



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



T.Y. B.Tech (Civil Engineering)
Scheme 2023– 2024, Semester –V
(Level 5.5 - B.Voc./ B.Sc. Engg) -Semester V

Course	Course Code	Course	Teaching Scheme				Credit C	Examination Scheme				Total Marks	Ownership
			L	T	P	Pr		ISE	MSE	ESE	TW		
PCC	CE3201T	Environmental Engineering	3	-	-	3	3	20	30	50	-	100	Civil
PCC	CE3201L	Environmental Engineering Lab	-	-	2	2	1	ISCE: 30		20	-	50	Civil
PCC	CE3202T	Design of Steel Structures	3	-	-	3	3	20	30	50	-	100	Civil
PCC	CE3202L	Design of Steel Structures Lab	-	-	2	2	1	ISCE: 30		20	-	50	Civil
PEC	CE3203T	Professional Elective-I	3	-	-	3	3	20	30	50	-	100	Civil
OE	CEO3201T	Open Elective -I	3	-	-	3	3	20	30	50	-	100	Other Department
HSSM	HS3207T	Financial Management	3	-	-	3	3	20	30	50	-	100	Humanities
MDM	CEM3201T	Multidisciplinary Minor II	3	-	-	3	3	20	30	50	-	100	Other Department
MDM	CEM3201L	Multidisciplinary Minor II Lab	-	-	2	2	1	ISCE: 30		20	-	50	Other Department
CC	CE3204L	Co-Curricular Courses-III	-	-	2	2	1	ISCE: 30		20	-	50	Civil
Total			18	8	26	22						800	

Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (ISCE). The ESE is a separate head of passing.

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Multidisciplinary Minor II		Multidisciplinary Minor II Lab	
Course Code	Course Name	Course Code	Course Name
CEM3201T	Building Materials	CEM3201L	Building Materials Lab

Professional Elective I			
Course Code	Course Name	MODE	Offering Institute/ weeks/ Course Link
CE3203T-A	Air Pollution and Control	Offline	JSPM's RSCOE
CE3203T-B	Data Analytics	Offline	JSPM's RSCOE
CE3203T-C	Water Power Engineering	Offline	JSPM's RSCOE
CE3203T-D	Advanced Concrete Technology	Offline	JSPM's RSCOE
CE3203T-E	Infrastructure Planning And Management	NPTEL Online	IIT Madras 12 weeks https://archive.nptel.ac.in/courses/105106188/
CE3203T-F	Sustainable Materials And Green Buildings	NPTEL Online	IIT Delhi 12 weeks https://archive.nptel.ac.in/courses/105102195/

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T. Y. B. Tech. Civil Engineering
Academic Year -2024-2025 (Semester –VI)
(Level 5.5 - B.Voc./ B.Sc. Engg) -Semester VI

Course	Course Code	Course	Teaching Scheme				Credit C	Examination Scheme				Total Marks	Ownership
			L	T	P	Hr		ISE	MSE	ESE	TW		
PCC	CE3205T	Hydrology and Water Resources Engineering	3	-	-	3	3	20	30	50	-	100	Civil
PCC	CE3206T	Design of Reinforced Concrete structure	3	-	-	3	3	20	30	50	-	100	Civil
PCC	CE3206L	Design of Reinforced Concrete Structure Lab	-	-	2	2	1	ISCE: 30		20	-	50	Civil
PEC	CE3207T	Professional Elective-II	3	-	-	3	3	20	30	50	-	100	Civil
PEC	CE3208T	Professional Elective III	3			3	3	20	30	50	-	100	Civil
PEC	CE3208L	Professional Elective Lab III			2	2	1	ISCE: 30		20	-	50	Civil
OE	CEO3202T	Open Elective II	3	-	-	3	3	20	30	50	-	100	Other Department
MDM	CEM3202T	Multidisciplinary Minor III	3	-		3	3	20	30	50	-	100	Other Department
CEP	CE3209L	Engineering Innovation and society - I	-	-	4	4	2	ISCE: 50		50	-	100	Civil
Total			18		8	26	22					800	

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Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (ISCE). The ESE is a separate head of passing.

Multidisciplinary Minor I	
Course Code	Course Name
CEM3202T	Automation in Civil Engineering

Professional Elective II			
Course Code	Course Name	MODE	Offering Institute/ weeks/ Course Link
CE3207T-A	Solid Waste Management	Offline	JSPM's RSCOE
CE3207T-B	Remote Sensing and GIS	Offline	JSPM's RSCOE
CE3207T-C	Pre-stressed Engineering	Offline	JSPM's RSCOE
CE3207T-D	Infrastructure Engineering And Construction Techniques	Offline	JSPM's RSCOE
CE3207T-E	Geotechnical Engineering II Foundation Engineering	NPTEL Online	IIT Kharagpur 12 weeks https://archive.nptel.ac.in/courses/105105185/
CE3207T-F	Integrated Waste Management For A Smart City	NPTEL Online	IIT Kharagpur 12 weeks https://archive.nptel.ac.in/courses/105105160/

Professional Elective III		Professional Elective III Lab	
Course Code	Course Name	Course Code	Course Name
CE3208T-A	Open Channel Flow	CE3208L-A	Open Channel Flow Lab
CE3208T-B	Advanced Construction Management	CE3208L-B	Advanced Construction Management Lab
CE3208T-C	Industrial Waste Water Treatment	CE3208L-C	Industrial Waste Water Treatment Lab
CE3208T-D	Advanced Design of Steel Structures	CE3208L-D	Advanced Design of Steel Structures Lab

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Professional Elective III			
Course Code	Course Name	MODE	Offering Institute/ weeks/ Course Link
CE3209T-E	Advanced Foundation Engineering	NPTEL Online	IIT Kharagpur 12 weeks https://archive.nptel.ac.in/courses/105105207/
CE3209T-F	Computational Hydraulics	NPTEL Online	IIT Kharagpur 12 weeks https://archive.nptel.ac.in/courses/105105161/

List of Exit Courses after completion of Semester V and VI

1. Exit option is available for students those who have earned the total 132 credits at the End of sixth Semester.
2. Student who wants to avail the exit option after third year have to earn additional 6-8 credits from the list of courses shown below.
3. These courses student have to complete within summer vacation after 3rd Year.
4. After fulfilment as mentioned in 1 to 3 above, Students can earn **B.Voc./ B.Sc. Engg** and same will be issued by the Institute.

Sr. No.	Course code	Name	Credits
1.	EX-CE3201	Advanced Design of Concrete Structures	2
2.	EX-CE3202	Total Quality Management	2
3.	EX-CE3203	Smart Infrastructure And Construction	2
4.	EX-CE3204	Advanced Transportation Engineering	2

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3201T] Environmental Engineering

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Basics of Hydraulics, Engineering Chemistry, Environmental Science

Course Objective:

To develop the ability to design water and waste water treatment processes and apply the concepts to solve engineering problems.

Course Outcome:

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

- CO1:** Calculate water demand.
- CO2:** Design Primary and Preliminary treatment process for water.
- CO3:** Design of clariflocculator and filter for water.
- CO4:** Design circular sewer for an estimated quantity of storm water and wastewater.
- CO5:** Design Primary and Preliminary treatment process for wastewater.
- CO6:** Design secondary and tertiary Treatment process for wastewater.

Course Contents

UNIT-I	Introduction to Water Supply Engineering	06 Hours
Introduction to water supply scheme: Data collection for water supply scheme, components and layout. Design period, factors affecting design period, coincident draft. Issues related to rural water supply schemes. Quality and Quantity of Water: Physical, Chemical, Radioactivity and Bacteriological Characteristics, Standards as per IS: 10500 (2012), Rate of water consumption for various purposes like domestic, industrial, institutional, commercial, fire demand, coincident draft and water system losses, factors affecting rate of demand, Population forecasting, Government of India initiatives - SMART city, AMRUT, Jal Jeevan Mission and its implication in rural India.		
UNIT-II	Introduction to Water treatment	06 Hours
Introduction to Water treatment: Principles of water treatment processes. Unit operation and unit process. Introduction to different types of water treatment flow sheets. Criteria for site selection for WTP. Aeration: Principle and Concept, Necessity, Methods, Removal of taste and odour. Design of aeration fountain.		

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Sedimentation: Plain and chemical assisted - principle, efficiency of an ideal settling basin, settling velocity, types of sedimentation tanks, design of plain sedimentation tank. Introduction & design of tube settlers, Coagulation and flocculation: principle of coagulation, common coagulants, natural coagulants.

UNIT-III	Design of Water Treatment Plant	06 Hours
Design of Water Treatment Plant: Concept of mean velocity gradient and power consumption, design of flocculation chamber, design of clari-flocculator. Filtration: theory of filtration, mechanism of filtration, filter materials, types of filter and design of rapid sand gravity filters. Disinfection: mechanism, factors affecting disinfection, types of disinfectants, types and methods of chlorination, bleaching powder estimation. Water distribution system: system of water supply- continuous and intermittent system, design of elevated storage reservoir capacity		
UNIT-IV	Sanitary Engineering Framework	06 Hours
Introduction to Sanitary Engineering Framework: wastewater sources and types, importance of sanitation infrastructure, collection and conveyance, quantitative estimation of wastewater, self-cleansing velocity, hydraulic design of circular sanitary sewer, necessity, and location of pumping station. Self-purification of natural streams: oxygen sag curve, Streeter - Phelps equation- application and limitations. Wastewater recycle and reuse: driving factors for recycle and reuse, recycling of grey water, municipal sewage, storm water and industrial effluent, reuse opportunities in municipal, industrial, agricultural sector.		
UNIT-V	Preliminary and Primary Wastewater Treatment	06 Hours
Introduction to Preliminary and Primary Wastewater Treatment: sewage/effluent treatment plant - flow diagram, unit operation and process, preliminary and primary treatment, emerging contaminants & its treatment issues, Screens: types, hydraulics, velocity and head loss, design of screens, disposal of screenings. Grit chamber: sources of grit, types, proportional flow weir, Parshall flume, design of grit chamber, disposal of grit, Skimming tanks: sources of oil and grease, methods of oil and grease removal. Equalization and neutralization tanks: application and benefits. Primary sedimentation tank: types of settling, types of sedimentation tanks, factors affecting efficiency, design of primary sedimentation tank.		
UNIT-VI	Secondary and tertiary Treatment	06 Hours

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Introduction to Secondary and tertiary Treatment: Aerobic secondary treatment: unit operations and processes, principle of biological treatment,

Activated sludge process (ASP): design of ASP, modifications in ASP.

Oxidation pond: bacteria – algae symbiosis, design of oxidation pond,

Constructed wetlands, phytoremediation: principle, advantages, disadvantages,

Trickling filter: principle, different TF media & their characteristics, design TF using NRC formula, operational problems, and control measures.

Rotating biological contractors: theory of rotating biological contractors.

Sludge digestion and disposal: Anaerobic Treatment for Sludge and its Disposal.

Concept of Zero Liquid Discharge (ZLD).

Text Books:

- T1 Environmental studies by Rajgopalan- Oxford University Press.
- T2 Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication.
- T3 Water Supply and Sanitary Engineering: G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi.
- T4 Water Supply and Treatment Manual: Govt. of India Publication
- T5 Waste Water Treatment-Concept Design and Approach---C.L.Karia,R.A.Christian--PHI

Reference Books:

- R1. CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
- R2. Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
- R3. Waste Water Engg. – B.C. Punmia & Ashok Jain - Arihant Publications.
- R4. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication.
- R5. Environmental Engg. – Davis - McGraw Hill Publication
- R6. Manual on sewerage and sewage treatment – Public Health Dept., Govt. of India
- R7. Standard Methods by APHA.
- R8. McGhee, T.J., “Water Supply and Sewerage”, McGraw Hill.
- R9. Theory and practice of water and waste water treatment—Wiley

IS Code:

- IS code: IS 10500: 2012 , IS 3025

e-Resources:

1. <http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php>
2. <http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php>
3. <http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php>
4. <http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php>

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3201L] Environmental Engineering Lab

Teaching Scheme: LAB: 2 Hours/Week	Credit LAB: 01	Examination Scheme: In Sem. Continuous Evaluation: 30 Marks End Sem. Exam : 20 Marks
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Course Prerequisites: Basics of Hydraulics, Engineering Chemistry, Environmental Science

Course Objective:

Student will have adequate background to understand and solve the problem involving Identification of appropriate tests for specific environmental issues, statistical interpretation of laboratory results, writing technical reports, and developing basic environmental designs and technical solutions.

Course Outcome:

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

CO1: Perform lab test to characterize drinking water for physical & chemical treatment and design water treatment plant

CO2: Perform lab test to characterize wastewater for physical, chemical, and microbiological treatment and design wastewater treatment plant.

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work (for 30 marks) is to be done based on overall performance and lab practicals performance of student. Each lab practical 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.

Both internal and external examiners should jointly conduct practical followed by oral examination for 20 marks based on the term work completed. Examination will be based on the practical conducted, site visit to WTP / STP, and design of WTP / STP.

List of Laboratory Experiments

(Minimum 08 from part A, B and C are compulsory)

A: Determination of following Characteristics;

1	pH and Alkalinity of given water and waste water sample
2	Total hardness and its components
3	Chlorides
4	Chlorine demand and residual chlorine
5	Turbidity and optimum dose of alum.

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6	Solids -Total solids, suspended solids, volatile solids, settleable solids & non settleable solids
7	Sludge Volume Index.
8	Dissolved oxygen.
9	Bio-Chemical Oxygen Demand.
10	Chemical Oxygen Demand.
11	Most Probable Number
12	Na and K by Flame photometer
B	Site visit to water treatment plant or wastewater treatment plant & its detailed report.
C	Design of Water Treatment Plant / Sewage Treatment Plant using appropriate software.

Text Books:

- T6 Standard Methods for examination of water and wastewater, Mary Franson, American Public Health Association.
T7 Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication.
T8 Water Supply and Treatment Manual: Govt. of India Publication
T9 Waste Water Treatment-Concept Design and Approach---C.L.Karia,R.A.Christian--PHI

Reference Books:

- R10.** CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
R11. Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
R12. Waste Water Engg. – B.C. Punmia & Ashok Jain - Arihant Publications.
R13. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication.
R14. Theory and practice of water and waste water treatment—Wiley

IS Code:

1. IS 10500:2012 Drinking water specifications.
2. IS 3025: 2013, Methods of Sampling and Test (Physical, Chemical and Biological) for Water and Waste Water, Bureau of Indian Standards, New Delhi.

1. e-Resources:

2. <http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php>
3. <http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php>
4. <http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php>
5. <http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php>
6. <https://ee1-nitk.vlabs.ac.in/>
7. <https://ee2-nitk.vlabs.ac.in/>

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3202T] Design of Steel Structures

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Engineering Mechanics, Solid Mechanics, Structural Analysis, and Engineering Physics

Course Objective:

To study the behavior and properties of structural steel members to resist bending, shear, tension and compression and apply the relevant codes of practice. Also to perform analysis and design of structural steel members and connection.

Course Outcome:

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

CO1: Explain fundamentals of structural steel analysis and simple connection.

CO2: Design of tension and compression members.

CO3: Design of column and column bases.

CO4: Design of laterally restrained and unrestrained steel beams.

CO5: Design of connections and gantry girder.

CO6: Analysis and design of roof trusses.

Course Contents

UNIT-I	Introduction to steel structure and Simple connections	06 Hours
Steel as a structural material, various grades of structural steel (as per IS 2062:2011), various rolled steel sections, Introduction to IS such as IS: 800-2007, IS: 808-1989, IS: 875 part I to III, SP: 6(1), SP: 6(6), SP38. IS: 4000- 1992. Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, various design load combinations, classification of cross section such as plastic, compact, semi-compact and slender. Types of bolted and welded connections, Relative advantages and Limitations, Modes of failure, efficiency of joints- Axially loaded bolted and welded connections for Plates and Angle Members.		
UNIT-II	Design of axially loaded member	06 Hours
Tension member: various cross sections. Limit strength due to yielding, rupture and block shear. Compression member: Buckling classification as per geometry of cross section, buckling curves, design of struts in trusses using single and double angle section.		
UNIT-III	Design of Beams	06 Hours

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Design of Laterally restrained and unrestrained beam. Design of simple beams, built up beams using flange plates, curtailment of flange plates, web buckling & web crippling.

UNIT-IV	Design of column and column bases	06 Hours
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Design of axially loaded column using rolled steel section. Design of built-up column, lacing and battening. Design of eccentrically loaded column providing uniaxial and biaxial bending (check for section strength only). Design of column bases: Design of slab base, gusseted base, and moment resistant base. (axial load and uni-axial bending)

UNIT-V	Design of connections and gantry girder	06 Hours
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Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld. Design of gantry girder: Selection of gantry girder, design of cross section, check for moment capacity, buckling resistance, bi-axial bending, deflection at working load and fatigue strength.

UNIT-VI	Design of roof trusses	06 Hours
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Roof truss: assessment of dead load, live load and wind load, design of purlin, design of members of a truss, detailing of typical joints and supports.

Text Books:

- T1 N. Subramanian (2009), "Design of Steel Structures", Oxford University Press.
T2 V.L. Shah , V. A. Gore (2015) , "Limit State Design of Steel Structures", Structures Publications
T3 S.S. Bhavikatti (2012), "Design of Steel Structures by Limit State Method", I.K International Publishing House Pvt. Ltd., 3rd Edition

Reference Books:

- R1. Structural Design in Steel—Sarwar Alam ,Raz—New Age International Publishers
R2. Analysis and Design: Practice of Steel Structures—Karuna Ghosh-- PHI Learning Pvt. Ltd .Delhi
R3. Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi.
R4. Design of Steel Structures by K. S. Sai Ram, Pearson, New Delhi.
R5. Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private limited, New Delhi.
R6. Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.
R7. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S S, I.K. International Publishing House, New Delhi.

IS Code:

- IS:800-2007, IS: 808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), SP38. IS:4000- 1992

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3202L] Design of Steel Structures Lab

Teaching Scheme: LAB: -2 Hours/Week	Credit LAB: 01	Examination Scheme: In Sem. Continuous Evaluation : 30 Marks End Sem. Exam : 20 Marks
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Course Prerequisites: Engineering Mechanics, Solid Mechanics, Structural Analysis, and Engineering Physics

Course Objective:

To analysis and design of structural steel members and connection..

Course Outcome:

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

- CO1: draw detailed sketch of steel rolled section, steel members & connections.
- CO2: Draw tension and compression members
- CO3: Draw steel column and column bases
- CO4: Draw connections and gantry girder.
- CO5: Draw steel roof trusses.
- CO6: draw showing detailed sketch of roof truss and connection

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work (for 30 marks) is to be done based on overall performance and lab practicals performance of student. Each lab practical 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.

Both internal and external examiners should jointly conduct practical followed by oral examination for 20 marks based on the term work completed.

List of Laboratory Experiments

(First six experiments are compulsory.)

1	Full imperial drawing sheet (Hand drawn) showing detailed sketch of rolled section & Bolted connections.
2	Full imperial drawing sheet (Hand drawn) showing detailed sketch of Detailed sketch of welded connections
3	Full imperial drawing sheet (Hand drawn) showing detailed sketch of Tension & Compression members

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4	Full imperial drawing sheet (Hand drawn) showing detailed sketch of detailed sketch of Column section and column bases.
5	Design of Industrial building including roof truss, purlin, bracing, gantry girder, column , column bases & connections.
6	Full imperial drawing sheet (Hand drawn) showing detailed sketch of roof truss & analysis of roof truss
7	Full imperial drawing sheet (Software) showing detailed sketch roof truss connections
8	Full imperial drawing sheet (Hand drawn) showing detailed sketch gantry girder, column & column bases
9	Two site visits: Report should contain structural details with sketches

IS Code:

IS:800-2007, IS: 808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), SP38. IS:4000- 1992

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3203T-A]: Professional Elective-I
Air Pollution and Control

Teaching Scheme: TH: 03 Hours/Week	Credit TH: 3	Examination Scheme: In Sem. Evaluation: 20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam: 50 Marks Total Marks 100
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Course Prerequisites: Basics of Environmental Science

Course Objective:

To comprehend various kinds of air pollution control equipment and its suitability with respect to meteorological parameters and stability conditions.

Course Outcome:

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

CO1: Explain the meteorological aspects and its effects with respect to Gaussian diffusion model.

CO2: Analyze ambient air quality according to standards laid by CPCB.

CO3: Describe the sources and controlling measures of indoor air and odour pollution.

CO4: Illustrate process operation of air pollution control devices.

CO5: Explain the controlling of gaseous pollution.

CO6: Describe environmental impact assessment and its management.

Course Contents

UNIT-I	Meteorological aspects and fundamentals of Air Pollution	6 Hours
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.		
UNIT-II	Ambient Air sampling and analysis	6 Hours
Air pollution survey, basis and statistical considerations of sampling sites, devices and methods used for sampling of gases and particulates. Stack emission monitoring for particulate and gaseous matter, isokinetic sampling. Analysis of air samples chemical and instrumental methods. Emission inventory and source apportionment studies. Ambient air quality monitoring as per the procedure laid down by CPCB. National Ambient Air Quality Standards (NAAQS) 2009		
UNIT-III	Indoor air pollution	6 Hours

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Causes of air pollution, sources and effects of indoor air pollutants, factors affecting exposure to indoor air pollution, sick building syndrome. Investigation of indoor air quality problems, changes in indoor air quality, control of indoor air pollutants and air cleaning systems. Use of various plants to control indoor air pollution. Radon and its decay products in indoor air.

Odour pollution: Theory, sources, measurement and methods of control of odour pollution

UNIT-IV

Process Modification and Equipments for controlling air pollution

6 Hours

By process modification, change of raw materials, fuels, process equipment and process operation. Control of particulate matters. Working principle and design of control equipment as Settling chamber, Cyclone, Fabric filter and Electro Static Precipitator.

UNIT-V

Control of Gaseous Contaminants

6 Hours

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring. Combustion chemistry & control of air pollution from automobiles.

UNIT-VI

Environmental impact assessment and management

6 Hours

Methodology for preparing environmental impact assessment (Identifying the sources of air pollution, calculating the incremental values, prediction of impacts and mitigation measures). Role of regulatory agencies and control boards in obtaining environmental clearance for project. Public hearing. Environmental impacts of thermal power plants, sugar and cement industry. Environmental management plan. The environmental rules 1999 (sitting of industries).

Text Books:

T1 H. V. N. Rao and M. N. Rao, Air Pollution, TMH, Publication.

T2 KVSG Murali Krishna, Air Pollution, USP.

Reference Books:

R1. Perkins, Air Pollution, US

R2. Stern, Air Pollution, Academic Press

R3. K. Wark, C.F. Warner & W.T. Davis, Air Pollution Control: its origin and control, Pearson

R4. Richard W. and Donald L., Fundamentals of Air Pollution, Academic Press.

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T.Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3203T-B] Professional Elective I
Data Analytics

Teaching Scheme: TH: 03 Hours/Week	Credit TH: 3	Examination Scheme: In Sem. Evaluation: 20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam: 50 Marks Total Marks 100
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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: analyse data used in Civil Engineering using mathematical techniques.

CO2: Apply data analytic tools in analysis of data used in Environmental Engineering.

CO3: Apply data analysis tools in Structural Engineering.

CO4: Apply data analysis tools in Transportation Engineering.

CO5: Apply data analysis tools 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		
Text Books: T1 A Primer on Machine Learning Applications in Civil Engineering, by Paresh Chandra Deka T2 Data Sciences for Civil Engineering, CRC press		
Reference Books: R1. Big Data & Hadoop, V.K. Jain, Khanna Publishing House R2. Big Data Black Book, DT Editorial Services, Wiley India R 3. 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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T.Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3203T-C] Professional Elective I
Project Management

Teaching Scheme: TH: - 3 Hours/Week	Credit: 03	Examination Scheme: Theory In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Basic Civil Engineering

Course Objective: This course aims to enable students for project planning and project cost analysis. The aim is to make the students aware about material management, Project Economics , Project Appraisal etc.

Course Outcome:

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

- CO1: explain basic concepts related to construction projects and management
- CO2: analyze project network through scheduling methods
- CO3: analyze cost of project through various methods
- CO4: identify the concept of material procurement and management
- CO5: apply the knowledge of economics in project management
- CO6: analyze project appraisal by various methods

Course Contents

UNIT-I	Project Management	06 Hours
History and Principles of management, Importance and objectives of project management, categories of project, Project Life Cycle, Project Management Book of Knowledge (PMBOK), area of PMBOK, PMI,PMP, Importance of organization, Types of organizational structure		
UNIT-II	Project Planning and Scheduling	06 Hours
Bar-Charts, Work-breakdown-structure, Network Scheduling techniques, types of network, basic terms, types of float, time estimates, Critical Path Method(CPM), Program Evaluation and Review Technique(PERT), Precedence Network Analysis (PNA), Line of Balance (LOB)		
UNIT-III	Project Monitoring	06 Hours
Resource Allocation: Resource Smoothing and resource levelling, manpower planning, concept of time scaled network diagram, updating of network, network crashing, Introduction to project management software's		
UNIT-IV	Material Management	06 Hours

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Importance and functions of Materials Management, objectives of material management, Inventory Control techniques ABC analysis, Economic order quantity (EOQ) technique, Material procurement and its management, indents, storage layout, fleet management, site planning, site layout, safety at site

UNIT-V	Project Economics	06 Hours
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Introduction to project economics, Concept of cost, value, price, laws of economics: law of demand, supply, law of diminishing marginal utility, law of substitution, factors affecting price determination, equilibrium price, elasticity of demand and supply, time value of money, cash flow diagram, simple interest, compound interest, annuity

UNIT-VI	Project Appraisal	06 Hours
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Types of appraisal, study of project feasibility report, detailed project report, criteria for selection of project: NPV, IRR, benefit cost ratio, payback period, breakeven analysis, role of project management consultants

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
T4. Materials Management an integrated approach by Gopalkrishnan and M. Sundaresan, Delhi 2014
T5. Project Planning and Control with PERT and CPM by Dr. B. C. Punmia and K. K. Khandelwal, New Delhi. 4th edition-2002, reprint- 2012
T6. Project Management by Nagarajan

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 Management and Planning by Sengupta and H Guha, Tata McGraw Hill Publishing Company, New Delhi
R5. Construction Engineering and Management by Seetharaman, Umesh publication, New Delhi. 2012

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T.Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3203T-D] Professional Elective I
Advanced Concrete Technology

Teaching Scheme: TH: 3Hours/Week	Credit TH:3	Examination Scheme: In Sem. Evaluation:20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam : 50 Marks Total :100Marks
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Course Prerequisites:

Basic civil engineering/ Basics of construction materials like lime, cement, Natural & artificial sand, plain cement concrete. Chemistry / chemical reaction between cement & water and Concrete technology

Course Objective:

The course is focused on advanced cement-based composites, emerging materials, and green materials. Material properties are evaluated using conventional and innovative non-destructive evaluation methods. The course will include a project component focusing on specialized concretes and emerging materials not limited to Fiber Reinforced Concrete, Self-consolidating concrete, High Strength Composites, Light Weight Concrete, and Carbon Negative Concrete
 It helps the students to gain the knowledge of various topics such as durability and quality control. It also aims to impart the knowledge regarding concrete mix design of special concrete

Course Outcome:

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

CO1: Discuss the concrete ingredients and its influence at gaining strength.

CO2: Explain the recent developments in Special concrete like high performance concrete. Light weight etc.

CO3: Design of concrete mix of special types of concrete

CO4: Describe the application and use of fiber reinforced concrete and gain ideas on non-destructive testing of concrete

CO5: Demonstrate durability of concrete & quality control

CO6: Discuss Ferro cement & Precast structure

Course Contents

UNIT-I	Introduction	06 Hours
Cement and its types: general, hydration of cement, Grading curves of aggregates, Manufactured sands fine aggregate, copper slag as fine aggregate. Concrete: properties of concrete, w/b ratio, gel space ratio, Problems on maturity concept, Effect of admixtures.		
UNIT-II	Special types of Concrete	06 Hours

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Structural Light weight concrete, ultra-light weight concrete, vacuum concrete, mass concrete, waste material based concrete, ultra-rapid hardening, gap graded concrete, high strength concrete, high performance concrete, Self-curing concrete, Pervious concrete, Geo polymer concrete, smart concrete

UNIT-III

Mix Design of Special concrete

06 Hours

Design of high strength concrete mixes, design of light weight aggregate concrete, design of fly ash cement concrete mixes, Design of pumpable concrete mixes, Design of self-compacting concrete.

UNIT-IV

Fiber Reinforced Concrete and NDT

06 Hours

Properties of artificial and naturally occurring fibres. Interaction between fibres and matrix, basic concepts and mechanical properties: strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, Advanced non-destructive testing methods: ground penetration radar, probe penetration, break off maturity method, stress wave propagation method, electrical/magnetic methods etc.

UNIT-V

Durability of Concrete and Quality Control

06 Hours

Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability. Guidelines for Quality control & Quality assurance of concrete.

UNIT-VI

Ferro cement & Precast structure

06 Hours

Ferrocement: Properties & specifications of ferrocement materials, analysis and design of prefabricated concrete structural elements, precast construction, erection and assembly techniques.

Text Books:

- T1. M. S. Shetty, S Chand, Concrete Technology, New Delhi-110055
- T2. M. L. Gambhir, Concrete Technology, Tata McGraw-Hill.
- T3. Concrete Technology -- A R Santhakumar, Oxford University Press.
- T4. Fiber Reinforced Cement Composite- P.N.Balguru & P.N.Shah.
- T5. Concrete: Microstructure, Properties and Materials-- P. Kumar Mehta and P. S. M. Monteiro-- Tata Mc-Graw Hill Education Pvt. Ltd.

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Reference Books:

- R1.** Handbook on Advanced concrete Technology Edited by N V Nayak,A .K.Jain, Narosa Publishing House
- R2.** Properties of concrete by A. M. Neville, Longman Publishers.
- R3.** Concrete Technology by R.S. Varshney, Oxford and IBH.
- R4.** Concrete technology by A M. Neville, J.J. Brooks, Pearson
- R5.** Ferro cement Construction Manual-Dr. D.B.Divekar-1030, Shivaji Nagar, Model Colony, Pune
- R6.** Concrete Mix Design-A.P.Remideos--Himalaya Publishing House (ISBN-978-81-8318- 996-5
- R7.** Concrete, by P. Kumar Metha, Gujrat Ambuja.
- R8.** Learning from failures R .N.Raikar
- R9.** Structural Diagnosis R.N.Raikar
- R10.** Concrete Mix Design Prof. Gajanan Sabnis

IS Codes:

- i) IS 456
- ii) IS 383
- iii) IS 10262-2009
- iv) IS 9103

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T.Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CE3203T-E] Professional Elective I
Hydro Power Engineering

Teaching Scheme: TH: - 3 Hours/Week	Credit 03	Examination Scheme: In Sem. Evaluation: 20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam : 50 Marks Total: 100 Marks
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Course Prerequisites:

Basic Civil & Environmental Engineering, fluid mechanics I, Engineering, Geotechnical Engineering.

Course Objective:

The objective of this course is to determine the energy resources and analyzes hydro power potential. Also study and design economically components of power plant is also another objective of this course.

Course Outcome:

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

CO1: explain different energy potential

CO2: analyse hydro power potential and choose the type of power plant.

CO3: determine the various electric terms and estimate electrical energy.

CO4: demonstrate the functions of components of power plant and design it

CO5: design the type of turbine

CO6: analyze economics of hydro power plants.

Course Contents

UNIT-I	Energy Resources – Planning and Potential	06 Hours
Power resources – Conventional and Nonconventional, Need & advantages, Overview of World Energy Scenario, energy and development linkage, Environmental Impacts of energy use - Air Pollution, Land and Water Pollution, Green House Effect, Trends in energy use patterns in India, Hydropower development in India, Hydropower potential		
UNIT-II	Hydropower Plants	06 Hours
Hydrological Analysis, Classification of hydropower plants - Run of river plants, Storage or Valley dam plants, Pumped storage plants, Introduction to micro hydro, Base load and Peak load plants, advantages & disadvantages, Components of hydropower plants.		
UNIT-III	Load Assessment	06 Hours

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Estimation of electrical load on turbines. Load factor, Plant factor, peak demand and utilization factor, load curve, load duration curve, Prediction of load, Tariffs, Hydro-Thermal Mix, Combined Efficiency of Hydro-Thermal-Nuclear Power Plants

UNIT-IV	Water Conductor System and Powerhouse	06 Hours
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Water Conductor System – Alignment, Intake Structures- Location and Types, Trash Rack. Penstock and pressure shaft, Types of Powerhouses, Typical layout of powerhouse, Components, Power plant equipments, Instrumentation and control

UNIT-V	Turbines	06 Hours
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Classification, Principles and design of impulse & reaction turbines, Selection of Turbine, Specific Speed, Governing of turbines, Water hammer, Hydraulic Transients and Surge tanks, Draft tubes, Cavitation.

UNIT-VI	Economics of Hydroelectric Power	06 Hours
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Hydropower - Economic Value and Cost and Total Annual Cost. Economic considerations – pricing of electricity, laws and regulatory aspects, Policies, Electricity act – 2003, Investment in the power sector, Carbon credits, Participation of private sector

Compulsory hydro power plant visit.

Reference Books:

- R1.** Water Power Engineering – M. M. Dandekar and K. N. Sharma
- R2.** Water Power Engineering – R. K. Sharma and T. K. Sharma, S. Chand and Co. Ltd.
- R3.** Handbook of Hydroelectric Engineering – P.S. Nigam
- R4.** Modern Power System Planning – Wang.
- R5.** Hydropower Resources in India – CBIP
- R6.** Hydro Power Structures – R. S. Varshney.
- R7.** Water Power Development – E. Mosonvi, Vol. I & II.
- R8.** Hydro-electric Engineering Practice – G. Brown, Vol. I, II & III.
- R9.** Water Power Engineering – P. K. Bhattacharya, Khanna Pub., Delhi.

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -V
[CEO3201T] Disaster Management

Teaching Scheme: TH: - 3 Hours/Week	Credit 03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Engineering Chemistry, Environmental Science

Course Objective:

1. To provide basic conceptual understanding of disasters.
2. To understand approaches of Disaster Management
3. To build skills to respond to disaster.

Course Outcome:

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

- CO1:** Describe hazard and vulnerability.
- CO2:** Report the occurrence of natural and manmade disaster
- CO3:** Exemplify the important disasters.
- CO4:** Illustrate disaster risk reduction process.
- CO5:** Discuss awareness program for Disaster Management.
- CO6:** Recommend disaster risk management plan for recent disaster.

Course Contents

UNIT-I	Understanding Disasters	06 Hours
Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management		
UNIT-II	Types of Disasters	06 Hours
Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunamis, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.		
UNIT-III	Study of Important disasters	06 Hours
Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements, Social Economics and Environmental impact of disasters with respect to case studies.		
UNIT-IV	Disaster Risk Reduction	06 Hours
Disaster management cycle, Post disaster environmental response; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for		

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disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V	Training, awareness program for Disaster Management	06 Hours
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Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Crisis mitigation.

UNIT-VI	Suggested Areas for Project and Assignments	06 Hours
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Study of Recent Disasters (at local, state and national level) And Preparation of Disaster Risk Management Plan of an Area or Sector Role of Engineers in Disaster Management.

Reference Books:

- R1: Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
- R2: Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi
- R3: Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
- R4: Nasim Uddin and Alfredo H. S. Ang, "Quantitative Risk Assessment (QRA) for Natural Hazards", ASCE
- R5: Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
- R6: An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
- R7: World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland.
- R8: Encyclopedia of disaster management, Vol I, II and III. Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006.
- R9: Encyclopedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2, Angus M. Gunn, Greenwood Press, 2008
- R10: Disasters in India Studies of grim reality, Anu Kapur & others, 2005, 283 pages, Rawat Publishers, Jaipur

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -VI
(CE3205T): Hydrology and Water Resources Engineering

Teaching Scheme: TH: - 3Hours/Week	Credit TH: 3	Examination Scheme: In Sem. Evaluation: 20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks
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Course Prerequisites: Engineering Mathematics and Surveying

Course Objective:

To understand the relation between different processes involved in rainfall runoff process along with peak flood analysis. To find water requirement of different crops along with feasibility study of reservoirs. To analyse ground water flow to estimate the yield of the well and effective use of water resource.

Course Outcome:

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

CO1: Estimate the distribution rainfall in various processes.

CO2: Estimate peak flood.

CO3: Calculate the ground water flow and yield of well.

CO4: Solve the problems on water requirement of crop.

CO5: Investigate the feasibility of a reservoir.

CO6: Analyze the water management system.

UNIT-I	Introduction to Hydrology	6 Hours
Hydrological cycle, Application of hydrology Precipitation: Types of precipitation, measurement, Rain gauge network, Preparation of data-estimation of missing data, Consistency test, Presentation of rainfall data-mass rainfall curves, Hyetograph, Point rainfall, Moving average, Mean precipitation over an area- arithmetic mean method, Thiessen's polygon, isohyetal method, Concepts of depth-area-duration analysis, Frequency analysis - frequency of point rainfall and plotting position, Intensity-duration curves, Maximum Intensity-duration- frequency analysis Abstractions of Precipitation: Intersection, Depression storage, Evaporation- Elementary concepts, factors affecting, Measurement of evaporation, Transpiration, Evapotranspiration- process and measurement, Infiltration –introduction, Infiltration capacity, Infiltrometer, Horton's method and infiltration indices Stream Gauging: Selection of site, various methods of discharge measurement (velocity-area method, dilution method, slope-area method), Advance techniques/equipments used in gauge discharge measurements such as Radar, Current meter, ADCP (Acoustic Doppler Current Profiler)		
UNIT-II	Runoff	6 Hours

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Introduction, Factors affecting runoff, Rainfall-Runoff relationships, Empirical Techniques to determine runoff,

Hydrograph: Introduction, Factors affecting Flood Hydrograph, Components of Hydrograph, Base flow separation, Effective rainfall, Unit hydrograph theory, S-curve hydrograph, synthetic hydrograph. probability of an event .

Floods: Causes and effects, Factors affecting peak flows and its estimation, Rational formula and other methods, Flood frequency analysis, Gumbel's method, Flood routing and Flood forecasting.

UNIT-III	Ground Water Hydrology	6 Hours
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Occurrences and distribution of ground water, Specific yield of aquifers, Movement of ground water, Darcy's law, Permeability, Safe yield of basin and yield test, Hydraulics of wells under steady flow condition in confined and unconfined aquifers, Specific capacity of well, Well Irrigation: Tube wells, Open wells and their construction

UNIT-IV	Introduction to Irrigation	6 Hours
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Definition, Functions, Advantages and Necessity, Methods of Irrigation, Surface Irrigation, Subsurface Irrigation, Micro-Irrigation

Water Requirements of Crops: Soil moisture and Crop water relationship, Factors governing Consumptive use of water, Principal Indian crops, their season and water requirement, Crop planning, Agricultural practices, Calculations of canal and reservoir capacities – duty, delta, irrigation efficiency Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures, Assessment of Canal Revenue: Various methods (Area basis or crop rate basis, volumetric basis, seasonal basis, composite rate basis, permanent basis or betterment levy basis)

UNIT-V	Reservoir Planning	6 Hours
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Introduction, Term related to reservoir planning (Yield, Reservoir planning and operation curves, Reservoir storage, Reservoir clearance), Investigation for reservoir planning, Significance of mass curve and demand curves, Applications of mass curve and demand curves, Fixation of reservoir capacity from annual inflow and outflow, Fixation of reservoir capacity using elevation capacity curve and dependable yield, Reservoir regulation, Reservoir sedimentation- Phenomenon, Measures to control reservoir sedimentation, Density currents Significance of trap efficiency, Useful life of reservoir, Costs of reservoir, Apportionment of total cost, Use of facilities method, Equal apportionment method, Alternative justifiable expenditure method

UNIT-VI	Water Management and climate change	6 Hours
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Distribution, Warabandi, Rotational water supply system, Participatory Irrigation Management, Cooperative water distribution systems, Introduction to auto weather station

Water Logging and Drainage: The process of water logging, Causes of water logging, Effects of waterlogging, preventive and curative measures

Climate Change: Introduction, Effect of climate change on Water Resources

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Reference Books:

- R1. Irrigation Engineering - S. K. Garg, Khanna Publishers
- R2. Irrigation, Water Resources and water power engineering- P. N. Modi, Standard Book House.
- R3. Irrigation and water power Engineering- Dr. Punmia and Dr. Pande, Standard Publisher
- R4. Elementary Engineering Hydrology- M.J.Deodhar-Pearson Education
- R5. Engineering Hydrology. –Ojha—Oxford University Press
- R6. Engineering hydrology – K. Subramanyam Tata McGraw Hill.
- R7. Hydrology- Principles, Analysis and Desin, Raghunath, New Age International
- R8. Irrigation Engineering-Raghunath—Wiley
- R9. Groundwater Hydrology, 3ed—Todd—Wiley
- R10. Applied Hydrology – Chow, Maidment, Mays, McGraw-Hill
- R11. Principles of Hydrology- Ward and Robinson, Tata McGraw Hill
- R12. Irrigation Engineering - Bharat Singh

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T. Y. B. Tech (Civil Engineering)

Academic Year – 2023-2024

Semester -VI

[CE3206T]: Design of Reinforced Concrete Structure

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Material properties of concrete and steel, load calculation , Bending moments and shear force calculations for different types of beams.

Course Objective:

To design all structural members in RC building and show proper detailing and schedule of reinforcement of RC building..

Course Outcome:

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

CO1: Explain the design philosophy of reinforced concrete structures and prestressed concrete.

CO2: Design rectangular and flanged beam

CO3: Design one way, two way, continuous and cantilever slab

CO4: Design reinforced concrete staircase.

CO5: Design axial, uniaxial and bi-axial columns.

CO6: Design isolated and combined footing.

Course Contents

UNIT-I	Design philosophies and Prestressed Concrete	06 Hours
Introduction to various design philosophies R.C structures: Working stress method, Ultimate load method and Limit state method. loads on structures, Role of structural engineer. Study of Structural Properties of Concrete. Limit state method: Limit state of collapse, Limit state of serviceability and Limit state of durability. Characteristic strength, Characteristic load, concept of Safety - Probabilistic approach, Semi probabilistic approach. Partial safety factors for material strengths and loads. Provisions in Indian standard code of practice. Concept of prestressing, Difference between RCC & PSC, Situations where prestressed concrete is used, and Materials used in prestressed concrete and their specifications as per IS code.		
UNIT-II	Design of flexural members	06 Hours
Assumptions of Limit State Method, Strain variation diagram, Stress variation diagram, Analysis and design of Singly and Doubly Reinforced rectangular sections, singly reinforced flanged beams. Design of flexural members: For Shear, Bond and Torsion.		

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UNIT-III	Design of slab	06 Hours
Design of slab: One way, simply supported, Cantilever and Continuous slabs by using IS code coefficients. Two way slabs: Simply supported, Continuous and Restrained.		
UNIT-IV	Design of staircase	06 Hours
Design of continuous beam by IS code method. Redistribution of moments in continuous reinforced concrete beam.		
UNIT-V	Design of column	06 Hours
Introduction, Strain and Stress variation diagrams, axially loaded Short Column with minimum eccentricity requirements. Design of Short Column for axial load, Uni-axial, Biaxial bending using interaction curves.		
UNIT-VI	Design of footing	06 Hours
Design of Isolated Column footing for axial load and uni-axial bending. Design of combined footing, Eccentric footing.		
Text Books: T1. V.L.Shah, S.L.Karve “ Limit State Theory & Design of Reinforced Concrete”, structures publications T2. B.C Punmia, A.K.Jain “Comprehensive Design of R.C. Structures”, Standard Book House, NewDelhi T3. N.C Sinha, S.K.Roy “ Fundamentals of reinforced concrete”, S.Chand and company ltd., NewDelhi		
Reference Books: R1. P.C.Vargese, “Limit state design of Reinforced Concrete ”, PHI, New Delhi. R2. P. Dayaratnam, “Limit State Analysis and Design”, Wheeler Publishing company, Delhi R3. V.L.Shah and S.R. Karve, “ Illustrated Design of Reinforced Concrete Buildings (G+3)”, Structures Publications, Pune R4. PillaiMenon, “Reinforced Concrete Design”, Tata McGraw Hill, New Delhi		
IS Code: R5. IS 456 -2000 , SP-34 ,SP-16, IS 13920 -2016		

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024
Semester -VI

[CE3206L]: Design of Reinforced Concrete Structure Lab

Teaching Scheme: LAB: 02 Hours/Week	Credit LAB: 01	Examination Scheme: In Sem. Evaluation: 30 Marks End Sem. Exam : 20 Marks
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Lab Outcome:

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

CO1: design all structural members in RC building slabs, beams, columns, staircase and footing

CO2: draw proper detailing and schedule of reinforcement of RCC building.

Lab Contents (Plan A)

Guidelines for Assessment

1. Continuous assessment of laboratory work is to be done based on overall performance and lab practical /assignments performance of student.
2. Students will be divided into groups. Maximum number of students for projects not more than four.
3. Oral Examination shall be based on the term work.

List of Laboratory Assignments/Experiments (minimum -- to be covered)

A	Design of G + 2 (Residential/Commercial/Public) building covering all types of Slabs, Beams, Columns, Footings and Staircase (first and intermediate flights).
1	Minimum plan area of each floor shall be more than 150 square meter
2	Design of all plinth and ground beams.
3	Design of all slabs (One way , two way, cantilever) and beams of first floor.
4	Design of three types columns for, (a) axial load, (b)axial load + uniaxial BM, (c)axial load + biaxial BM), from terrace level to footing along with detailed load calculations and footing for columns with (a) axial load (b)axial load + uniaxial BM
5	Detailing of reinforcement on full imperial sheetas per SP-34 & IS 13920
6	Full imperial drawing sheets in five numbers. Out of which only structural plan drawing sheet shall be drawn by using any drafting software (AUTOCAD)
7	Design any one element by using spread sheet.
B	Reports of two site visits. (Building under construction)

Lab Contents (Plan B)

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List of Laboratory Assignments/Experiments

A	The plan prepared in Architectural and building planning S.Y.B Tech sem -II is taken for the R.C.C. Design covering all types of Slabs, Beams, Columns, Footings and Staircase (first and intermediate flights).
1	Design of all plinth and ground beams.
2	Design of all slabs (One way , two way, cantilever) and beams of first floor.
3	Design of three types columns for, (a) axial load, (b)axial load + uniaxial BM, (c)axial load + biaxial BM), from terrace level to footing along with detailed load calculations and footing for columns with (a) axial load (b)axial load + uniaxial BM
4	Detailing of reinforcement on full imperial sheet as per SP-34 & IS 13920
5	Full imperial drawing sheets in five numbers. Out of which only structural plan drawing sheet shall be drawn by using any drafting software (AUTOCAD)
6	Design any one element by using spread sheet.
B	Reports of two site visits. (Building under construction)

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -VI
[CE3207T-A]: Professional Elective II
Solid Waste Management

Teaching Scheme: TH: - 3Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total Marks : 100
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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 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: Describe the Sources, Composition and Characteristics and disposal technique for biomedical waste.

Course Contents

UNIT-I	Fundamentals of Solid Waste Management	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	Biomedical Waste Management	06 Hours
Introduction, Sources Biomedical waste, Classification of Biomedical waste, Biomedical Waste Management techniques, Impact of mismanagement of Biomedical waste , Challenges and solutions, Biomedical waste handling Guidelines and Rules worldwide.		
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		
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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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -VI
[CE3207T-B]: Professional Elective II
Remote Sensing & Geographic
Information System

Teaching Scheme: TH: - 3 Hours/Week	Credit 03	Examination Scheme: In Sem. Evaluation: 30 Marks Mid Sem. Exam: 20 Marks End Sem. Exam : 50 Marks Total: 100 Marks
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Course Prerequisites:

Basic civil engineering , Surveying

Course Objective:

Understand the fundamentals of Remote sensing concepts, Geographical Information System and illustrate the types of Remote sensing platforms and sensors. Summarize the different steps and computation involved in Aerial Photogrammetric is also auxiliary objective of this course

Course Outcome:

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

CO1: Demonstrate the fundamentals of Remote sensing concepts

CO2: Select and utilize the data available from different type of remote sensing satellites for required purpose.

CO3: Interpret aerial photographs and Determine the field dimensions.

CO4: Analyze the basic components of GIS.

CO5: Explain the concept of Map projections and apply the techniques of remote sensing and GIS to required field.

CO6: Discuss the concepts of trigonometrical leveling.

Course Contents

UNIT-I	Remote sensing	06 Hours
Introduction, Ideal remote sensing system, basic principles of electromagnetic remote sensing, electromagnetic energy, electromagnetic spectrum, interaction with earth's atmosphere, interaction with earth- surface materials, spectral reflectance of earth surface materials		
UNIT-II	Remote sensing platforms and sensors	06 Hours
Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. Sensors-active and passive, MSS, AVHRR, LISS, TM, PAN, WIFS, microwave sensors, sensor resolutions (spatial, spectral, radiometric and temporal),		
UNIT-III	Aerial Photogrammetry	06 Hours

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Introduction, basic geometric characteristics of aerial photographs, photographic scale, ground coverage of aerial photographs, Area measurement, relief displacement of vertical features, image parallax, ground control for aerial photography, mapping with aerial photographs, flight planning, Basics of stereoscopy, stereoscopes.

Self-Learning Topics: Basics of stereoscopy, stereoscopes

UNIT-IV	Fundamentals of Geographical Information System	06 Hours
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Definition of GIS, History of GIS, Key Components of GIS, Data structures in GIS, Geospatial data, GIS operations, Data overlay, Data input and editing, Data display and Cartography

UNIT-V	Coordinate systems & Applications	06 Hours
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Geographical Coordinate System, Datum, Map projections, Types of Map Projections, Projected Coordinate System.

Applications -Integration of Remote Sensing and GIS, Applications of Remote sensing and GIS, Softwares scenario in Remote sensing and GIS.

UNIT VI	Trigonometric leveling and microwave remote sensing	06 Hours
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Trigonometric Levelling: - Terrestrial refraction, Angular corrections for curvature and refraction, Axis signal correction, Determination of difference in elevation by single observation and reciprocal observations

Introduction to microwave remote sensing. History of Microwave Remote Sensing; Interaction of Microwaves with the Atmosphere; Interaction with discrete objects

Reference Books:

- R1.** Lillesand T.M., and R.W. Kiefer, "Remote sensing and image interpretation." John Wiley & Sons, Fourth edition, 2000.
- R2.** Kang tsuang Chang "Introduction to Geographical Information Systems"—Tata McGraw Hill, New Delhi, Fourth edition, Twelfth edition reprint, 2013.
- R3.** M. Anji Reddy, "Remote Sensing and Geographical Information systems", BS Publications, Fourth edition, Twelfth edition reprint, 2017
- R4.** M. Chandra and S. K. Gosh. "Remote Sensing and GIS", Narosa Publishing Home, New Delhi 2009.
- R5.** James B. Campbell and Randolph H. Wynne, "Introduction to Remote Sensing", The Guilford Press, 2011
- R6.** Paul Longley, "Geographic Information systems and Science", John Wiley & Sons, 2005.

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -VI
[CE3207T-C]: Professional Elective II
Pre-stressed Engineering

Teaching Scheme: TH: - 3 Hours/Week	Credit 03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Engineering Chemistry, Environmental Science

Course Objective:

To raise awareness among students about sustainability issues within the field of engineering and sustainable development, and to clearly understand the role and impact of engineering decisions on environmental, societal, and economic challenges.

Course Outcome:

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

CO1: Explain the basic principles, necessity, types and materials used for prestressed concrete construction.

CO2: Apply the concepts of load balancing and pressure line to analyze internal force distribution in prestressed members.

CO3: Analyze stress distribution in prestressed concrete members under different loading stages (transfer and service), including various cross-section.

CO4: Calculate different types of prestress losses and total loss of prestress for both pre-tensioned and post-tensioned members.

CO5: Determine short-term and long-term deflections in prestressed members.

CO6: Design prestressed concrete flexural members.

Course Contents

UNIT-I	Introduction to Prestressed Concrete	06 Hours
Principles and necessity of prestressing, Comparison with reinforced concrete, Types of prestressing: Pre-tensioning and post-tensioning, Methods and systems of prestressing (Hoyer, Freyssinet, Gifford–Udall, Magnel, etc.), Materials for prestressed concrete – high strength concrete and high tensile steel		
UNIT-II	Load Balancing Concept and Pressure Line in Prestressed Concrete	06 Hours
Force concept, Load balancing concept, Kern point, Pressure line (Thrust Line), Classification of prestressed concrete, Calculation of pressure line profile for given tendon geometry and prestressing force.		
UNIT-III	Analysis of Prestressed Members	06 Hours

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Stress analysis in prestressed concrete members at transfer and at service loads, Stress distribution in rectangular and I-section beams

UNIT-IV	Losses of Prestress	06 Hours
Types of losses: Elastic shortening, shrinkage, creep, relaxation of steel, anchorage slip, frictional losses, Calculation of total losses in pre-tensioned and post-tensioned members		
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UNIT-V	Deflections and Cracking in Prestressed Members	06 Hours
Short-term and long-term deflections of uncracked and cracked members, Factors influencing deflections, IS code provisions for control of deflection and cracking		

UNIT-VI	Design of Prestressed Concrete Beams	06 Hours
Analysis of members at ultimate strength, Preliminary Design, Final Design for Type 1 members.		

Text Books:

T1. Krishna Raju, N. "Pre stressed Concrete", Tata McGraw Hill Publishing Company, New Delhi 2006

T2. Krishna Raju. N., "Pre-stressed Concrete - Problems and Solutions", CBS Publishers and Distributors, Pvt. Ltd., New Delhi.

T3. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi

Reference Books:

R1. Praveen Nagarajan, "Advanced Concrete Design", Person Publishers

R2. P. Dayaratnam, "Pre stressed Concrete Structures", Scientific International Pvt. Ltd.

R3. Lin T Y and Burns N H, 'Design of Pre - stressed Concrete Structures', John Wiley and Sons, New York

R4. Pundit G S and Gupta S P, "Pre - stressed Concrete", C B S Publishers, New Delhi

IS Code:

IS: 1343: Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.

IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, BIS, New Delhi

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T. Y. B. Tech (Civil Engineering)
Academic Year – 2023-2024 Semester -VI
[CE3207T-D]: Professional Elective II
Infrastructure Engineering and Construction Techniques

Teaching Scheme: TH: - 3 Hours/Week	Credit: 03	Examination Scheme: Theory In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Basic Civil & Environmental Engineering, Concrete Technology, Engineering Geology, Geotechnical Engineering.

Course Objective: To understand the contribution of infrastructure in Indian economy and study various techniques, equipment used in construction projects. It also aims to study fundamentals of transportation modes like Railway engineering, Docks & Harbors along with construction techniques of tunneling.

Course Outcome:

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

CO1: Explain the importance of Infrastructure in development of India

CO2: Discuss the fundamentals of railway engineering.

CO3: Explain the fundamentals of Docks & Harbours

CO4: Discuss techniques used in construction

CO5: Describe the fundamentals of tunnel engineering

CO6: Explain the various equipment's required in for construction

Course Contents

UNIT-I	Introduction to Infrastructure Engineering	06 Hours
Meaning and Scope of Infrastructure Engineering: Scope of Infrastructure Engineering in National and Global development, Forthcoming Infrastructure projects at national and global level, Necessity, Advantages and disadvantages of PPP (Public Private Partnership), Salient features of smart city , AMRUT, PPP, PM Gatishakti National Master Plan, Funding of infrastructure project development, smart irrigation, ITS, Automation, Infrastructure Asset Management		
UNIT-II	Railway Engineering	06 Hours
Introduction to Railway Engineering- Feasibility studies, Gauges, Wheel and Axles, Coning of Wheels, tilting of rail, Resistances, Stresses, Stresses in Components of Track, Rails, Creep in Rails, Wears & Failures in Rails, Jointed or Welded rails, Sleepers, Ballast, Fastenings, Geometric Design - Alignment of Track, Horizontal Curve and Super elevation, Speeds on Track, Transition Curve & Widening of Track, Vertical Curve & Gradients, Turnouts - Components, Crossing and Design of Turnout, Track		

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Junctions and Designs, Train Control Systems, Interlocking of Track, High Speed Tracks- Bullet train, Metro rail, concept of Monorail

UNIT-III	Docks & Harbors	06 Hours
Introduction, Requirements of harbors and ports, Classification of harbors with examples, Selection of site for harbor, Various components of ports, Break waters- types, comparison, design criteria , methods of construction, Tetra pod, Tri bar, Hexapod, Quay wall, Wet & dry dock, Floating dock, Wharves, Jetties, Types of fenders, Dolphins, Marin railway		
UNIT-IV	Construction Techniques	06 Hours
Dredging and dewatering techniques, Asphalt construction: Asphalt pavers, Compactors for asphalt concrete and other construction methods, Concrete construction: Mixing and placement-pumps, Ready-Mix Concrete trucks, Concrete paving technology, Pre-cast concrete and Steel construction: Launching techniques for heavy decks, Pre-stressed concrete construction, underwater construction		
UNIT-V	Tunneling	06 Hours
Tunneling, functions & types of tunnel, Criteria for selection of size & shape of tunnels. Pilot tunnel, shaft, addit and portal, Needle beam, NATM, TBM & earth pressure balance method of tunneling in soft soil, Drilling & blasting method of tunneling including various operations like mucking, Drainage in tunneling- Pre drainage and permanent drainage, Ventilation in tunneling temporary and permanent, Micro tunneling and trenchless tunneling.		
UNIT-VI	Construction Equipment	06 Hours
Selection of equipment, factors affecting performance of equipment, Earthwork moving equipment like Dozers, Power shovels, Excavators, Loaders, Scrapers, Dumpers, Drag line, Clamp shell, Compactors, Pavers, Plant operational equipment, concreting equipment, types of cranes, uses, maintenance of construction equipment		

Reference Books:

- R1.** Construction Planning Methods & Equipment: Puerifoy –Tata MC Graw Hill
- R2.** Construction Equipment's& its Management: S.C Sharma,Khanna Publication
- R3.** Railway Engineering, 2/E by Chandra—Oxford University Press
- R4.** Railway Track Engineering: J.S.Mundrey,Tata McGraw Hill
- R5.** Harbour,Dock& Tunnel Engineering:R. Srinivasan
- R6.** Dock & Harbour Engineering: Hasmukh P. Oza & Gautam H.Oza - Charoter Book Stall
- R7.** Construction Project Scheduling & Control, 2ed—Mubarak--Wiley.

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T. Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208T-A] Professional Elective-III
Open channel flow

Teaching Scheme: TH: - 3Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks
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Course Prerequisites: Fluid mechanics, Engineering Mechanics, Engineering Mathematics and Engineering Physics.

Course Objective:

To study the analysis and design considerations related to open channel flow systems and energy dissipation. To provide students the knowledge about recognizes and classify types of flow, flow around submerged body and hydraulic machinery.

Course Outcome:

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

CO1: Demonstrate open chaneel flow

CO2: Apply mathematical relationship for open channel flow and depth energy relation in open channel

CO3: Design open channel to suite real field requirements.

CO4: Compare RVF and GVF in open channel flow problems.

CO5: Estimate GVF with suitable method.

CO6: Apply momentum equation to RVF and classify hydraulic jump

Course Contents

UNIT-I	Introduction to open channel flow	06 Hours
Introduction to Open channel flow: Classification of channels, and Channel flows. Basic governing equations of Channel flow viz. continuity equation, energy equation and momentum equation, One dimensional approach, Geometric elements of channel, Velocity distribution in open channel flow, Introduction to notches and weirs ((Rectangular, Triangular, Trapezoidal).		
UNIT-II	Depth energy relationship in open canal	06 Hours
Depth-Energy Relationships in Open Channel Flow: Specific energy, Specific force Specific energy diagram, Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of		

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critical flow; Froude's number, flow classification based on it, Important terms pertaining to critical flow viz. section factor, concept of first hydraulic exponent; Critical flow computations; channel transitions

UNIT-III

Uniform flow in open channel

06 Hours

Uniform flow in open channels: Characteristics and establishment of uniform flow, uniform flow formulae: Chezy's and Manning's formulae; Factors affecting Manning's roughness coefficient; Important terms pertaining to uniform flow, viz. normal depth, conveyance, section factor, concept of second hydraulic exponent, Uniform flow computations. Most efficient channel sections (rectangular, triangular, trapezoidal and circular).

UNIT-IV

Gradually Varied Flow

06 Hours

Gradually Varied Flow in Open Channels: Definition and types of non-uniform flow; Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF; Differential equation of GVF - Alternative forms; Classification of channel bed slopes, Various GVF profiles, their general characteristics and examples of their occurrence; Control section

UNIT-V

GVF Computation

06 Hours

Gradually varied flow computations: Methods of GVF computations. Direct Step method, Graphical Integration method, Standard Step method, VenTe Chow method

UNIT-VI

Rapidly varied flow and hydraulics of mobile bed channel

06 Hours

a) Hydraulic Jump-Phenomenon of hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel: Conjugate depths and relations between conjugate depths. Energy dissipation in hydraulic jump; Graphical method of determination of energy dissipation, Classification of hydraulic jump; Practical uses of hydraulic jump, venture flume, standing wave flume

b) introduction, initiation of motion of sediment, bed forms, sediment load, design of stable channels, scour.

Text Books:

- T1 Hydraulics & Fluid Mechanics by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House.
- T2 Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers.
- T3 Fluid Mechanics and Fluid Machinery by R. K. Bansal, Laxmi Publications.

Reference Books:

- R1. Flow in Open Channels, K. Subramanya, Tata McGraw Hill Publishing Co. Ltd.
- R2. Open Channel Hydraulics, VenTe Chow, Tata McGraw Hill Publishing Co. Ltd.

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- R3. Fluid Mechanics by Yunus Cengel, Jhon Cimbala, Tata Macgraw Hill, New Delhi.
R4. Fluid Mechanics by R. J. Garde, A.J Mirajgaonkar, SCITECH Publication.
R5. Fluid Mechanics by Streeter & Wylie, Tata McGraw Hill.
R6. Fluid Mechanics by Frank White, McGraw Hill.

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T. Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208L-A] Professional Elective-III
Open channel flow Lab

Teaching Scheme Hours - 2 /Week	Credit:01	Examination Scheme: ISCE:30Marks End Sem. Exam : 20 Marks
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Course Prerequisites: Engineering Mechanics, Engineering Physics, Fluid mechanics

Labrotory Objective:

To perform experiments related to open channel flow and design related open channel flow

Laboratory Outcome:

After successful completion of lab, students will able to:

1. **CO1:** Determine uniform flow coefficients
2. **CO2:** Determine Velocity distribution
3. **CO3:** Determine energy loss in GVF
4. **CO4:** Application of flow transition
5. **CO5:** Design and application of soft technique related to fluid problems

List of Laboratory Assignments/Experiments

Experiments.

1	Study of Uniform Flow Formulae for Open channel.
2	Velocity Distribution in Open Channel Flow.
3	Calibration of Venturi flume
4	Determine energy loss for hydraulic jump in rectangular channel

Assignments any three of following

1	Gradually varied flow computation (any method) etc
2	Design of trapezoidal channel section
3	Site visit for hydraulic jump under spillway
4	Site visit: Report on Site visit to any one of the Research Institute like CWPRS, WALMI, MERI

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Programming for open channel flow design

Text Books:

- T10 Hydraulics & Fluid Mechanics by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House.
T11 Flow in Open Channels by K Subramanya, Pub: Tata McGraw Hill, New Delhi
T12 Fluid Mechanics and Fluid Machinery by R. K. Bansal, Laxmi Publications.
T4 Asawa, G. L., Laboratory Work in Hydraulic Engineering, New Age International Private Limited, 2016.

Reference Books:

- R1. Fluid Mechanics and Hydraulic Machines by McGraw Hill Education (India).
R2. Fluid Mechanics by Yunus Cengel, Jhon Cimbala, Tata MacgrawHill, New Delhi.
R3. Open Channel Hydraulics by Ven Tee Chow, Pub: Mcgraw- Hill Book Company- Koga

Hand books:

- <http://www.engmatl.com/home/viewdownload/10-engineering-handbooks-pocket-books/123-fluid-mechanics-handbook>
- <http://www.springer.com/materials/mechanics/book/978-3-540-25141-5>.

e-Resources:

- <http://nptel.iitm.ac.in/courses.php>
- [http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/FLUIDMECHANICS /ui/Course_home-3.htm](http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/FLUIDMECHANICS/ui/Course_home-3.htm)

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208T-B] Professional Elective-III
Advanced Construction Management

Teaching Scheme: TH: - 3 Hours/Week	Credit: 03	Examination Scheme: Theory In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Basic Civil Engineering, Project Management

Course Objective: This course aims to enable students for project planning and project cost analysis. The aim is to make the students aware about material management, Project Economics, Project Appraisal etc.

Course Outcome:

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

CO1: Explain the knowledge of capital budgeting and working capital in construction projects.

CO2: Illustrate concept of scheduling, work study.

CO3: Discuss concept of risk management.

CO4: explain the concept of material management and human resource management.

CO5: Apply the knowledge of economics and taxation in construction industry.

CO6: Describe basics of artificial intelligence techniques in civil engineering.

Course Contents

UNIT-I	Financial Management	06 Hours
Role of financing institutes in construction sector, Meaning and types of working capital, components of working capital, factors affecting working capital, estimation of working capital, 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, Inflation accounting and corporate practices in Construction, Profit and loss, Balance sheet, Income statement		
UNIT-II	Construction Scheduling, Work Study, BIM	06 Hours
WBS, Construction scheduling techniques, Line of Balance, Project monitoring, application of software in scheduling, Work study (time and motion study): definition, objectives, process of method study, symbols, multiple activity charts, two handed process chart, string diagram, introduction to building information modeling (BIM) based on software.		
UNIT-III	Risk Management	06 Hours
Risk Management: introduction, principles, steps in risk management, risk in construction, origin, use of mathematical models: sensitivity analysis, simulation analysis (examples), decision tree analysis, risk		

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identification, mitigation of project risks, role of insurance in risk management, use of correlation analysis and regression analysis

UNIT-IV	Material Management and Human Resource Management	06 Hours
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Material: introduction, need, objectives and functions and scope of material management, inventory control methods, EOQ Model, stores management and control, concept of logistics and supply chain management, role of ERP in material management and material resource information systems.

Human Resources: introduction, nature and scope of human resource management, human resource development process, recruitment & selection, performance evaluation and appraisal, training & development, succession planning, compensation and benefits, career planning, human resources information systems, HR data and analytics, role of ERP in human resource management and human resource information system

UNIT-V	Project Economics, Taxation	06 Hours
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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. Introduction to direct and indirect tax, GST, impact of GST on construction industry, property tax: types, methods of calculation, tax deductions against income from property, corporate tax planning.

UNIT-VI	Artificial Intelligence in Civil Engineering	06 Hours
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Introduction to artificial intelligence technique, basic terminologies and applications in civil engineering: artificial neural network, fuzzy logic and genetic algorithm, 3D printing technology.

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

T4. Materials Management an integrated approach by Gopalkrishnan and M. Sundaresan, Delhi 2014

T5. Project Planning and Control with PERT and CPM by Dr. B. C. Punmia and K. K. Khandelwal, New Delhi. 4th edition-2002, reprint- 2012**T6.** Project Management by Nagarajan

Reference Books:

R1.Construction Project Management Theory & practice --- Kumar Neeraj Jha,Pearson,2012

R2. Construction project scheduling and control ----Mubarak, Wiley India.

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R3. Real Estate, Finance and investment, Bruggeman. Fishr, McGraw Hill, 2010.

R4. Construction Management and Planning by Sengupta and H Guha, Tata McGraw Hill Publishing Company, New Delhi

R5. Construction Engineering and Management by Seetharaman, Umesh publication, New Delhi.2012

R6. Human Resource Management, Biswajeet Pattanayak, Prentice Hall Publishers

R7. Artificial Neural Network, Veganarayanan, Prentice Hall

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208L-B] Professional Elective-III
Advanced Construction Management Lab

Teaching Scheme: LAB: -2 Hours/Week	Credit: 01	Lab Evaluation In Sem Continuous Evaluation : 30 Marks: End Sem. Exam : 20 Marks
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Course Prerequisites: Basic Civil Engineering

Course Objective: This course aims to enable students for project planning and project cost analysis. The aim is to make the students aware about material management, Project Economics, Project Appraisal etc.

Course Outcome:

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

- CO1: execute the knowledge of capital budgeting and working capital in construction projects.
- CO2: illustrate concept of scheduling, work study.
- CO3: express concept of risk management.
- CO4: explain the concept of material management and human resource management.
- CO5: execute the knowledge of economics and taxation in construction industry.
- CO6: understand basics of artificial intelligence techniques in civil engineering.

Lab Contents

Guidelines for Assessment

In Semester Continuous Evaluation and End Semester Examination(oral) is based on solved laboratory assignments.

List of Laboratory Assignments/Experiment

1	Assignment on Microsoft Project(MSP)/ BIM
2	Assignment on Risk Management techniques
3	Assignment on ABC Analysis and EOQ Model
4	Numerical Based assignment on Project Economics
5	Assignment on application of AI in Civil Engineering

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

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T3. “Safety management” – Girimaldi and Simonds, AITBS, New Delhi

T4. Materials Management an integrated approach by Gopalkrishnan and M. Sundaresan, Delhi 2014

T5. Project Planning and Control with PERT and CPM by Dr. B. C. Punmia and K. K. Khandelwal, New Delhi. 4th edition-2002, reprint- 2012**T6.** Project Management by Nagarajan

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 Management and Planning by Sengupta and H Guha, Tata McGraw Hill Publishing Company, New Delhi

R5. Construction Engineering and Management by Seetharaman, Umesh publication, New Delhi. 2012

R6. Human Resource Management, Biswajeet Pattanayak, Prentice Hall Publishers

R7. Artificial Neural Network, Veganarayanan, Prentice Hall

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208T-C] Professional Elective-III
Industrial Waste Water Treatment

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Environmental Engineering, and Wastewater Engineering

Course Objective:

To develop the ability to design waste water treatment processes for industrial wastewater and apply the concepts to solve engineering problems.

Course Outcome:

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

- CO1: Describe the characteristics, flow measurements, and treatability of domestic and industrial wastewater.
- CO2: Explain the unit operations and processes involved in water pollution control, including the generation of influent, segregation, stream pollution, and self-purification.
- CO3: Summarize the pre-treatment, characteristics, collection, treatment, and disposal methods for textile and dairy wastes.
- CO4: Identify the pre-treatment, characteristics, collection, treatment, and disposal techniques for tannery wastes, sugar mill wastes, and pulp and paper mill waste.
- CO5: Discuss the pre-treatment, characteristics, collection, treatment, and disposal processes for fermentation industry wastes, engineering industry wastes, and petroleum refining industry wastes.
- CO6: Illustrate comprehensive industrial wastewater treatment.

Course Contents

UNIT-I	Introduction to Wastewater Management	06 Hours
Domestic waste water and industrial waste waters, Flow measurements, Characteristics and Treatability studies of industrial waste waters		
UNIT-II	Fundamentals of Water Pollution Control	06 Hours
Unit operation and unit processes, Generation of influent, Segregation, Stream pollution and self-purification.		
UNIT-III	Treatment and Disposal of Textile and Dairy Wastes	06 Hours
Pre-treatment of industrial wastes, Characteristics, collection treatment and disposal of Textile Wastes, Dairy wastes.		

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UNIT-IV	Treatment and Disposal of Tannery and Sugar Mill Wastes	06 Hours
Pre-treatment of industrial wastes, Characteristics, collection treatment and disposal of Tannery wastes, Sugar mill wastes, Pulp and paper mill wastes.		
UNIT-V	Treatment and Disposal of Fermentation and Petroleum Refining Wastes	06 Hours
Pre-treatment of industrial wastes, Characteristics, collection treatment and disposal of Fermentation industry wastes, The engineering industry, Petroleum refining industry		
UNIT-VI	Comprehensive Industrial Waste Treatment	06 Hours
Pre-treatment of industrial wastes, Characteristics, collection treatment and disposal of Petrochemicals industry, Fertilizers and pesticides industries, Vegetable oil, food and allied industries, Dyestuff and dye manufacturing industries, Rubber wastes, Radioactive wastes, Organic and inorganic chemicals, Common effluent treatment plants.		
Text Books: T13 A.D. Patwardhan "Industrial Waste Water Treatment" PHI Learning Pvt. Ltd. T14 Waste Water Treatment-Concept Design and Approach---C.L.Karia,R.A.Christian--PHI		
Reference Books: R15. Fair, G.M. and G.C. Geyer (1954): Water supply and Wastewater Disposal. New York: Wiley. R16. Mahajan, S.P.(1998): Pollution Control in Process Industries, New Delhi :Tata McGraw-Hill. R17. Manual on sewerage and sewage treatment – Public Health Dept., Govt. of India R18. Standard Methods by APHA.		
e-Resourses: 1. http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php 2. http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php		

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208L-C] Professional Elective-III
Industrial Waste Water Treatment Lab

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: ISCE : 20 Marks MSE : 30 Marks ESE : 50 Marks Total : 100 Marks
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Course Prerequisites: Environmental Engineering, and Wastewater Engineering

Course Objective:

To provide practical knowledge on the characteristics and treatment of various industrial wastewaters and to familiarize students with the techniques and equipment used in the pre-treatment and treatment processes.

Course Outcome:

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

- CO1:** Draft a detailed site visit report by describing the operational processes of an effluent treatment plant (ETP) and its effectiveness in treating industrial wastewater.
- CO2:** Interpret the characteristics of industrial effluent by performing standard tests on samples collected from various stages of effluent treatment.
- CO3:** Prepare a working or demonstrative model of a unit operation or process used in industrial wastewater treatment.

Course Contents

Activity 1: Site Visit to Effluent Treatment Plant (Textile/ dairy/ Tannery/ Sugar Mill etc.) followed by report writing.

Activity 2: To perform tests on industrial effluent collected from any industry (Textile/ dairy/ Tannery/ Sugar Mill etc.)

Collect and characterize wastewater samples of any of above-mentioned industry Effluent Treatment Plant; perform following experiments on samples collected after pre-treatment, primary treatment, and advanced treatment methods (if any) from ETP. Perform any five from list given below;

- i) Determination of pH
- ii) Determination of Conductivity
- iii) Determination of DO
- iv) Determination of BOD
- v) Determination of COD
- vi) Determination of Total Solids

Activity 3: Prepare working/ demonstrative Model for any of Unit Operations and Processes in

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Industrial Wastewater Treatment

Lab Assessment

Lab Reports: Detailed reports for each experiment, including objective, methodology, results, and analysis.

Viva Voce: Oral examination to assess understanding of the experiments and theoretical concepts.

Practical Exam: Hands-on assessment to evaluate proficiency in conducting experiments and using lab equipment.

Text Books:

- T1. Standard Methods for examination of water and wastewater, Mary Franson, American Public Health Association.
- T2. Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication.
- T3. Water Supply and Treatment Manual: Govt. of India Publication
- T4. Waste Water Treatment-Concept Design and Approach---C.L.Karia,R.A.Christian--PHI

Reference Books:

- R1. CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
- R2. Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
- R3. Waste Water Engg. – B.C. Punmia & Ashok Jain - Arihant Publications.
- R4. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication.
- R5. Theory and practice of water and waste water treatment—Wiley

IS Code:

- 1. IS 10500:2012 Drinking water specifications.
- 2. IS 3025: 2013, Methods of Sampling and Test (Physical, Chemical and Biological) for Water and Waste Water, Bureau of Indian Standards, New Delhi.

e-Resources:

- 1. <http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php>
- 2. <http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php>
- 3. <http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php>
- 4. <http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php>
- 5. <https://ee1-nitk.vlabs.ac.in/>
- 6. <https://ee2-nitk.vlabs.ac.in/>

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208T-D] Professional Elective-III
Advanced Design of Steel Structures

Teaching Scheme: TH: 3 Hours/Week	Credit 3	Examination Scheme: In Sem. Evaluation: 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
Course Prerequisites: Engineering Mechanics, Solid Mechanics, Structural Analysis, and Engineering Physics		
Course Objective: - To learn advanced design concepts for structural steel applicable to various types of steel structures. - To understand primary code source applies to building design, which is supplemented by a strong theoretical background in steel behavior applicable to non-typical structures.		
Course Outcome: After successful completion of the course, students will able to: CO1: Apply unified code philosophy to steel building design CO2: Apply plastic method for design of beams and frames. CO3: Design & details of Bunkers and Silos CO4: Explain the use of cold form sections in the steel structure including pre-engineered building. CO5: Design a member for torsion CO6: Design for Pre Engineered buildings		
Course Contents		
UNIT-I	Properties of Steel	6 Hours
Mechanical Properties, Hysteresis, Ductility. Compactness and non-compactness, slenderness, residual stresses.		
UNIT-II	Plastic Behavior of Structural Steel	6 Hours
Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis		
UNIT-III	Design of Bunkers and Silos	6 Hours
Introduction to Bunkers and Silos, Structural Behavior, Failure Modes and Structural Stability, Design Codes and Standards, Design of Bunker, Design of Silos		

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UNIT-IV	Design of cold formed sections	6 Hours
Advantages, stiffened and un stiffened elements, local buckling and post buckling strength, shear lag and flange curling, unusually wide flange section, short span sections, members subjected to axial tension, compression and bending.		
UNIT-V	Torsion	6 Hours
Introduction to torsional loadings in practises, behaviour of the members due to torsional, shear centre, Approximate design procedure, torsional buckling and torsional deformation.		
UNIT-VI	Pre-Engineered Buildings	6 Hours
Introduction to pre-engineered buildings, components of pre-engineered buildings, Design Codes, Design of primary frame, Gable end framing		

Text Books:

1. N. Subramanyan, “*Design of Steel Structures*”, Oxford Publication.
2. Horne, M.R. and Morris L.J., “*Plastic Design of Low -rise frames*”, Granada Publishing.
3. S. K. Duggal, “*Design of Steel Structure*”, Tata Mc Graw Hill.

Reference Books:

1. Kuzamanovic B.O. and Willems N., “*Steel Design for Structural Engineers*”, Prentice Hall.
2. Wie - Wen Yu. “*Cold-formed Steel Structures*”, McGraw Hill Book Company, 1973.
3. William McGuire, “*Steel Structures*”, Prentice Hall, Inc., Englewood Cliffs, N.J.1986.
4. Guidelines to design cold form section by Tata Steel.
5. Shah and Gore, “*Design of Steel Structure*”- Structures Publishers, Pune
6. IS: 800, - “*Code of practice for General Construction in steel*”.
7. IS: 875 - (Part I to V) – “*Code of practice for structural safety of building loading standards*”.
8. IS: 226 – “*Structural steel*” (Standard Quality).
9. SP: 6(1) – “*Structural steel section*”.
10. SP: 6(6) – “*Application of plastic theory in design of steel structures*”.
11. IS 801: “*Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction*”.

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T.Y. B. Tech (Civil Engineering)
Semester -VI
[CE3208L-D] Professional Elective-III
Advanced Design of Steel Structures Lab

Teaching Scheme: PR: 2 Hours/Week	Credit 01	Examination Scheme: ISCE: 30 ESE: 20
Course Prerequisites: Engineering Mechanics, Solid Mechanics, Structural Analysis, and Engineering Physics		
Course Objective: - To learn advanced design concepts for structural steel applicable to various types of steel structures. - To understand primary code source applies to building design, which is supplemented by a strong theoretical background in steel behavior applicable to non-typical structures.		
Course Outcome: After successful completion of the course, students will able to: CO1: Design and Drawing for welded Plate Girder. CO2: Design and Drawing for Primary and Gable end frames.		
Course Contents		
PROJECT-I		
1) Design of welded plate girder, design of cross section, curtailment of flange plate, stiffeners and connection.		
2) Full imperial drawing sheet (Using suitable software) showing detailed sketch of welded plate girder.		
PROJECT- II		
1) Design of primary frame, Gable end framing		
2) Full imperial drawing sheet (Using suitable software) showing detailed sketch of Primary frame, Gable end frame.		
Text Books: T1. N. Subramanyan, “Design of Steel Structures”, Oxford Publication. T2. Horne, M.R. and Morris L.J., “Plastic Design of Low -rise frames”, Granada Publishing.		

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T3. S. K. Duggal, “*Design of Steel Structure*”, Tata Mc Graw Hill.

Reference Books:

- R1.** Kuzamanovic B.O. and Willems N., “*Steel Design for Structural Engineers*”, Prentice Hall.
- R2.** Wie - Wen Yu. “*Cold-formed Steel Structures*”, McGraw Hill Book Company, 1973.
- R3.** William McGuire, “*Steel Structures*”, Prentice Hall, Inc., Englewood Cliffs, N.J. 1986.
- R4.** Guidelines to design cold form section by Tata Steel.
- R5.** Shah and Gore, “*Design of Steel Structure*” - Structures Publishers, Pune
- R6.** IS: 800, - “*Code of practice for General Construction in steel*”.
- R7.** IS: 875 - (Part I to V) – “*Code of practice for structural safety of building loading standards*”.
- R8.** IS: 226 – “*Structural steel*” (Standard Quality).
- R9.** SP: 6(1) – “*Structural steel section*”.
- R10.** SP: 6(6) – “*Application of plastic theory in design of steel structures*”.
- R11.** IS 801: “*Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction*”.

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T. Y. B. Tech (Civil Engineering)
Semester -VI
[CEO3202T] Sustainable Engineering

Teaching Scheme: TH: - 3 Hours/Week	Credit TH:03	Examination Scheme: In Sem. Evaluation :20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks
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Course Prerequisites: Engineering Chemistry, Environmental Science

Course Objective:

To raise awareness among students about sustainability issues within the field of engineering and sustainable development, and to clearly understand the role and impact of engineering decisions on environmental, societal, and economic challenges.

Course Outcome:

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

CO1: Describe the relevance and the concept of sustainability and the global initiatives in this direction.

CO2: Explain the various types of environmental pollution problems and their sustainable solutions.

CO3: Discuss the environmental regulations and standards.

CO4: Illustrate the significance of sustainable habitat.

CO5: Outline the concepts related to conventional and non-conventional energy.

CO6: Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles.

Course Contents

UNIT-I	Sustainability	06 Hours
Introduction, concept, evolution of the concept; Social, environmental, and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).		
UNIT-II	Environmental Pollution	06 Hours
Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.		
UNIT-III	Environmental Management Standards	06 Hours

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ISO 14001:2015 frame work and benefits, Scope, and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

UNIT-IV	Sustainable habitat	06 Hours
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Sustainable habitat, Green building, Green materials for building construction, Material selection for sustainable design, Green building certification, Methods for increasing energy efficiency of Buildings, Sustainable cities, Sustainable transport.

UNIT-V	Resources and its utilisation	06 Hours
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Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

UNIT-VI	Sustainability practices	06 Hours
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Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport

Text Books:

- T1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
- T2. Bradley, A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
- T3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
- T4. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
- T5. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
- T6. Sustainable Engineering: Principles and Practice, Bhavik R. Bakshi, Cambridge University press (2019)

Reference Books:

- R1. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).Engineering for Sustainability, Jonker Gerald, Elsevier Science & Technology 1st Edition (2012).
- R2. Engineering for Sustainability, Jonker Gerald, Elsevier Science & Technology 1st Edition (2012).
- R3. Cradle to Cradle: Remaking the Way We Make Things, William McDonough, North Point Press, (2002)

IS Code:

ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications- Rating System, TERI Publications - GRIHA Rating System

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e-Resources:

1. <https://www.rit.edu/sustainabilityinstitute/blog/what-life-cycle-assessment-lca>
2. <https://link.springer.com/book/10.1007/978-3-319-56475-3#toc>
3. <https://archive.nptel.ac.in/courses/105/105/105105157/>
4. <https://www.coursera.org/learn/global-sustainable-development>

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