S. Vivek and P. Vaishnavi, "Pre-Engineered Steel Buildings", Lambert Academic Publishing
 Supplementary Reading:
<http://nptel.ac.in/courses/105106113/3>



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 Department of Civil Engineering



B. Tech (Civil Engineering)

2019 Pattern (SEM-VII)

[CE4103C]: Solid Waste Management

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation (TW+OR) : 50 Marks
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Course Prerequisites:
Basics of Environmental Science

Course Objective:

To provide necessary knowledge regarding functional elements of solid waste management and to create awareness about environmental legislation and government initiatives pertaining to solid waste.

Course Outcome:

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

CO1: Describe the Sources, Composition and Characteristics of Municipal Solid Waste and Environmental impact of mismanagement

CO2: Choose proper vehicle routing and sites for collection and storage of solid waste.

CO3: Identify proper processing and disposal technique for municipal solid waste.

CO4: Illustrate Thermal Processing and Landfills

CO5: Explain functional elements of biochemical processes and associated rules and government initiatives regarding solid waste disposal

CO6: Select proper processing and disposal technique for plastic waste.

Course Contents

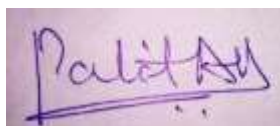
UNIT-I	Sources, Composition and Characteristics of Municipal Solid Waste	06Hours
Introduction, Sources and types of solid waste, Composition of solid waste, Physical, Chemical and Biological characteristics of municipal solid waste, Solid Waste Management: Objectives, Functional elements, Environmental impact of mismanagement, Present Indian Scenario of solid waste management system.		
UNIT-II	Solid Waste Generation, Collection and Storage	06 Hours
Waste Generation Rate: Definition, Typical values for Indian cities, Factors affecting. Storage and collection: General considerations for waste storage at source, Collection components, Types of collection systems and its design, Transportation of solid waste: Means and methods, Routing of vehicles. Transfer station: Need, Types, factors affecting Capacity and Location		

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UNIT-III	Waste Processing Techniques & Material Recovery	06 Hours
Waste Processing Techniques: Purpose, Mechanical volume and size reduction, component separation techniques. Material Recovery and Recycling: Objectives, Recycling program elements, commonly recycled materials and processes. Energy recovery from solid waste		
UNIT-IV	Thermal Processing and Landfills	06 Hours
Fundamentals of thermal processing, Combustion, Effects of combustion, Pyrolysis, Incineration, Refuse derived fuels, Energy recovery, Landfill: Classification, planning, landfill processes, design and operation, maintenance		
UNIT-V	Biochemical Processes and Waste Management legislation	06 Hours
Factor affecting, properties, benefits, Aerobic and Anaerobic digestion, Composting, Vermi- composting and other biochemical processes Waste Management legislation in India, integrated management-public awareness; Role of NGO's; Introduction to various initiatives of the Govt. of India such as Swachh Bharat Mission, occupational hazards and safety measures. Construction waste disposal act 2016.		
UNIT-VI	Plastic Waste Management	06 Hours
Plastic Waste – Sources, Production, Global and Indian Context Plastic Waste Management Practices – Use of Plastic waste in roads, issues and challenges Possible Alternate Materials to Plastics –Greener Alternatives, Plastics Resource Recovery and Circular Economy, Plastic Waste Management Rules 2016 (India) and Global Rules and Regulations		
Lab Contents		
Guidelines for Assessment		
Continuous assessment of laboratory work is to be done based on overall performance and assignments performance of student. Each assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.		
Term work		
1	Assignment on ‘Sources, Composition and Characteristics of Municipal Solid Waste’	
2	Assignment on ‘Solid Waste Generation, Collection and Storage’	
3	Assignment on ‘Waste Processing Techniques & Material Recovery’	
4	Assignment on ‘Thermal Processing and Landfills’	
5	Assignment on ‘Biochemical Processes and Waste Management legislation’	
6	Assignment on ‘Plastic Waste Management’	
7	Detailed industrial site visit report on Landfill site or garbage depot.	
Text Books:		
T1 Bhide. A. D. and Sundaresan. B. B., —Solid Waste Management, Indian National Scientific Documentation Centre, 1st Edition, 1983.		
T2 George Tchobanoglous, Hilary Theisen, and S. A. Vigil, —Integrated Solid Waste Management, McGraw-Hill Publications, Indian edition, 2015.		
T3 Reddy Jayarama P., —Municipal Solid Waste Management, B S publications, 1st edition, 2018		



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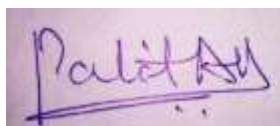
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Reference Books:

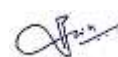
- R1. George Tchobanoglous and Frank Kreith, —Handbook of Solid Waste Management, McGraw Hill Education, 2nd edition, 2002.
- R2. Manual on Municipal Solid Waste Management - CPHEEO, Ministry of Urban Development, GoI, New Delhi, 2000.
- R3. Peavy H. S., Rowe D. R. and Tchobanoglous G, —Environmental Engineering, McGraw-Hill Book Company, International edition, 1985.



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VII)
[CE4104]: Project Phase- I

Teaching Scheme: TU: 01 Hours/Week LAB: 10 Hours/ Week	Credit: 06	Examination Scheme: TW: 50 Marks Oral: 100 Marks Total :150 Marks
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Course Prerequisites:
Knowledge of Civil Engineering.

Course Objective:
 1. To identify the field of interest.
 2. To enhance the knowledge in the selected field.
 3. Promoting learning through Do-It-Yourself (DIY).

Course Outcome:
 On completion of the course, student will be able to—
 CO1: Identify current research trends, advanced techniques, and interdisciplinary developments in Civil Engineering.
 CO2: Select relevant literature using various technical databases and scholarly resources.
 CO3: Interpret key findings from the reviewed literature.
 CO4: Prepare structured technical report.
 CO5: Demonstrate effective oral presentation skills.

Course Contents

Project Phase-I forms a critical foundation for the Final Year Project (Phase-I) and is an essential component of experiential learning. The objective is to enable students to identify a relevant civil engineering problem, conduct a thorough investigation through literature and/or field study, and document the progress made. This phase is expected to reflect a strong understanding of core and advanced civil engineering concepts, innovation, and practical application in societal or industrial contexts.

Students must submit a printed report (both sides) in the standard institute-approved format, which includes the following components:

1. Introduction
 - Background of the study
 - Aim and objectives of the project
2. Review of Literature
 - Detailed review of previous studies and research related to the topic

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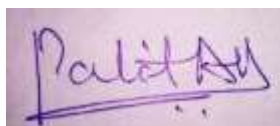
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- Identification of research gaps
- 3. Problem Statement and Methodology
 - Clear articulation of the problem
 - Proposed approach/methodology for addressing the problem
- 4. Data Collection / Experimental Setup
 - Data gathered from field surveys, experiments, case studies, or organization
 - Details of laboratory work or software modeling (if applicable)
- 5. Limitations and Challenges
 - Any constraints, limitations, or challenges faced during this phase
- 6. Progress Achieved
 - Detailed summary of the work completed in Phase-I
- 7. Future Plan of Action
 - A well-defined plan for continuing the work in Project Phase-II
- 8. References
 - Properly formatted references from books, journals, websites, standards, etc.

B. Assessment Criteria

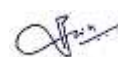
- Project Presentation
 - Each student or group shall deliver a formal presentation on their project progress before a panel of examiners.
 - The presentation should clearly outline the problem identified, the methodology adopted, initial results, and future steps.
- Evaluation Parameters (*indicative*):
 - Clarity of objectives and problem statement
 - Depth of literature review and relevance of references
 - Innovation and applicability of methodology
 - Quality of data collected and analysis conducted
 - Professionalism of the report and presentation
 - Active participation and progress tracking



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B. Tech (Civil Engineering)

2019 Pattern (SEM-VIII)

[CE4105]: Project and Finance Management

Teaching Scheme: TH: - 3 Hours/Week LAB: - 2 Hours/ week	Credit TH:3 PR: 1	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam :60 Marks Lab :25 Marks
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Course Pre-requisites:

Basic Civil and Environmental Engineering, Professional Practices in Civil Engineering, Employability Skill Development

Course Objective:

To familiarize the students with the concepts and techniques in Project and Financial Management. The aim is to enrich them with the classical concepts and methods to understand the advanced level of management system and its application in every construction project which will enhance startup thinking useful in construction sector.

Course Outcome:

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

CO1: express the different aspects of project and financial management.

CO2: execute the knowledge of capital budgeting and working capital in construction projects.

CO3: estimate and categorize the project economics with the use of various techniques.

CO4: explain the concepts of taxation in construction industry

CO5: demonstrate the roles and importance of regulatory bodies

CO6: explain the process of start-up

Course Contents

UNIT-I	INTRODUCTION	6 Hours
Introduction - Principles of Management, different types of construction projects, Project Life Cycle, phases in project life cycle, Pre-feasibility report and clearance, project estimate, Techno economic feasibility report, detailed project report, partners in project Introduction to financial Management: Goal of financial management, key activities in financial management, role of financing institutes in construction sector: banking institutions, Non-Banking Financial Company (NBFC), Real estate bonds, housing finance institutions etc.		
UNIT-II	FINANCIAL MANAGEMENT	6Hours

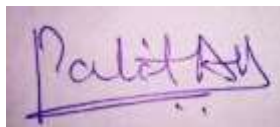
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Budget, types of budgets, master budget, cost estimating and budgeting in civil engineering project, definition of capital budgeting, process of capital budgeting, techniques of capital budgeting, preparation of financial statements, financial decision making in a construction project.
Meaning and types of working capital, components of working capital, factors affecting working capital, working capital management, estimation of working capital, components of working capital in Construction Company financing resources of working capital, SIDBI (Small Industries Development Bank of India)

UNIT-III	PROJECT ECONOMICS	6 Hours
Inflation accounting and corporate practices in Construction, Profit and loss, Balance sheet, Income statement, Simple and Compound Interest. Time value of money, Cash flow, Pay-back period, Net present value (NPV), Rate of Return (ROR), Internal Rate of Return (IRR), benefit cost ratio, benefit cost analysis, replacement analysis, break even analysis.		
UNIT-IV	TAXATION	6 Hours
Introduction to direct and indirect tax, GST, impact of GST on construction industry, tax exemption for contractors, property tax: types, methods of calculation, tax deductions against income from property, corporate tax planning.		
UNIT-V	REGULATORY BODIES	6Hours
Financial regulatory bodies: roles & functions, CIDC (Construction Industry Development Council), NREDC (National Real Estate Development Council), ICRA (Information and Credit Rating Agency of India), SEBI (Security and Exchange Board of India), IRDA (Insurance Regulatory & Development Authority) and RBI (Reserve Bank of India) - Bank and its types, uses and functions of banking related to construction, banking systems, Introduction and functions of Maharashtra Real Estate Regulation Act (MahaRERA)		
UNIT-VI	STARTUP ORIENTATION	6Hours
Business process management, National initiatives for start-ups and Entrepreneurship development, perspectives of Atmanirbhar Bharat, National funding schemes for construction sector, Micro, Small and Medium Enterprises (MSME), scope and development of allied construction industries.		
Text Books: T1. Prasanna Chandra, Projects Planning, Analysis Selection, Implementation and Review, Tata McGraw Hill, New Delhi. T2. "Construction Project Management" – K. K. Chitkara, TATA McGraw Hill. T3. "Financial Management" – Prasanna Chandra, TATA McGraw Hill		
Reference Books: R1. "Project planning and Control with PERT and CPM" - B. C. Punmia, Laxmi Publication. R2. "Industrial Engineering and Management" - O.P. Khanna, Dhanapat Rai Publication. R3. "Construction Engineering and Management" - Dr. S. Seetharaman, Umesh Publications R4. "Engineering Economics" - Paneerselvam, PHI Publications. .		



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B. Tech (Civil Engineering)

2019 Pattern (SEM-VIII)

[CE4106]: Dams and hydraulics structures

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation (OR) : 50 Marks
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Course Prerequisites:

Fluid Mechanics, Fluid Mechanics-II, Hydrology and water resource engineering, solid mechanics, concrete technology.

Course Objective:

To develop the ability to understand and hydraulic design the components parts of dam.

Course Outcome:

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

CO1: recognize type of dams, concept of retrofitting and dame instrumentation

CO2: check the stability of gravity dam

CO3: Design spillway and energy dissipator

CO4: Analyses stability of earthen dam

CO5: choose appropriate Cross Drainage works

CO6: select type of River training works.

Course Contents

UNIT-I	Introduction to dams and Dam Safety and Instrumentation	06 Hours
Introduction to dams Introduction, , Different terms related to dams, Selection of site for dam, Factors governing selection of type of dam, Classification of dams , Dams and earthquakes, Dams and social issues, Large dams verses small dams, Displacement and rehabilitation, Dams and climate change, Dam Safety and Instrumentation Introduction, Objectives of dam safety and instrumentation, Types of measurements, , Working principles and functions of instruments, Selection of Equipment's, Different Instruments, Piezometers and type ,Settlement measurement system, Inclinator, Joint meter, Pendulums and its type, ,Vibrating wire pressure cell, Extensometer, Embedment strain gauge, Temperature gauge, distributed fiber optics temperature tool, seismograph.		
UNIT-II	Gravity Dams, Arch Dam and Other Dams (Introduction only)	06 Hours

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Gravity Dams Introduction, Components of gravity dam, Conditions favoring gravity dams, Forces acting on gravity dam, Combinations of loading for design, Seismic analysis of dam, Terms related to seismic analysis, Determination of Seismic forces (Zangar's method), Effect of horizontal earthquake acceleration, Effect of vertical earthquake acceleration, Stress analysis in gravity dam (Only concept, no derivations), Vertical or normal stress, Principal stresses, Shear stress, Middle third rule, Modes of failure of gravity dam, Elementary profile of gravity dam, Concept of low and high gravity dams, Various Design methods of gravity dam (Introduction only)— Details of Gravity method or 2 D method, Construction of gravity dams, Colgrout masonry, Roller Compacted Concrete (R.C.C.), Rubber dam, Retrofitting of the dam, strengthening of dam

Arch Dam and Other Dams (Introduction only) Introduction, Concept of Arch Dam, Conditions favoring an arch dam, Classification of an arch dam, Buttress dams, Advantages of Buttress dams, Limitations of Buttress dams, Types of buttress dams.

UNIT-III	Spillway and Gates	06 Hours
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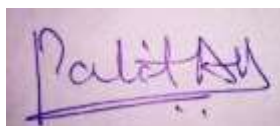
Capacity, Components of spillway Classification of spillway, Classification based on operation, gates, and features-, Stepped spillway, piano key type spillway Design of Ogee spillway, Energy dissipation below spillway, Classification of energy dissipation devices, Energy dissipation in stilling basin, Stilling basin, Components of stilling basin, Types of stilling basins, Correlation between jump height and tail water depth.

Spillway Gates Introduction of Spillway gates, Classification of spillway crest gates, Classification based on function, Classification based on movement of gates, Classification based on special features, Introduction to automatic gates, Maintenance of gates, Inspection of gates.

UNIT-IV	Earth Dam	06 Hours
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Introduction, Conditions favoring an earth dam, Limitations of earth dam, Classification of earth dam, Classification based on---materials, method of construction, height; Selection of type of earth dam, Components of an earth dam, Requirements for safe design of earth dam, Hydraulic (Seepage) Analysis, plotting of seepage line, Case 1: Homogeneous earth dam with horizontal drainage blanket, Determination of seepage discharge using phreatic line. Case II: Composite earth dam with casing and hearting, Properties of phreatic line, Determination of seepage discharge through earth dam using flownet, Forces acting on earth dam, Method of stability analysis of an earth dam, Procedure of analysis by Swedish slip circle method, Fellenius Method of Locating Centre of Critical Slip circle, Stability analysis for foundation, Failure of earth dam, Classification of failure of earth dams, Seepage control in earth dams, causes of seepage, Seepage control measures, Construction of earth dam,

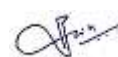
UNIT-V	C. D. Works	06 Hours
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Introduction, Necessity of cross drainage works, Selection of site for Cross Drainage work, Data required for design of Cross Drainage work, Classification of Cross Drainage works, Drain over canal-Siphon, Super passage, Canal over drain—Aqueduct, Siphon aqueduct, Canal and drain water mixed in each other--Level crossing, Inlet and Outlet, Selection of suitable type of C. D. works, Design considerations for cross drainage works.

UNIT-VI	River Training Structures	06 Hours
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Introduction, Classification of rivers, Classification based on topography, regime, alignment, source, Behaviour of rivers, River training, Objectives of river training, Classification of river training, purpose, orientation, River training structures, Embankment or Levee, Guide banks, Groins or spurs, Artificial cut off, Pitched island, Submerged sill or dykes, Closing dykes.

Lab Contents

Guidelines for Assessment

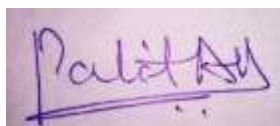
Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments

GROUP A	1) Stability analysis of gravity dam
	2) Design of profile of spillway and energy dissipation device below the spillway
	3) Stability analysis of zoned earthen dam
GROUP B	Site visits and reports with photographs (compulsory).
	1. Gravity dam.
	2. Earth dam

Text Books:

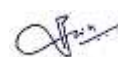
T1 . Irrigation, Water Resources and Water Power Engineering- Modi, P.N. - Standard Book House, New Delhi, 2nd ed, 1990



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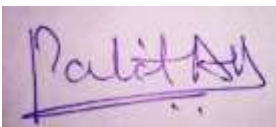
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Reference Books:

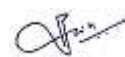
- R1. Irrigation Engineering and Hydraulic Structures- Garg S.K- Khanna Publishers N.D. 13th ed, 1998.
- R2. Irrigation and Water Resources Engineering- Asawa G.L- New Age International (P) Ltd. Publishers, first ed, 2005.
- R3. Roller Compacted Concrete Dams- Mehrotra V.K- Standard Publishers Distributors, Delhi, 1st ed, 2004.
- R4. Earth and Earth Rock Dams- Sherard J.L, Woodward R.J. - John Wiley and Sons, inc. 1963.



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)

[CE4107A]: Smart City management of Urban Infrastructure

Teaching Scheme: TH: - 03Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites :Nil

Course Objective:

- To develop a basic understanding about various types of Infrastructure and Smart city.
- To enable the students to apply the basic need and planning concept to solve various Infrastructure problems.

Course Outcome:

Course Outcome:

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

CO1: Identify components of infrastructure and Prepare infrastructure plan for smart city.

CO2: Explain the necessity of infrastructural development for smart cities.

CO3: Discuss smart transport system for cities and its application.

CO4: Apply water resources systems for smart city.

CO5: Explain National and Global policies to implement for smart city development.

Unit I	Fundamental of smart city & Infrastructure	06 Hours
Introduction of Smart City, Concept of smart city, Objective for smart cities, Need to develop smart city, Different steps in the selection of Smart Cities, Challenges of managing infrastructure in India and world, various types of Infrastructure systems.		
Unit II	Planning and development of Smart city	06 Hours
Energy and ecology, solar energy for smart city, Housing, sustainable green building, Rating system of green building safety, security, disaster management, economy, Project management.		
Unit III	Intelligent transport systems	06 Hours
Smart vehicles, GIS, GPS, Navigation system, traffic safety management, mobility services, E-ticketing		
Unit IV	Management of water resources and urban energy management	06 Hours
Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system, urban energy management		
Unit V	Infrastructure Management system & Policy for Smart city	06 Hours

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Integrated infrastructure management systems for smart city, Infrastructure management, Infrastructure Development, IT Application in Infrastructure, Infrastructure Sector Economy and Planning, Infrastructure Law and Policy

Unit VI

Real Estate Planning

06 Hours

Introduction to real estate, definition, principles of real estate value concepts, methods of valuation, introduction to real property ownership, leasing property succession, methods of sale/ purchase, title search

Text Books:

T1.Introduction to Smart Cities, P.P.Anilkumar | First Edition | By Pearson Publication

T2.Designing the Urban Future: Smart Cities , by Coleen Marlo ,Scientific American Blackstone Publication .

Reference Books:

R1. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li

R2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos

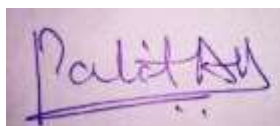
R3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend

R4. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988

R5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997

R6. 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

R7. 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](http://smartcities.gov.in/upload/uploadfiles/files/Smart%20City%20Guidelines(1).pdf)



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)

[CE4107B]: Integrated Water Resources Planning & Management

Teaching Scheme: TH: - 3 Hours/Week	Credit 03	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks Total: 100 Marks
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Course Prerequisites : Hydrology and Water Resource Engineering (CE3108).

Course Objective:

To introduce the students to the interdisciplinary analysis of water and conceptual design of intervention strategies. To develop a knowledge-base on capacity building on IWRM.

Course Outcome:

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

CO1: Discuss objectives, principles and evolution of integrated water resources management.

CO2: Explain contextualizing IWRM

CO3: Describe emerging issues in water management, flood, drought, pollution and poverty.

CO4: Explain the water resources development in India and wastewater reuse.

CO5: Discuss integrated development of water management.

Course Contents

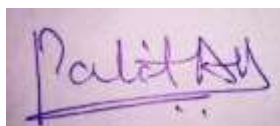
UNIT-I	IWRM Framework	06 Hours
Introduction: World water resources, water resources in India, water as finite resource, variability of water in time & space, history of water resources development, water infrastructure-problems and perspectives, present institutional framework for water management. Definition – Objectives – Principles - Evolution of IWRM - IWRM relevance in water resources management – Paradigm shift: Processes and prospective outcomes. Water laws: Constitutional provisions, National Water Policy.		
UNIT-II	Economics & Paradigm shift in water management	06 Hours
Economics of water :Water as economic good, intrinsic value, principles of water pricing & water allocation, capital cost, opportunity cost, internal rate of return, benefit cost analysis, principles of planning and financing of water resources project : Discussion on any two case studies') Paradigm shift in water management: Global and national perspectives of water crisis, water scarcity, water availability and requirements for human and nature, concepts of 'blue water', 'Green water', and 'virtual water', and their roles in water management. Sustainability principles for water management, framework for planning a sustainable water future.		

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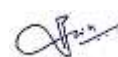
UNIT-III	Basin scale hydrology	06 Hours
a) Estimation of surface water, estimation of ground water draft/recharge import/export of water (inter basin water transfer), recycling and reuse and storage, control of water logging, salinity, & siltation of storages. B) Flood & Drought management: causes of floods, structural and non-structural measures, mitigation plan, flood damage assessment, use of geoinformatics for flood management. Types of droughts, severity index, drought forecasting, damage assessment, mitigation plan, use of geoinformatics for drought management		
UNIT-IV	Water demand and supply based management	06 Hours
(a) Consumptive & non consumptive demands, irrigation demand estimation, water utilization, irrigation efficiency, water management in irrigation sector. (b) demand estimation in hydro/thermal/nuclear power sector, estimation & forecasting of water demands of domestic & industrial sector, navigation and recreational water demands		
UNIT-V	Environmental and social aspects	06 Hours
Environmental management: protection of vital ecosystems, water requirements for environmental management, aquaculture, minimum flows, water quality management for various uses. b) Social impact of water resources development: direct/ indirect benefits, employment generation, industrial growth, agro-industry, enhanced living standards, education & health, co-operative movement, management of rehabilitation & resettlement.		
UNIT-VI	Basin planning & Watershed management	06 Hours
a) Perspective plan for basin development & management, Decision support system for Integrated Water Resources Management (IWRM), use of data driven techniques like Artificial Neural Networks, Genetic programming, Model Tree in water resources planning, development & management. b) Watershed Management: Watershed definition, classification of watersheds, integrated approach for watershed management, role of RS & GIS in watershed management, soil and water conservation necessity- soil erosion- causes- effects-remedial measures, contour bunding- strip cropping bench terracing-check dams.		
Text Books: T1. Water Resources Systems Engg, D. P. Loucks, Prentice Hall T2. Water Resources Systems Planning and Management, Chaturvedi, M.C. Tata McGraw Hill T3. Economics of Water Resources Planning, James L.D and Lee R.R, McGraw Hill T4. Water resources hand book; Larry W. Mays, McGraw International Edition T5.Design of Water Resources Systems, Arthur Mass, MacMillan 1962.		
Reference Books: R1. Economics of Water Recourses Planning, L. D. James & R.R.Leo, McGraw Hills, NY 1971. R2. Water Resources Systems Engineering, W. A. Hill & J. A. Dracup. R3. Water shed Management – B.M. Tideman R4. Watershed management –J. V. S. MURTY, new Age International Publisher. R5. Integrated Watershed Management Perspectives and Problems - Beheim, E., Rajwar, G.S., Haigh, M., Krecek, J. (Eds.) , Springer Publication. R6. Managing Water in River Basins: Hydrology, Economics and Institutions -- M. Dinesh Kumar, Publisher: Oxford Universit Press		



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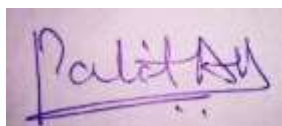
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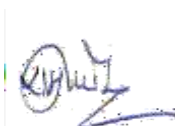
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- R7. Water Resources Design Planning Engg. and Economic; Edward Kuiper, Butterworth & Co.
R8. ANN in Hydrology; Govinda Raju & Ramachandra Rao; PHI
R9. Integrated Water Resources Management in Practice: Better Water Management for Development - R. L. Lenton, Mike Muller , Publisher Earthscan.
R10. Sustainability of Integrated Water Resources Management - Editors: Setegn, Shimelis Gebriye, Donoso, Maria Concepcion (Eds.) Publisher Springer International Publishing
R11. Integrated Water Resources Management in the 21st Century: Revisiting the paradigm - Pedro Martinez-Santos, Maite M. Aldaya, M. Ramón Llamas, Publisher CRC Press, Taylor & Francis Group.
R12. Key Concepts in Water Resource Management: A Review and Critical Evaluation - Jonathan Lautze, publisher Routledge.
R13. Water Management – Jasapal Singh, M.S.Achrya, Arun Sharma – Himanshu Publication

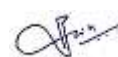
e- Resources: [nptel.iitm.ac.in/courses /webcourse-contents / IISc-Bang/water resource management](http://nptel.iitm.ac.in/courses/webcourse-contents/IISc-Bang/water%20resource%20management)



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)
[CE4107C]: Optimization Techniques

Teaching Scheme: TH: - 03Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation (OR) : 50 Marks
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Course Prerequisites: Engineering mathematics.

Course Objective:

To familiarize the students with the concepts and techniques of linear and integer programming to enhance their analytical approach to solve a problem. Problems associated with the complex motions in construction sector including material inventory.

Course Outcome:

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

CO1: Understand different optimisation methods.

CO2: Apply optimization techniques in civil engineering.

CO3: Solve engineering problems with the use of various algorithm

CO4: apply techniques for transportation problem

CO5: analyse the concept of game theory and sequencing

CO6: understand the concept of Inventory and Queuing Models

Course Contents

UNIT-I	Introduction and Basic Concepts	06Hours
Historical Development; Engineering applications of Optimization; Art of Modelling, Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems, Classification of optimization problems, Optimization techniques – classical and advanced techniques		
UNIT-II	Linear Programming	06 Hours
Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations, Graphical method for two variable optimization problem; Examples, Motivation of simplex method, Simplex algorithm and construction of simplex tableau; Simplex criterion; Minimization versus maximization problems, Revised simplex method.		
UNIT-III	Integer Programming	06 Hours

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Formulations, Zero-One Problem- additive algorithm, Gomory's cutting plane algorithm, Branch and bound algorithm, All integer primal-dual algorithms

UNIT-IV

Transportation and Assignment

06 Hours

Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in TP; Assignment Problem, Hungarian Method, Traveling Salesman Problem

UNIT-V

Game Theory and Sequencing

06 Hours

Two Person Zero Sum Game, Pure and Mixed Strategies, Algebraic Solution Procedure, Graphical Solution, Solving by Linear Programming; Sequencing Problem, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem.

UNIT-VI

Inventory and Queuing Models

06
Hours

Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model, Newsboy Problem. Elements of Queuing Model, Pure Birth Death Model, Single Server and Multi-server Markovian Models, Machine Repair Model, Networks of Queues.

Text Books:

T1. Chandra, Suresh, Jayadeva and Mehra, Aparna, Numerical Optimization with Applications, Narosa, 2009.

T2 Hiller, F. S. and Liebermann, G. J., Introduction to Operations Research, Tata McGraw Hill, 2002.

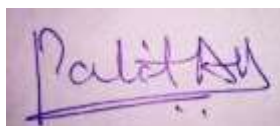
Reference Books:

R1. Mittal, K. V. and Mohan, C., Optimization Methods in Operations Research and Systems Analysis, New Age, 2003.

R2 Mohan, C. and Deep, Kusum, Optimization Techniques, New Age, 2009.

R3 Ravindran, A., Phillips, D. T and Solberg, J. J., Operations Research: Principles and Practice, John Willey and Sons, 2nd Edition, 2009.

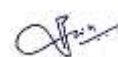
R4 Rao S. S. Engineering optimization: Theory and Practice, 4th Edition, ISBN: 978-0-470-18352-6, 2009.



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)
[CE4107D]: Coastal Engineering

Teaching Scheme: TH: - 03Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites:
 Fluid mechanics , Dock Engineering , Wave mechanics

Course Outcome:

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

CO1: Explain coastal engineering aspects of harbors methods to improve navigation.

CO2: Discuss the wave properties and analysis of wave.

CO3: Describe the concepts of sediment transport.

CO4: Design of shore defense structures.

CO5: Explain modeling in coastal engineering

Course Contents

UNIT-I	Unit 1: Introduction	06 Hours
Basic understanding of wave and tides including wave generation, propagation, form and assessment in the surf zone. Statistical and spectral analysis of recorded wave data and prediction in coastal zone, Sediment motion along the coast.		
UNIT-II	Tides & Coastal Processes	06 Hours
Global tidal cycle, tidal analysis. Types of tides, effect of tides, significance in coastal engineering, Coastal process-erosion/accretion due to waves, estimation of littoral drift, Effect of construction of coastal structures on stability of shoreline / beaches, shoreline configuration.		
UNIT-III	Coastal Structures	06 Hours
Introduction to Coastal structures: Design criteria and functional aspects of coastal structures: sea wall, revetment, bulk-head, quay- wall, jetties, breakwater types: rubble-mound, composite, floating and pneumatic types, design of RBW, Introduction to offshore structures: oil platform, design criteria for sub marine pipelines, cables, response of oil platform members, floating structure to wave load –vibration and spacing of piles, forces on piles.		
UNIT-IV	Ports & Harbors	06 Hours

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Planning and management of port and Harbors, Modern trends and techniques in port engineering. - Roll on-Roll off/ Lift on –Lift off etc. Special purpose ports: Concepts of twin /mother port, SBM, outer to outer port etc. Significance of port cost analysis economic.

UNIT-V	Dredging & Disposal	06 Hours
Dredging technology: types of dredgers, Radioactive tracers' studies for feasibility of dumping ground for dredged materials- environmental aspects of dredging etc. Pollution in Coastal zone, disposal of waste/dredged spoils, design criteria of coastal outfall inlets and system. Oil spills and contaminants, coastal zone management: activities in coastal zone, CRZ, Coastal 25 regulation zone		

UNIT-VI	Case Study	06 Hours
Application & case studies for Coastal Engineering Projects. Including Site & Lab (CWPRS) visit, desk studies for port development		

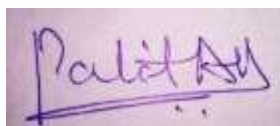
Text Books:

T1. Basic Coastal Engineering-R.M.Sorensen, 2006. T2. Coastal Hydrodynamics-J.S.Mani ,I IT Madras

Reference Books:

R1. Shore Protection Manual-U.S.Waterways Experiment Station Corps of Engineer, Coastal Protection Manual 2002. Narasimhan and S. Kathirolu.

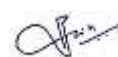
R2. Harbour and Coastal Engineering”, Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)
[CE4108]: Project Phase- II

Teaching Scheme: LAB: 16 Hours/ Week	Credit: 8	Examination Scheme: TW: 100 Marks Oral: 150 Marks Total :250 Marks
Course Prerequisites: Knowledge of Civil Engineering.		
Course Objective: To provide hands-on experience in completing an engineering project through problem identification, analysis, design, development, testing, and evaluation. Students will demonstrate independent thinking, teamwork, and technical communication through the final report and presentation.		
Course Outcome: On completion of the course, student will be able to— CO1: Apply principles of engineering and relevant technologies to develop feasible and innovative solutions. CO2: Design sustainable and cost-effective solutions considering technical, environmental, and societal aspects. CO3: Plan and execute project activities efficiently while demonstrating teamwork, leadership, and communication skills. CO4: Utilize appropriate methods and tools for analysis and validation. CO5: Prepare technical reports, communicate project outcomes professionally.		
Course Contents		
Report Writing: In Project Work Stage II, the student shall complete the Project. The student shall prepare the final report of Project work in standard format duly certified for satisfactory completion of the work by the concerned guide and Head of the Department/Institute. The report shall consist of the following as applicable. • Introduction including aim and objective of the Project topic. • Review of literature. • Problem statement. • Theoretical contents associated with the dissertation topic. • Methodology adopted. • Data collection from field or organization / experimental set up preparation if any/analysis.		

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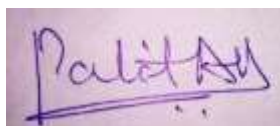
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- **Results and discussion.**
- **Validation of results if applicable.**
- **Conclusions and future scope of work.**
- **References.**

Assessment:

The final dissertation shall be submitted in hard bound copy as well as a laminated Poster. The Term Work of Dissertation of semester VIII shall be assessed jointly by the pair of internal and external examiners, along with oral examination of the same. The candidate shall deliver a presentation on report of Project Stage-II (Project work) in front of external and internal examiner.

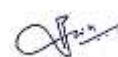
It is recommended that at least one paper on the Project topic to be presented in a conference or published in a referred journal as a part of the progress report of Project Phase-II.



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)
[CE4109]: Industry Internship

Teaching Scheme: TH: 00 Hours/Week	Credit: 03	Examination Scheme: Term work : 200 Marks Oral/ Presentation: 150 Marks Total :350 Marks
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Course Prerequisites:

Knowledge of Civil Structural Engineering.

Course Objective:

1. To identify the field of interest.
2. To enhance the knowledge in the selected field.
3. Promoting learning through Do-It-Yourself (DIY).

Course Outcome:

On completion of the course, student will be able to–

CO1: Apply theoretical knowledge in real-world construction projects by understanding site execution, material selection, and structural practices.

CO2: Develop technical report writing and documentation skills to effectively communicate project details, progress, and analysis.

CO3: Gain hands-on experience with modern construction techniques and tools used in planning, design, and execution.

CO4: Demonstrate teamwork, leadership, and project management skills by effectively collaborating with professionals in a real-world construction environment.

CO5: Apply industry standards, safety regulations, and ethical responsibilities to ensure sustainable and responsible construction practices.

CO6: Analyze various career paths in the construction industry and align personal career goals with industry demands.

Course Contents

A. Internship Engagement

Students must undergo a full-time internship in any of the following organizations:

- Civil/Structural Engineering Design Consultancy
- Government Bodies (PWD, WRD, Urban Local Bodies)
- Infrastructure Companies (roads, bridges, dams, buildings)
- Research Institutes or Approved Start-ups (civil domain)

Key Activities Expected:

- Structural analysis and design (manual/computer-aided)

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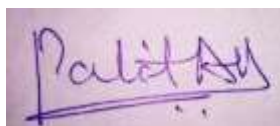
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- Site supervision and inspection
- Estimation, billing, project planning
- Quality control/lab testing
- Use of software like AutoCAD, STAAD. Pro, ETABS, SAP2000, Revit, Primavera/MS Project

Assessment:

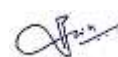
- Student has to maintain and submit a record of activities of all projects handled by them during internship period.
- Every week, student will submit the report to UG Coordinator about learning and work carried out during that week.
- At the end of semester project submitted for course certification will be used for assessment and external oral examination of individual student will be conducted based on that. The external examiner for the oral will be from the company from where they did the internship and the internal examiner will be from the institute.



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B. Tech (Civil Engineering)
2019 Pattern (SEM-VIII)
[CE4110]: Data Analytics in Civil Engineering

Teaching Scheme: TH: - 3Hours/Week	Credit TH: 3	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites : Introduction to Environmental Engineering, Structural Engineering, Transportation Engineering, Water Resources Engineering and Geomatics

Course Objective:

To provide necessary knowledge regarding analysis of data used in Civil Engineering. The various modules like structural Engineering, transportation Engineering, geomatics etc. are covered

Course Outcome:

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

- CO1: Analyze data used in Civil Engineering by using various mathematical techniques.
- CO2: Apply data analytic tools in analysis of data used in Environmental Engineering.
- CO3: Apply data analytic tools in analysis of data used in Structural Engineering.
- CO4: Apply data analytic tools in analysis of data used in Transportation Engineering.
- CO5: Apply data analytic tools in analysis of data used in Water Resource Engineering.
- CO6: Apply data analytic tools in Geomatics.

Course Contents

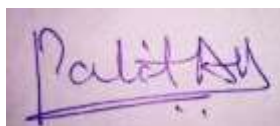
UNIT-I	Introduction and Mathematical Foundation	6 Hours
Data Science: An overview , Vector spaces and subspaces, Basis and dimensions of vectors spaces, Linear Transformation, Eigenvalues and Eigenvectors, Matrix factorization, Introduction to Regression analysis, Linear and Multi linear Regression Technique, Polynomial Regression Technique, Logistic Regression Technique.		
UNIT-II	Environmental Data Analysis and Modelling	6 Hours
Introduction to Environmental Engineering, Areas of Environmental Engineering, Data Analysis, Applications of Soft Computing Tools, Multiple Criteria Decision Making Model.		
UNIT-III	Structural Engineering: Trends, Applications and Advances	6 Hours
Overview of Structural Engineering, Need of Data Science in Structural Engineering, Current Trends & Applications of Data Science in Structural Engineering, Application of AI in Concrete Technology.		

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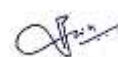
UNIT-IV	Data Science Application in Intelligent Transportation Systems	6 Hours
Introduction to Transportation Engineering, Data in Transportation Industry, Data Analytics in Transportation Industry, Boom Bike Share Demand Case study		
UNIT-V	Data Driven Modelling in Water Resource Engineering	6 Hours
Introduction to Water Resource Engineering, Data Analytics in Water Resource Engineering, Computational Intelligence Techniques in Water Resources Management, Predictive Models, Applications of Data Analytics in water resource engineering.		
UNIT-VI	Data Analysis Methods in Geomatics	6 Hours
Introduction to Geomatics, Adjustment of Survey Measurements, Data Analysis in Satellite Based Positioning System, Geospatial Analysis		
Lab Contents		
Guidelines for Assessment		
Continuous assessment of laboratory work is to be done based on overall performance and assignments performance of student. Each assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.		
List of Assignments		
1	Assignment on ‘Eigenvalues and Eigenvectors’	
2	Assignment on ‘Soft Computing Tools’	
3	Assignment on ‘Application of AI’	
4	Assignment on ‘Data Analytics in Transportation Industry’	
5	Assignment on ‘Data Analytics in Water Resource Engineering’	
6	Assignment on ‘Adjustment of Survey Measurements’	
Text Books:		
T1 A Primer on Machine Learning Applications in Civil Engineering, by Paresh Chandra Deka		
T2 Data Sciences for Civil Engineering, CRC press, (under process)		



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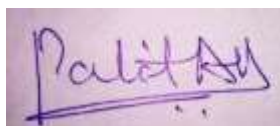
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Reference Books:

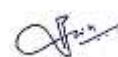
- R1. Big Data & Hadoop, V.K. Jain, Khanna Publishing House
- R2. Big Data Black Book, DT Editorial Services, Wiley India
- R3. Data Science & Analytics, V.K. Jain, Khanna Publishing House
- R4. Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93- 86173454
- R5. Sivanandam & Deepa, Principles of Soft Computing, Wiley India
- R6. S. Rajasekaram & G.A. Vijyalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI
- R7. A Textbook of Matrices, Narayan & Mittal, (ISBN: 9788121925969), S.Chand
- R8. K.Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Wiley
- R9. Papoulis & Pillai, Probability, Random Variable and Stochastic Processes, McGraw Hill



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B. Tech (Civil Engineering)
(2019 Pattern) Semester -VIII
[CE411]: Research Methodology

Teaching Scheme: TH: - 03Hours/Week LAB: -02Hours/Week	Credit TH:03 LAB: 01	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation (OR) : 50 Marks
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Course Prerequisites: Engineering Mathematics, Professional Practices in Civil Engineering, Employability Skill Development.

Course Objective:

- To familiarize the students with concepts and techniques in Research and Research Process
- To acquaint students with identifying problems for research and develop research strategies
- To familiarize students with the techniques of data collection, analysis of data and interpretation

Course Outcome:

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

CO1: Explain basics of research

CO2: identify type of research

CO3: apply the sampling techniques

CO4: Discuss the application of research methodology

CO5: understand the formulation of research formulation

CO6: understand the interpretation of data and report writing

Course Contents

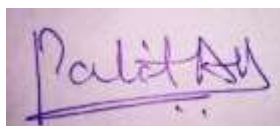
UNIT-I	Introduction and Basic Research	06 Hours
Basic Concepts: Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Research methods versus Methodology, Need of Research in Business and Social Sciences, Objectives of Research, Issues and Problems in Research, Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical.		
UNIT-II	Types of Research	06 Hours
Basic Research, Applied Research, Descriptive Research, Analytical Research, Empirical Research, Qualitative and Quantitative Approaches, Problems in measurement in research –Validity and Reliability. Levels of measurement –Nominal, Ordinal, Interval, Ratio.		

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UNIT-III	Research Design and Sample Design	06 Hours
Research Design – Meaning, Types and Significance, Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors		
UNIT-IV	Research Methodology	06 Hours
Meaning of Research Methodology, Stages in Scientific Research Process: Identification and Selection of Research Problem, Formulation of Research Problem, Review of Literature, Formulation of Hypothesis, Formulation of research Design, Sample Design, Data Collection, Data Analysis, Hypothesis testing and Interpretation of Data, Preparation of Research Report.		
UNIT-V	Formulating Research Problem	06 Hours
Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis.		
UNIT-VI	Outcome of Research	06 Hours
Interpretation of Data and Report writing: Types of publication, Paper Writing, Layout of a Research Paper, Journals in Science, Impact factor of Journals, When and where to publish? Plagiarism, Preparation of the report on conclusion reached, Validity Testing & Ethical Issues, Suggestions and Recommendation		
Lab Content		
Guidelines for Assessment: Continuous assessment of term work is to be done based on overall performance and assignment performance of students. Each assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, punctuality and neatness. Term Work: It shall consist of assignments based on each unit. Oral: Oral examination shall be based on above term work.		
Text Books: T1.Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005 T2.Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition		
Reference Books: R1.Research Methodology: Methods and Trends, by Dr. C. R. Kothari R2.Operational Research’ by Dr. S.D. Sharma, Kedar Nath Ram Nath & co. R3.Research Methodology: A Step by Step Guide for Beginners, by Ranjit Kumar, 2 nd Edition R4.Research Methodology: An Introduction’ by Wayne Goddard and Stuart Melville 3.		



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B. Tech (Civil Engineering)
(2019 Pattern) Semester -VIII
[CE4112]: Advancement in Civil Engineering

Teaching Scheme: TH: - 03Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks
Course Prerequisites: Thorough knowledge of various subjects like environmental engineering, structural engineering etc.		
Course Objective: To develop the interest of higher study in civil engineering branch, so as to make students able to provide realistic solutions to complex civil engineering problems.		
Course Outcome: After successful completion of the course, students will able to: CO1: Apply GIS and remote sensing techniques to manage water supply for various purposes. CO2: Provide solutions to smart city challenges. CO3: To adopt research as their career after graduation in civil engineering. CO4: To prepare suitable water management schemes in the drought prone areas. CO5: To prepare development plans for new towns. CO6: Prepare a suitable solution to housing for poor in urban areas.		
Course Contents		
UNIT-I	Application of Remote Sensing and GIS to Water Resources	06 Hours
Land Use Land Cover mapping, determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification, water shed prioritization, solid waste collection, water supply.		
UNIT-II	Smart City Management and Urban Infrastructure	06 Hours
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-III	Research Methodology	06 Hours
Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation,		
UNIT-IV	Droughts Management	06 Hours

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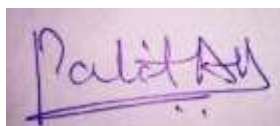
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Drought Assessment- Drought Severity Assessment – Meteorological Hydrological and Agricultural methods – Drought Indices – GIS based Drought Information system – Drought Vulnerability Assessment and Mapping Using GIS.

UNIT-V	Town Planning Basics	06 Hours
Elements of Infrastructure (physical, social, utilities and services); Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, provision of infrastructure, and land requirements; Principles of resource distribution in space; Types, hierarchical distribution of facilities, Access to facilities, provision and location criteria, Norms and standards, etc		
UNIT-VI	Affordable Housing	06 Hours
Affordable Housing For Urban Poor - Income and Affordability, Housing for Urban Poor, Rental housing projects, Incremental F.S.I. for LIG/EWS/HIG, Affordable Housing Policies and Scheme		

Reference Books:

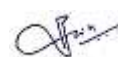
- R1. Garg, S.K, “Irrigation Engineering”, Khanna Publishers
- R2. Smart Cities and Urban Development in India by Dr. N. Mani, New Century Publications
- R3. Hiraskar, G. K., “Fundamentals of Town Planning”, Dhanpat Rai Publications.
- R4: Droughts Management By Arun Kumar Talwar, Arjun Publishing House
- R5: Basics of Remote Sensing and GIS by Dr. S. Kumar, Laxmi Publications.
- R6: Ranjit Kumar, “Research Methodology: A Step by Step Guide for beginners”, Pearson, 2005



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Department of Civil Engineering
Structure & Syllabi
Honor Course
Earthquake engineering
w.e.f. Academic Year 2021-2022



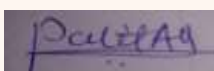
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B. Tech (Honor Course)
Earthquake Engineering
Structure

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
T. Y. Sem V											
CEH3101	Engineering Seismology	4			15	25	60	-	-	100	4
T. Y. Sem VI											
CEH3102	Seismic analysis of structures	3		2	15	25	60	-	25	125	4
CEH3103	Earthquake resistant design of structures	3	-	2	15	25	60	-	25	125	4
B.Tech. Sem VII And B.Tech. Sem VIII*											
CEH4101	Restoration and Rehabilitation of structures	4	-	-	15	25	60	-	-	100	4
CEH4102	Earthquake Resistant Design of Foundations	4	-	-	15	25	60	-		100	4
Total		18	-	4	75	125	300	-	50	550	20

***NOTE-Students have a choice to opt both subjects in seventh semester or one subject in seventh and one subject in eighth semester.**


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T. Y. B. Tech (Honor Course)
Academic Year – 2021-2022 Semester -V
[CEH3101]: Engineering Seismology

Teaching Scheme: TH:4 Hours/Week	Credit TH:04	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites : Civil Engineering, Geology,

Course Objective:

- 1.To provide basic understanding of the origin of earthquakes and of their effects from an engineering seismology point of view.
2. To illustrate the fundamentals of both deterministic and probabilistic seismic hazard assessment for establishing the seismic input and design ground motion parameters.

Course Outcome:

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

- CO1:** Explain the types, causes, and historical context of earthquakes.
CO2: Quantify different earthquake hazards and its effects using different methods
CO3: Compare various earthquake magnitude and intensity scales.
CO4: Describe seismic wave properties, different types of seismic waves and their propagation behavior during earthquakes.
CO5: Explain the need and methodology for seismic zonation and codal provisions in India
CO6: Identify causes and effects of landslides and tsunamis.

Course Contents

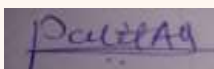
UNIT-I	Introduction	8 Hours
Types of Earthquake/Seismic Hazards , List of Major Historic Earthquakes in the World ,History of Earthquakes, Causes of Earthquakes: Types of Plate Boundaries ,Continental Drift and Plate Tectonics, Major Subduction zones in the world, Major Spreading zones in the world ,Major Thrust Faults in the world.		
UNIT-II	Earthquake terminology and Liquefaction	8 Hours
Terminologies and Definitions, Earthquake types, Reservoir triggered earthquakes, Plate Tectonics, Continental drift, Faults, Identification of Active faults, Consequence of Liquefaction, Examples from Past earthquakes, Classification of Liquefaction, Evaluation of Liquefaction Hazards, Liquefaction Susceptibility.		
UNIT-III	Earthquake Measurement technology	8 Hours
Intensity, Comparison of different intensity scales, Problems associated with Non instrumental measurement, Magnitude, Richter Magnitude (or Local Magnitude) ML, Other types of Magnitudes, Tele seismic Magnitude scales, Magnitude discrepancies.		
UNIT-IV	Study of Seismic Waves	8 Hours
Wave and its Properties, Wave Propagation, Types of Seismic Waves, Compressional or P-Waves or longitudinal waves-Waves or Torsional Waves, Love Waves, Rayleigh Waves, Wave Character,		

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Seismic Waves in the Earth, Earthquake Record		
UNIT-V	Study of Seismic Zones	6 Hours
Introduction to Seismic zones, Need for Seismic Zonation, Types of Zonation Seismic zonation scales Component of Seismic Micro zonation, Macro zonation and Codal Provisions in India, First Seismic Code, Third Zonation Map, Our Seismic Zone.		
UNIT-VI	Landslide and Tsunami	6 Hours
Landslides, Causes of Landslides, Earthquake Induced Landslides, Methods for Landslide Evaluation Newmark Sliding Block Analysis, Preventive Measures for static landslide, Tsunami, Major Tsunami's in the World		
Textbooks: T1. International Handbook of Earthquake and Engineering Seismology. Lee, W.H.K, Kanamori, H., Jennings, P.C., Kissinger, C., Academic Press T2. Introduction to Seismology. Shearer, P. M., Cambridge University Press T3. Geotechnical Earthquake Engineering. Kramer, S. L., Prentice Hall T4. Soil Dynamics, Prakash, S., McGraw Hill Book Company)		
Reference Books: R1. Earthquake Engineering - From Engineering Seismology to Performance - Based Engineering Edited by Bozorgnia, Y. and Bertero, V.V., CRC Press Washington 2004. R2. Earthquake hazard Analysis - Issues and Insights by Leon Reiter, Columbia University Press New York 1990		



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T. Y. B. Tech (Civil Engineering)
Academic Year – 2021-2022 Semester -VI
[CEH3102]: Seismic analysis of structures

Teaching Scheme: TH: 3 Hours/Week PR: 2 Hours/Week	Credit TH: 3 PR: 1	Examination Scheme: In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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Course Prerequisites : Modern Computational Statistics

Course Objective:

To introduce the concepts of structural dynamics and method for earthquake load analysis

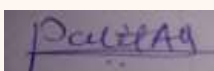
Course Outcome:

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

- CO 1: Illustrate different types of dynamic loads.
- CO 2: Explain the fundamentals of structural dynamics.
- CO 3: Discuss the concepts of different seismic analysis methods.
- CO 4: Calculate seismic loads by linear static method
- CO 5: Calculate seismic loads by linear dynamic method
- CO 6: Describe the different types of structural irregularities.

Course Contents

UNIT-I	Introduction to dynamic loads	8 Hours
Static Load v/s Dynamic Load, Types of Dynamic forces, Force Control and Displacement Control, concepts of oscillation and SHM, inertia force, restoring force, damping force, Earthquake terminologies.		
UNIT-II	Fundamentals of structural dynamics	8 Hour
Equation of Motion Degrees of Freedom, Single Degree of Freedom, Mathematical Modeling, Equation of Motion for Free Vibration for Damped and Un damped System (Single Degree of Freedom System), Equation of Motion for Forced Vibration for Damped and Un damped System(Single Degree of Freedom System), Logarithmic Decrement , multi degree of freedom system ,free vibration of multi degree of freedom system , normal mode theory , Eigen values and Eigen vectors.		
UNIT-III	Methods of seismic analysis	8 Hours
Introduction to methods of Earthquake Load Analysis (Linear Static, Linear Dynamic, Non Linear Static, Non Linear Dynamic)Advantages and disadvantages of these methods, Introduction to time history		


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method and capacity based design of soft story RC Bldg, Effect of stiffness, strength and ductility on seismic performance of structures

UNIT-IV	Analysis of Structure by Linear Static Method	8 Hours
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Seismic coefficient methods , assumptions, IS 1893-2016 provisions for analysis of seismic forces by using seismic coefficient method , Step by step procedure for Equivalent static force analysis , limitations of seismic coefficient method, explanatory example on determination of earthquake load of RC building (G+4)

UNIT-V	Analysis of Structure by Linear Dynamic Method	8 Hours
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Response spectrum method : Response spectra, Factor Influencing Response Spectra, general code provisions of dynamic analysis, Step by step procedure for Response spectrum method ,explanatory example on determination of earthquake load of RC building by response spectrum method (IS1893-2016 code provisions).

UNIT-VI	Structural irregularities	8 Hours
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Vertical stiffness irregularity, Weight (mass) irregularity, Vertical geometric irregularity, In-plane discontinuity, Out-of-plane offsets, Discontinuity in capacity (weak storey), Torsional sensitivity. Non-orthogonal systems, effect of structural irregularities on seismic design of RC building.

Lab Contents		
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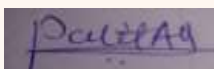
Guidelines for Assessment		
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- 1) Continuous assessment shall be based on experiments performed, submission of assignments in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness.
- 2) Practical/Oral examination shall be based on the term work assignments
- 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination

List of Laboratory Assignments		
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1	Presentation on Great Indian Earthquake and on great International Earthquake	
2	10 Examples on unit II	
3	Example of lateral load analysis of RC building by seismic coefficient method.	
4	Example of lateral load analysis of RC building by response spectrum method	
5	Excel Sheet for seismic coefficient method and Random Response Method with manual checking	

Text Books:
T1. Earthquake Resistant Design of Structures By Pankaj Agarwal & Manish Shrikhande, PHI Publications
T2. Manish Shrikhande & Pankaj Agrawal; Earthquake Resistant Design of Structures, PHI Publication, New Delhi



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T3. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi

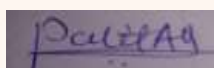
T4. A. K. Chopra; Dynamics of Structures, Pearson, New Delhi

T5. IS: 1893 (Part-I) 2016, Criteria for Earthquake Resistant Design General Provision to Building

Reference Books:

R1.. Clough & Penzin; Dynamics of Structures

R2. Structural Dynamics Theory and computation by Mario Paz



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T. Y. B. Tech (Honor Course)

Academic Year – 2021-2022 Semester -VI

[CEH3103]: Earthquake resistant design of structures

Teaching Scheme: TH:3 Hours/Week PR: 2 Hours/Week	Credit TH:03 PR:2	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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Course Prerequisites: Mechanics of Solids, Structural Analysis I & II, Design of Reinforced Concrete Structure.

Course Objective:

Apply the concept of earthquake engineering in seismic analysis and design of structures.

Course Outcome:

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

- CO 1:** Explain the philosophy of Earthquake Resistant Design,
- CO 2:** Discuss the behavior of structure during earthquake.
- CO 3:** Explain the concept of Seismic-resistant building architecture.
- CO 4:** Apply the concept of ductile detailing in RC structures.
- CO 5:** Analyse and earthquake resistant design of two story RCC building.
- CO 6:** Discuss seismic isolation of structure.

Course Contents

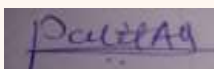
UNIT-I	Design philosophy	6 Hours
Philosophy of earthquake resistant design, earthquake proof v/s earthquake resistant design, four virtues of earthquake resistant structures(strength, stiffness, ductility and configuration), seismic structural configuration, Introduction to IS: 1893 (Part I), IS: 875 (Part V), and IS code provisions		
UNIT-II	Behavior of Structures During Earthquake and Earthquake Resistant Features of Structure	6 Hours
Inertia forces in structures, Behavior of Brick and stone Masonry Structures: Behavior of Brick and stone Masonry Walls, Box Action, Different types of Bands, Earthquake Resistant Features of Stone Masonry Structures. Behavior of RC Structures: Load Transfer Path, Strength Hierarchy, Reversal of Stresses, Importance of Beam Column Joints, Importance of Stiffness and Ductility (Capacity Design Concept) in Structures, Effect of Short Column, Effect of Soft Storey, Improper Detailing, Effect of Masonry Infill Walls, Effect of Eccentricity		
UNIT-III	Seismic-resistant building architecture	6 Hours
Introduction; Lateral load resisting systems- moment resisting frame, Building with shear wall or bearing wall system, building with dual system; Building configuration – Problems and solutions; Building characteristics – Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight, hyperstaticity /redundancy, non-structural elements.		

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UNIT-IV	Ductility considerations in earthquake resistant design of RCC buildings	6 Hours
Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility– Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920		
UNIT-V	Earthquake resistant design of a long two-story, two-bay RCC building	6 Hours
Determination of lateral forces on an intermediate plane frame using Equivalent static method and Model analysis using response spectrum; Analysis of the intermediate frame for various load combinations as per IS1893(Part 1); Identification of design forces and moments in the members; Design and detailing of typical flexural member ,typical column, footing and detailing of a exterior joint as per IS13920		
UNIT-VI	Base isolation of structures	6 Hours
Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic isolation design principle; Feasibility of seismic isolation; Seismic-isolation configurations		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on submission of assignment in the form of report/journal, timely completion, attendance, understanding, punctuality and neatness. 2) Oral examination shall be based on the Assignment/practical's performed in the lab. 3) Lab assessment marks shall be based on continuous assessment and performance in Oral examination will be of 25 marks		
List of Laboratory Assignments/Experiments		
1	Assignment no. 1: Design philosophy of earthquake resistant design.	
2	Assignment no. 2: Behavior of Brick and stone Masonry Structures.	
3	Assignment no. 3: Seismic-resistant building architecture.	
4	Assignment no. 4: Assessment of ductility of Member/element ductility and Structural ductility.	
5	Assignment no. 5: Determination of lateral forces on an intermediate plane frame using equivalent static method and Model analysis using response spectrum.	
6	Assignment no. 6: seismic isolation design principle.	
Text Books: T1. Earthquake resistance design of structure by Duggal- Oxford University Press. T2. Earthquake – Resistant Design of Building Structures-Dr. Vinod Hosur-Wiley Indi T3. Earthquake resistant design of structures- Agarwal, Shrikhande, PHI learning.		
Reference Books: R1. Dynamics of structure by Clough R.W. and Penzin J. McGraw Hill Civil Engineering Series. R2. Dynamics of structure by Anil Chopra, Prentice Hall India Publication. R3. Dynamics of structure by Mario Paz, CBSPD Publication		



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B. Tech (Honor Course)

Academic Year – 2022-2023 Semester -VII AND VIII

[CEH4101]: Restoration and Rehabilitation of Structures

Teaching Scheme: TH:4 Hours/Week	Credit TH:04	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites: Concrete Technology,

Course Objective:

- 1.To provide basic understanding of the origin of repair and rehabilitation of structure
2. To illustrate the different health issues of RCC Structures.

Course Outcome:

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

- CO1: Explain the cause of deterioration of concrete structures.
 CO2: Analyze the health condition of structures.
 CO3: Describe the principles of repair and rehabilitation of structures
 CO4: Identify the ideal material for different repair and retrofitting techniques
 CO5: Identify tests the assess the condition of properties of existing concrete structures
 CO6: Analyse the damage structures.

Course Contents

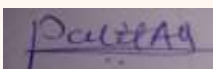
UNIT-I	Introduction	6 Hours
Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures		
UNIT-II	Damage Assessment	6 Hours
.Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, nondestructive and semi destructive testing systems		
UNIT-III	Influence on Serviceability and Durability	6 Hours
Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection		
UNIT-IV	Maintenance and Retrofitting Techniques	6 Hours
Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, External post- tensioning, Section enlargement		
UNIT-V	Retrofitting by Composite Materials	6 Hours
Fiber reinforced concrete, Ultra-high performance fibre reinforced concrete (UHPFRC), Fiber reinforced composites, Carbon fibre reinforced polymer (CFRP), Fibre wrapping (Carbon, Aramide, Glass)		

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UNIT-VI	Techniques for Repair	6 Hours
Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning.		
Reference Books: R1. Maintenance, Repair & Rehabilitation and Minor Works of Buildings P.C.Varghese PHI R2. Building Repair and Maintenance Management. P. S. Gahlot CBS Publishers and Distributors Pvt Ltd. R3. Handbook on Repairs and Rehabilitation of Structure CPWD, Delhi R4. Maintenance of Buildings A.C. Panchdhari New Age International R5. Concrete Technology-Theory and Practice. M.S.Shetty S.Chand and Company, New Delhi.		



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B. Tech (Honor Course)
Academic Year – 2022-2023 Semester -VII AND VIII
[CEH4102]: Earthquake Resistant Design of Foundations

Teaching Scheme: TH:4 Hours/Week	Credit TH:04	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks
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Course Prerequisites : Soil Mechanics and Foundation Engineering

Course Objective:

- 1.To provide basic understanding of s types of foundations, required soil investigations, soil parameters, and codes of practice.
2. To illustrate techniques of design of foundations so that it does not fail during earthquakes

Course Outcome:

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

- CO 1:** Understand the performance of the foundations during past earthquake
CO 2: Understand the design procedure of shallow foundation and IS recommendation
CO 3: To understand the effect of dynamic loading on foundations
CO 4: To calculate dynamic bearing capacity and design data
CO 5: To understand the concept of pile foundation
CO 6: To analyse the pile foundation under dynamic loads

Course Contents

UNIT-I	Introduction	8 Hours
General requirements, types of shallow and deep foundations and their use; performance of various types of foundations during past earthquakes.		
UNIT-II	Shallow Foundations:	8 Hours
IS codes for bearing capacity and settlement of foundations. foundation design, modes of soil failure, safe bearing capacity, differential & total settlements, increase in permissible stress under earthquake loads		
UNIT-III	Bearing Capacity under Transient & Earthquake Type Loads	8 Hours
Types of dynamic loads; Footing requirements to account for settlements and earthquake induced forces; Pseudo-Static analysis of footings with eccentric & inclined loads. Effect of horizontal load and moment		
UNIT-IV	Dynamic Bearing Capacity and Design Data	8 Hours
Dynamic Analysis of shallow foundations for various modes of vibrations, Design seismic coefficients for various foundation soil systems, provisions of IS codes and their limitations; seismic coefficient and response spectra methods.		
UNIT-V	Pile Foundations	6 Hours

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Types of piles based on usage, material, construction etc. pile load capacity in compression, Bearing capacity of piles, group action of piles, settlement of a pile group

UNIT-VI

Laterally loaded Pile foundation

6 Hours

Laterally loaded piles, elastic analysis; Reese and Matlock approach, fixity of pile heads, dimensionless factors; Pile with dynamic loads..

Text Books:

T1. Prakash S. (1981), "Soil Dynamics", McGraw-Hill Company, New York.

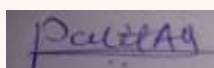
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