HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

COIMBATORE 641 032

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

CURRICULUM

&

SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION - 2022

(For the students admitted during the academic year 2024 – 2025 and onwards)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTE

IV: To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

IM1: To provide academic excellence in technical education through novel teaching methods

IM2: To empower students with creative skills and leadership qualities

IM3: To produce dedicated professionals with social responsibility

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT

DV: To be recognized globally for pre-eminence in Civil Engineering education, research and service

MISSION OF THE DEPARTMENT

DM1: To impart scientific and technical knowledge for professional practice, advanced study and research in Civil Engineering

DM2: To equip the students with ingenious leadership and organizational skills for a successful professional career

DM3: To inculcate professional and ethical responsibilities related to industry, society and environment

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates will be able to:

PEO1: Excel as practicing engineers, academicians and researchers with a comprehensive knowledge in Civil Engineering

PEO2: Play a significant role as team players and leaders in challenging environments for nation's infrastructure development, environmental protection and sustainability

PEO3: Uphold professional and ethical responsibilities as engineers, consultants and entrepreneurs while addressing the demands of the society

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The graduates will be able to:

PSO1: Apply their engineering knowledge, communication skills, professional and ethical principles to solve problems in civil engineering and contribute to the infrastructure development in a sustainable way

PSO2: Use their engineering background to excel in competitive exams for advanced study, research and professional career

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid

REGULATION – 2022

CIVIL ENGINEERING

CURRICULUM

B.E. CIVIL ENGINEERING
I TO VIII SEMESTERS CURRICULUM AND SYLLABI
SEMESTER I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA1101	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2	22ME1201	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH PRACTICAL COMPONENT											
3	22PH1152	Essentials of Acoustical and Optical Science	BSC	2	0	2	3	4	50	50	100
4	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
5	22IT1151	Python Programming and Practices	ESC	2	0	2	3	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSES											
6	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	-	100
7	22HE1073	Introduction to Soft Skills	AEC	1	0	0	0	1	100	-	100
MANDATORY COURSE											
8	22MC1091/ 22MC1094	தமிழர்மரபு/ Heritage of Tamil	MC	2	0	0	1	2	40	60	100
9	22MC1095	Universal Human Values	MC	2	0	0	0	2	100	0	100
			Total	**16**	**5**	**6**	**18**	**27**	**570**	**330**	**900**

SEMESTER II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA2105	Partial Differential Equations, Fourier Series and Transforms	BSC	3	1	0	4	4	40	60	100
2	22CY2102	Environmental Sciences and Sustainability	ESC	2	0		2	3	40	60	100
3	22CE2101	Engineering Mechanics and solid mechanics	ESC	3	0	0	3	3	40	60	100
4	22CE2102	Basic Building services	BSC	2	0	0	2	3	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CY2152	Applied Chemistry	BSC	2	0	2	3	4	50	50	100
6	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE2071	Design Thinking	AEC	1	0	2	2	2	100	-	100
9	22HE2072	Soft Skills and Aptitude I	SEC	1	0	0	1	1	100	-	100
MANDATORY COURSE											
10	22MC2091/ 22MC2092	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	MC	2	0	0	1	2	100	-	100
11	22MC2093	NCC/NSS/YRC/Sports/Clubs Enrolment	MC	All the students shall enroll in any one of the personality and character development programmes and undergo training for about 80 hours							
			Total	**18**	**1**	**10**	**23**	**28**	**620**	**380**	**1000**

SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA3108	Statistics & Numerical Methods	BSC	3	1	0	4	4	40	60	100
2	22CE3201	Building Construction	ESC	2	0	0	2	2	40	60	100
3	22CE3202	Construction Materials and Techniques	PCC	3	0	0	3	3	40	60	100
4	22CE3203	Water Supply and Wastewater Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CE3251	Strength of Materials	PCC	3	0	2	4	5	50	50	100
6	22CE3252	Mechanics of Fluids	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22CE3001	Water and Wastewater Testing Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE3071	Soft Skills – II	SEC	1	0	0	1	1	100	-	100
9	22CE3072	Computer Aided Building Drawing	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10	22CE3073	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	-	100
			Total	**19**	**1**	**12**	**24**	**31**	**580**	**420**	**1000**

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2	22CE4201	Structural Analysis	PCC	3	1	0	4	4	40	60	100
3	22CE4202	Concrete Technology	PCC	3	0	0	3	3	40	60	100
4	22CE4203	Highway and Railway Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CE4251	Surveying and Levelling	PCC	2	0	2	3	4	50	50	100
6	22CE4252	Soil Mechanics	PCC	2	0	2	3	4	50	50	100
7	22CE4253	Hydraulic Engineering	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8	22CE4001	Concrete and Highway Engineering Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
9	22HE4071	Soft Skills – III	SEC	1	0	0	1	1	100	-	100
			Total	**18**	**1**	**10**	**24**	**30**	**470**	**430**	**900**

SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5201	Design of RC Elements	PCC	3	1	0	4	4	40	60	100
2	22CE5202	Foundation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE53XX	Professional Elective - I	PEC	3	0	0	3	3	40	60	100
4	22CE53XX	Professional Elective - II	PEC	3	0	0	3	3	40	60	100
5	22CE53XX	Professional Elective - III	PEC	3	0	0	3	3	40	60	100
THEORY WITH PRACTICAL COMPONENT											
6	22CE5251	Construction Project Management	PCC	3	0	2	4	5	50	50	100
PRACTICAL											
7	22CE5001	Design and Drawing of RC Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE5071	Soft Skills – IV / Foreign Language	SEC	1	0	0	1	1	100	-	100
9	22CE5072	Survey Camp*	SEC	0	0	0	1	0	100	-	100
			Total	**19**	**1**	**6**	**24**	26	**510**	**390**	**900**

***Survey camp of one week has to be undergone by the student during fourth semester vacation.**

SEMESTER VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6201	Design of Steel Elements	PCC	3	1	0	4	4	40	60	100
2	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3	22CE63XX	Professional Elective - IV	PEC	3	0	0	3	3	40	60	100
4	22CE63XX	Professional Elective - V	PEC	3	0	0	3	3	40	60	100
5	22XX64XX	Open Elective - I	OEC	3	0	0	3	3	40	60	100
6	22XX64XX	Open Elective - II	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7	22CE6001	Design and Drawing of Steel Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE6071	Soft Skills - V	SEC	2	0	0	2	2	100	-	100
			Total	**20**	**1**	**4**	**23**	**25**	**400**	**400**	**800**

SEMESTER VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7201	Estimation, Costing and Valuation	PCC	3	1	0	4	4	40	60	100
2	22CE7202	Water Resources and Irrigation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE73XX	Professional Elective - VI	PEC	3	0	0	3	3	40	60	100
4	22XX74XX	Open Elective - III	OEC	3	0	0	3	3	40	60	100
5	22XX74XX	Open Elective - IV	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6	22CE7001	Computer Aided Analysis of Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
7	22CE7701	Internship *	SEC	-	-	-	1	-	100	-	100
			Total	**15**	**1**	**4**	**19**	**20**	**360**	**340**	**700**

*** Two weeks internship to be completed before the end of VI semester vacation**

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
EMPLOYABILITY ENHANCEMENT COURSES										
1	22CE8901	Project Work / Granted Patent	SEC	0	0	20	10	100	100	200
			Total	**0**	**0**	**20**	**10**	**100**	**100**	**200**

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	24	24	24	23	19	10	165

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Structural Engineering	VERTICAL II Construction Techniques and Practices	VERTICALIII Geotechnical Engineering	VERTICAL IV Geo-Informatics	VERTICAL V Transportation Infrastructure	VERTICAL VI Environmental Engineering	VERTICAL VII Water Resources
22CE5301 Repair and Rehabilitation of Structures	22CE5304 Formwork Engineering	22CE5307 Geo-Environmental Engineering	22CE5310 Total Station and GPS Surveying	22CE5313 Airports, Docks and Harbour Engineering	22CE5316 Climate Change Adaptation and Mitigation	22CE5319 Hydrology
22CE5302 Advanced Structural Analysis	22CE5305 Construction Equipment and Machinery	22CE5308 Ground Improvement Techniques	22CE5311 Remote Sensing Concepts	22CE5314 Traffic Engineering and Management	22CE5317 Air and Noise Pollution Control Engineering	22CE5320 Ground water Engineering
22CE5303 Prefabricated Structures	22CE5306 Sustainable Construction and Lean Construction	22CE5309 Soil Dynamics and Machine Foundations	22CE5312 Satellite Image Processing	22CE5315 Urban Planning and Development	22CE5318 Environmental Impact Assessment	22CE5322 Water Resources Systems Engineering
22CE6301 Pre-Stressed Concrete Structures	22CE6303 Construction Safety and Risk Management	22CE6305 Rock Mechanics	22CE6307 Cartography and GIS	22CE6309 Smart cities	22CE6311 Industrial Wastewater Management	22CE6313 Watershed Conservation and Management
22CE6302 Concrete Structures	22CE6304 Advanced Construction Techniques	22CE6306 Earthand Earth Retaining Structures	22CE6308 Photogrammetry	22CE6310 Intelligent Transport Systems	22CE6312 Solid and Hazardous Waste Management	22CE6314 Integrated Water Resources Management
22CE7301 Dynamics and Earthquake Resistant Structures	22CE7303 Energy Efficient Buildings	22CE7305 Pile Foundation	22CE7307 Airborne and Terrestrial laser mapping	22CE7309 Pavement Engineering	22CE7311 Environmental Policy and Legislations	22CE7313 Urban Water Infrastructure
22CE7302 Wind and cyclone Effect on Structures	22CE7304 Green Buildings	22CE7306 Tunneling Engineering	22CE7308 Hydrographic Surveying	22CE7310 Transportation planning Process	22CE7312 Environment, Health and Safety	22CE7314 Water Quality and Management

PROFESSIONAL ELECTIVE COURSES - I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5301	Repair and Rehabilitation of Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5304	Formwork Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5307	Geo- Environ mental Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE5310	Total Station and GPS Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE5313	Airports, Docks and Harbour Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE5316	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3	40	60	100
7	22CE5319	Hydrology	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5302	Advanced Structural Analysis	PEC	3	0	0	3	3	40	60	100
2	22CE5305	Construction Equipment and Machinery	PEC	3	0	0	3	3	40	60	100
3	22CE5308	Ground Improvement Techniques	PEC	3	0	0	3	3	40	60	100
4	22CE5311	Remote Sensing Concepts	PEC	3	0	0	3	3	40	60	100
5	22CE5314	Traffic Engineering and Management	PEC	3	0	0	3	3	40	60	100
6	22CE5317	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3	40	60	100
7	22CE5320	Ground water Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5303	Prefabricated Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5306	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3	40	60	100
3	22CE5309	Soil Dynamics and Machine Foundations	PEC	3	0	0	3	3	40	60	100
4	22CE5312	Satellite Image Processing	PEC	3	0	0	3	3	40	60	100
5	22CE5315	Urban Planning and Development	PEC	3	0	0	3	3	40	60	100
6	22CE5318	Environmental Impact Assessment	PEC	3	0	0	3	3	40	60	100
7	22CE5322	Water Resources Systems Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6301	Pre-Stressed Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6303	Construction Safety and Risk Management	PEC	3	0	0	3	3	40	60	100
3	22CE6305	Rock Mechanics	PEC	3	0	0	3	3	40	60	100
4	22CE6307	Cartography and GIS	PEC	3	0	0	3	3	40	60	100
5	2CE6309	Smart cities	PEC	3	0	0	3	3	40	60	100
6	22CE6311	Industrial Wastewater Management	PEC	3	0	0	3	3	40	60	100
7	22CE6313	Watershed Conservation and Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6302	Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6304	Advanced Construction Techniques	PEC	3	0	0	3	3	40	60	100
3	22CE6306	Earth and Earth Retaining Structures	PEC	3	0	0	3	3	40	60	100
4	22CE6308	Photogrammetry	PEC	3	0	0	3	3	40	60	100
5	22CE6310	Intelligent Transport Systems	PEC	3	0	0	3	3	40	60	100
6	22CE6312	Solid and Hazardous Waste Management	PEC	3	0	0	3	3	40	60	100
7	22CE6314	Integrated Water Resources Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7301	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7303	Energy Efficient Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7305	Pile Foundation	PEC	3	0	0	3	3	40	60	100
4	22CE7307	Airborne and Terrestrial laser Mapping	PEC	3	0	0	3	3	40	60	100
5	22CE7309	Pavement Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE7311	Environmental Policy and Legislations	PEC	3	0	0	3	3	40	60	100
7	22CE7313	Urban Water Infrastructure	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7302	Wind and cyclone Effect on Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7304	Green Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7306	Tunneling Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE7308	Hydrographic Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE7310	Transportation planning Process	PEC	3	0	0	3	3	40	60	100
6	22CE7312	Environment, Health and Safety	PEC	3	0	0	3	3	40	60	100
7	22CE7314	Water Quality and Management	PEC	3	0	0	3	3	40	60	100

B.E. / B. Tech. (Honours)

Vertical I (Structural Engineering)	Vertical II (Environmental Engineering)	Vertical III (Geotechnical Engineering)	Vertical IV (Remote Sensing and GIS)
22CE5206 Advanced Concrete Technology	22CE5207 Transport of Water and Wastewater	22CE5208 Soil Properties and Behaviour	22CE5209 Fundamentals of Remote Sensing
22CE6205 Advanced Concrete Structures	22CE6206 Design of Physico-Chemical Treatment Systems	22CE6207 Site Exploration and Soil Investigation	22CE6208 Advanced Remote Sensing
22CE6209 Experimental Techniques and Instrumentation	22CE6210 Design of Biological Treatment Systems	22CE6211 Environmental Geo-technology	22CE6212 Fundamentals of Geodesy
22CE7204 Advanced Steel Structures	22CE7205 Solid and Hazardous Waste Management	22CE7206 Advanced Foundation Engineering	22CE7207 Geographical Information System
22CE7208 Design of Steel-Concrete Composite Structures	22CE7209 Environmental Impact and Risk Assessment	22CE7210 Foundation in Expansive Soils	22CE7211 Modern Surveying
22CE8201 Design of Industrial Structures	22CE8202 Resource and Energy Recovery from Waste	22CE8203 Reinforced Soil Structures	22CE8204 Urban Geo-informatics
22CE8205 Structural Health Monitoring	22CE8206 Remote Sensing and GIS Application in Environmental Management	22CE8207 Remote Sensing and its Application in Geotechnical Engineering	22CE8208 Remote Sensing and GIS Application for Earth Sciences

B.E. / B. Tech. (Minor Degree)

S.No.	Course Code	Vertical I	Course Code	Vertical II
1	22CE5601	Principles of Surveying	22CE5602	Sustainable infrastructure Development
2	22CE6601	Construction Technology	22CE6603	Sustainable Agriculture and Environmental Management
3	22CE6602	Soil and Foundations	22CE6604	Sustainable Bio Materials
4	22CE7601	Basic Structural Engineering	22CE7603	Materials for Energy Sustainability
5	22CE7602	Water and Wastewater Treatment	22CE7604	Green Technology
6	22CE8601	Quantity Estimation and Valuation	22CE8603	Environmental Quality Monitoring and Analysis
7	22CE8602	Transportation Engineering	22CE8604	Integrated Energy Planning for Sustainable Development

HINDUSTHAN COLLEGE OF ENGG & TECH. - CBE - 32.

Signature of the Chairman (BoS)

Chairman - BoS
CIVIL - HiCET

Signature of the Dean Academics

Dean (Academics)
HiCET

Signature of the Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

Programme / Semester	Course Code	Name of the Course	L	T	P	C
B.E. /I	**22MA1101**	**MATRICES AND CALCULUS (Common to all Branches)**	3	1	0	4

Course Objective

The learner should be able to

1. Construct the characteristic polynomial of a matrix and use it to identify Eigen values and Eigenvectors
2. Impart the knowledge of single variate calculus
3. Familiarize the student with functions of several variables
4. Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
5. Make a vector differential operator for vector function and theorems to solve engineering problems

Unit	Description	Instructional Hours
I	**MATREICES** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) -Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**SINGLE VARIATE CALCULUS** Rolle's Theorem–Lagrange's Mean Value Theorem-Maxima and Minima–Taylor's and Maclaurin's Series.	12
III	**FUNCTIONS OF SEVERAL VARIABLES** Partial derivatives - Total derivative - Jacobians – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.	12
IV	**INTEGRAL CALCULUS** Double integrals in Cartesian coordinates – Area enclosed by plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**VECTOR CALCULUS** Gradient, divergence and curl vectors - Green's theorem - Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	**60**

Course Outcome

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

CO1: Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
CO2: Apply the concept of differentiation to identify the maximum and minimum values of curve.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply multiple integral ideas in solving areas, volumes and other practical problems.
CO5: Apply the concept of vector calculus in two and three-dimensional spaces.

TEXT BOOKS:

T1: G.B.Thomas and R.L.Finney, "Calculus and Analytical Geometry", 9th Edition Addison Wesley Publishing Company, 2016.
T2: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2019.
T3: K.P.Uma and S.Padma, "Engineering Mathematics I (Matrices and Calculus)" Pearson Ltd, 2022.

REFERENCE BOOKS:

R1- Jerrold E.Marsden, Anthony Tromba, "Vector Calculus" , W.H.Freeman 2003
R2- Strauss M .J, G.L.Bradley and K.J.Smith, "Multi variable calculus", Prentice Hall, 2002.
R3-VeerarajanT, "Engineering Mathematics", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2016.

Chairman - BoS
CIVIL - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman

Dean (Academics)
HiCET

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	-	-	1	2	2	3	2
CO2	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO3	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO4	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO5	3	3	3	3	2	2	2	-	-	1	2	2	3	3
AVG	3	3	3	3	2.2	2	2	-	-	1	2	2	2.4	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22ME1201	**ENGINEERING DRAWING**	1	4	0	3

Course Objective

The learner should be able :

1. To gain the knowledge of Engineer's language of expressing complete details about objects and construction of conics and special curves.
2. To learn about the orthogonal projections of straight lines and planes.
3. To acquire the knowledge of projections of simple solid objects in plan and elevation.
4. To learn about the projection of sections of solids and development of surfaces.
5. To study the isometric projections of different objects.

Unit	Description	Instructional Hours
I	**PLANE CURVES** Importance of engineering drawing; drafting instruments; drawing sheets – layout and folding; Lettering and dimensioning, BIS standards, scales. Geometrical constructions, Engineering Curves Conic sections – Construction of ellipse, parabola and hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	12
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane by rotating object method.	12
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids.	12
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Basics of drafting using AutoCAD software.	12
	Total Instructional Hours	**60**

Course Outcome

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

CO1: Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2: Draw the orthogonal projections of straight lines and planes.
CO3: Interpret the projections of simple solid objects in plan and elevation.
CO4: Draw the projections of section of solids and development of surfaces of solids.
CO5: Draw the isometric projections and the perspective views of different objects.

TEXT BOOK:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5thedition New Age International Publishers, New Delhi 2016.
T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai 2016.

REFERENCES:

R1. BasantAgrawal and C.M.Agrawal,"Engineering Drawing", Tata McGraw Hill Publishing company Limited,New Delhi 2013.
R2. N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University PRESS, India 2015.

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Programme / Semester	Course Code	Name of the Course	L	T	P	C
B.E. / I	22PH1152	**Essentials of Acoustical and Optical Science**	2	0	2	3

Course Objective

The learner should be able to :

1. Acquire knowledge on the acoustic properties of buildings,
2. Gain knowledge about thermal energy and their applications
3. Enhance the fundamental knowledge in mechanical properties of materials
4. Acquire fundamental knowledge of Ultrasonic and their applications
5. Extend the knowledge about laser in engineering field

Unit	Description	Instructional Hours
I	**ACOUSTICS OF BUILDINGS** Introduction and types of Acoustics - Classification of sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination – factors affecting acoustics of buildings and their remedies.	6
II	**THERMAL PHYSICS** Transfer of heat energy – thermal conduction, convection and radiation – thermal conductivity Lee's disc method to determine the thermal conductivity of bad conductor. Conduction through compound media (series and parallel) – applications: refrigerators and solar water heaters. **Determination of thermal conductivity of bad conductor – Lee's disc method**	9
III	**MECHANICAL PROPERTIES OF MATERIAL** Elasticity – Hooke's law – stress-strain diagram – bending moment – depression of a cantilever – derivation of young's modulus of the material of the beam by uniform bending - theory and experiment. Twisting couple - Torsion pendulum: theory and experiment. **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	12
IV	**ULTRASONICS** Production – Piezoelectric generator – Properties of Ultrasonic waves. Determination of velocity using acoustic grating – Cavitation- SONAR- Industrial applications – Drilling and welding – Nondestructive testing (pulse echo system). Medical applications – Ultrasound Scanner – A – mode – B- mode and C – mode. **Determination of velocity of ultrasonic sound waves by ultrasonic interferometer.**	9
V	**PHOTONICS** Characteristics of Laser - Principle of spontaneous emission and stimulated emission - Active medium - Types of laser -.Principle, Construction, Working, Properties, Merits, Demerits and applications of Nd-YAG laser – Applications – Holography (3D profiling)), laser drilling and laser welding. **Determination of Wavelength and particle size using Laser** **Visit to IDA lab**	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Gain the knowledge on the acoustic properties of buildings
CO2: Relate the thermal properties of materials and applications
CO3: Illustrate the fundamental mechanical properties of materials
CO4: Develop the Ultrasonics technology and its applications in NDT
CO5:Familiarize the concepts of laser in the field of Engineering

TEXTBOOKS:

T1: - Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.
T2: - Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCEBOOKS:

R1- M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2018
R2 - Halliday, D., Resnick, R. and Walker, J. "Principles of Physics". Wiley, 2020.

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PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	1	1	1	-	1	-	2	1	1	1
CO2	2	2	2	2	1	1	1	-	1	-	1	2	1	1
CO3	2	3	2	1	2	1	1	-	2	-	2	3	1	1
CO4	2	2	2	1	1	1	1	-	2	-	2	2	1	1
CO5	2	3	3	2	2	1	1	-	1	-	2	2	1	1
AVG	2	2.6	2.4	1.4	1.4	1	1	-	1.4	-	1.8	2.4	1	1

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Programme	Course Code	Name of the Course	L	T	P	C
	22HE1151	ENGLISH FOR ENGINEERS (Common to all Branches)	2	0	2	3

Course Objective

The student should be able

1. To help the students of engineering and technology develop a strong base in the use of English.
2. To help learners use language effectively in professional writing.
3. To impart basic English grammar and essentials of important language skills
4. To impart knowledge about the importance of vocabulary and grammar
5. To develop the communication skills of the students in both formal and informal situations

Unit	Description	Instructional Hours
I	**Language Proficiency:** Parts of Speech, Degrees of Comparison, Abbreviation& Acronyms **Writing**: Process Description, Instructions. **Vocabulary** – Words on Environment. **Practical Component: Listening**- Watching Short Videos and answer the questions, **Speaking**- Self introduction , Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing of documentaries / podcasts / interviews **Reading**- Purpose of Reading - Churning & Assimilation, Interpreting Ideas - Interpreting Graphs in Technical Writing.	7+2
II	**Language Proficiency**: Types of Sentences, Framing Question, One Word Substitution **Writing:** Writing Checklist, Reading Comprehension. **Vocabulary**– Words on Entertainment. **Practical Component: Listening**-Comprehensions based on TED talks **Speaking**- Story Telling **Reading** - Skimming – Scanning – Reading: Scientific Texts	7+2
III	**Language Proficiency:** Tenses, Conditional Clause ('If' clause), Active and Passive voices, **Writing:** Formal letter (invitation, acceptance, decline, Congratulation) Cloze test. **Vocabulary** – Words on Tools. **Practical Component: Listening**-Listening pre-recorded English language learning programme**Speaking** - Just a minute **Reading**- Reading feature articles (from newspapers and magazines) -Reading to identify point of view and perspective (opinion pieces, editorials etc.)	5+4
IV	**Language Proficiency:** Subject Verb Concord, Articles, The Use of Prefixes and Suffixes **Writing:** Preparing Agenda &Minutes, Writing Recommendations. **Vocabulary**– Words on Engineering process. **Practical Component: Listening**-An interview with someone who works for recruitment personnel. **Speaking**-Presentation on a general topic. **Reading**- Reading Comprehension - Literary Texts.	5+4
V	**Language Proficiency:** Prepositions, Phrasal Verbs, Modal Auxiliaries, **Writing:** Letter to the Editor, Sequencing of Sentences **Vocabulary** –Words on Engineering material **Practical Component: Listening**- Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking**- Preparing posters and presenting as a team. **Reading**- Biographies, Travelogues, Technical blogs.	6+3
	Total Instructional Hours	**45**

After completion of the course the learner will be able

Course Outcome

CO1: Understand English and converse effectively.
CO2: Enable the students to write coherently and cohesively.
CO3: Enable the development of basic grammar to enhance language for a better communication
CO4: Use suitable vocabulary and grammar with confidence and express their ideas both in speech and writing.
CO5: follow the etiquettes in formal and informal communication.

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TEXT BOOKS:

T1- Raymond Murphy, "English Grammar in Use"-5th editionCambridgeUniversityPress, 2019.

T2-- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.

REFERENCE BOOKS:

R1- Kapoor A.N., Business Letters for Different Occasions, New Delhi: S. Chand & Co. Pvt. Ltd., 2012.

R2-RaymondMurphy, " English Grammar For ESL Learners - Premium Fourth Edition.

R3- McCarthy, Michael et.al (2011) English Vocabulary in Use – advanced, Cambridge University Press.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	-	3	2	1	-	-
CO2	-	-	-	-	2	3	2	3	1	3	1	-	-	-
CO3	-	-	-	3		2	-	2	2	3	2	2	-	-
CO4	-	-	-	-	-	2	-	2	1	3	1	1	-	-
CO5	-	-	-	2	-	-	-	2	3	3	3	1	-	-
AVG	-	-	-	2.5	2	2.3	2	2.2	1.8	3	1.8	1.3	-	-

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	22IT1151	PYTHON PROGRAMMING AND PRACTICES	2	0	2	3

Course Objective

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs
3. To develop Python programs with conditionals and loops and to define Python functions and call them
4. To use Python data structures – lists, tuples, dictionaries
5. To do input/output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems:Find minimum in a list, insert acard in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.	9
II	**DATA, EXPRESSIONS, STATEMENTS** Python interpreter and interactive mode; values and types: int, float, boolean, string, and list;variables, expressions, statements, tuple assignment, precedence of operators, comments;modules and functions, function definition and use, flow of execution, parameters and arguments. ***Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.***	7+2(P)
III	**CONTROL FLOW, FUNCTIONS** Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: returnvalues, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. ***Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.***	5+4(P)
IV	**LISTS, TUPLES, DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension. ***Illustrative programs: selection sort, insertion sort, merge sort, histogram.***	3+6(P)
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, format operator; command line arguments,errors and exceptions, handling exceptions, modules, packages. ***Illustrative programs: word count, copying file contents.***	5+4(P)
	Total Instructional Hours	**45**

Course Outcome

CO1: Develop algorithmic solutions to simple computational problems
CO2: Read, write, execute by hand simple Python programs
CO3: Structure simple Python programs for solving problems and Decompose a Python program into functions
CO4: Represent compound data using Python lists, tuples, dictionaries
CO5:Read and write data from/to files in Python Programs

TEXT BOOKS:

T1 –Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.6.2", Shroff Publishers, First Edition, 2017.
T2 - Annadurai S., Shankar S, Jasmine J., Revathi M., "Fundamentals of Python Programming", McGraw Hill Education (India) Private Ltd., 2019.

REFERENCE BOOKS:

R1 - Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
R2 - Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
R3 - Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22HE1072	ENTREPRENEURSHIP & INNOVATION	1	0	0	1

Course Objective

The learner should be able :

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize the so innovations.
3. To plans pacific and detailed method to exploit these opportunities.
4. To acquire there sources necessary to implement these plans.
5: To make students understand organizational performance and its importance.

Module	Description
1	Entrepreneurial Thinking
2	Innovation Management
3	Design Thinking
4	Opportunity Spotting/Opportunity Evaluation
5	Industry and Market Research
6	Innovation Strategy and Business Models
7	Financial Forecasting
8	Business Plans/Business Model Canvas
9	Entrepreneurial Finance
10	Pitching to Resources Providers / Pitch Deck
11	Negotiating Deals
12	New Venture Creation
13	Lean Start-ups
14	Entrepreneurial Ecosystem
15	Velocity Venture
	Total Instructional Hours 15

Course Outcome

At the end of the course, the learner will be able to :

CO1: Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2: Understand the processes by which innovation is fostered, managed, and commercialized.
CO3: Remember effectively and efficiently the potential of new business opportunities.
CO4: Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5: Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXTBOOKS

T1: Arya Kumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson, Second Edition(2012).
T2: EmrahYayici "Design Thinking Methodology", Artbiz tech, First Edition(2016).

REFERENCEBOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen & Unwin Publication, Fourth Edition (2007).
R2: Thomas Lock Wood & Edger Papke "Innovation by Design",Career Press.com, Second Edition(2017).
R3:Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition(2010).

WEBRESOURCES

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

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Programme/ sem	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22MC1093	தமிழர்மரபு	2	0	0	1

Unit	Description	Instructional Hours
I	**அலகு I மொழி மற்றும் இலக்கியம்:** 3 இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	3
II	**அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	3
III	**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	3
IV	**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3 தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	3
V	**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3 இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	3
	Total Instructional Hours	**15**

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Signature of the Dean Academics

Dean (Academics) HiCET

Signature of the Chairman (BoS)

Chairman - BoS CIVIL - HiCET

TEXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	2	-	-	2
CO2	2	3	3	-	-	-	-	-	2	-	-	2
CO3	2	3	3	-	-	-	-	-	2	-	-	2
CO4	2	3	-	-	-	-	-	-	2	-	-	2
CO5	2	3	-	-	-	-	-	-	2	-	-	2
AVG	2	3	3	-	-	-	-	-	2	-	-	2

HINDUSTHAN COLLEGE OF ENGG & TECH - CBE - TN

Signature of the
Dean Academics
Dean (Academics)
HiCET

Signature of the Chairman (BoS)
Chairman - BoS
CIVIL - HiCET

Programme/ Semester	Course Code	Course Title	L	T	P	C
B.E./B.Tech/I	22HE1073	INTRODUCTION TO SOFT SKILLS	2	0	0	0

Course Objectives:

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice.
2. To enhance the students ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills.

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	2
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement – Punctuations	4
	Total Instructional Hours	30

Course Outcome

CO1	Students will analyze interpersonal communication skills. public speaking skills.
CO2	Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
CO5	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

HINDUSTHAN COLLEGE OF ENGG & TECH - CBE - TN

Signature of the Dean Academics

Dean (Academics) HiCET

Signature of the Chairman (BoS)

Chairman - BoS CIVIL - HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22MC1094	HERITAGE OF TAMIL	2	0	0	1

The learner should be able to

Course Objective

1. Introduce students to the great History of Tamil literature.
2. Establish the heritage of various forms of Rock art and Sculpture art.
3. To study and understand the various folk and Martial arts of Tamil culture
4. Introduce students to Ancient Tamil concepts to understand the richness of Tamil literature.
5. To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**LANGUAGE AND LITERATURE** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**HERITAGE _ ROCK ART PAINTINGS TO MODERN ART – SCULPTURE** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari, Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temples in social and economic life of Tamils.	6
III	**FOLK AND MARTIAL ARTS** Therukoothu, Karagattem, Villupattu, Kaniyan koothu, Oyilattam, Leather puppertry, Silambattam., Valari Tiger dance – Sports and Games of Tamils.	6
IV	**THINAI CONCEPT OF TAMILS** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	**30**

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

Course Outcome

CO1: Learn about the works pertaining to Sangam age
CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture.
CO4: Appreciate the intricacies of Tamil literature that had existed in the past.
CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXTBOOKS:

T1: Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
T2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
T3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
(Published by: International Institute of Tamil Studies).

REFERENCEBOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Chairman - BoS
CIVIL - HiCET

Chairman

Dean (Academics)
HiCET

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E. /I	22HE1071	UNIVERSAL HUMAN VALUES	2	0	0	0

Course Objective

The learner should be able :

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. TohighlightplausibleimplicationsofsuchaHolisticunderstandingintermsofethicalhumanconduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO VALUE EDUCATION** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)- Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**HARMONY IN THE HUMAN BEING AND HARMONY IN THE FAMILY** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**HARMONY IN THE FAMILY AND SOCIETY** Harmony in the Family – the Basic Unit of Human Interaction. Values in Human to Human Relationship' Trust' – the Foundational Value in Relationship Values in Human to Human Relationship 'Respect' – as the Right Evaluation Understanding Harmony in the Society	6
IV	**HARMONY IN THE NATURE / EXISTENCE** Understanding Harmony in the Nature .Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasive space Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHIC** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able :

CO1: To become more aware of holistic vision of life - themselves and their surroundings.
CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions.
CO3: To sensitive towards their commitment towards what they understood towards environment and Socially responsible behavior.
CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life and In handling problems with sustainable solutions.
CO5: To develop competence and capabilities for maintaining Health and Hygiene

REFERENCE BOOKS:

R1.*A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2.Teachers'Manualfor*AFoundationCourseinHumanValuesandProfessionalEthics*,RRGaur,R Asthana,G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3.JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.

R4.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.

Chairman - BoS
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HiCET

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

COIMBATORE 641 032

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

CURRICULUM

&

SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION-2022

(For the students admitted during the academic year 2023 – 2024 and onwards)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTE

IV: To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

IM1: To provide academic excellence in technical education through novel teaching methods

IM2: To empower students with creative skills and leadership qualities

IM3: To produce dedicated professionals with social responsibility

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT

DV: To be recognized globally for pre-eminence in Civil Engineering education, research and service

MISSION OF THE DEPARTMENT

DM1: To impart scientific and technical knowledge for professional practice, advanced study and research in Civil Engineering

DM2: To equip the students with ingenious leadership and organizational skills for a successful professional career

DM3: To inculcate professional and ethical responsibilities related to industry, society and environment

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates will be able to:

PEO1: Excel as practicing engineers, academicians and researchers with a comprehensive knowledge in Civil Engineering

PEO2: Play a significant role as team players and leaders in challenging environments for nation's infrastructure development, environmental protection and sustainability

PEO3: Uphold professional and ethical responsibilities as engineers, consultants and entrepreneurs while addressing the demands of the society

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The graduates will be able to:

PSO1: Apply their engineering knowledge, communication skills, professional and ethical principles to solve problems in civil engineering and contribute to the infrastructure development in a sustainable way

PSO2: Use their engineering background to excel in competitive exams for advanced study, research and professional career

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid

REGULATION – 2022

CIVIL ENGINEERING

CURRICULUM

B.E. CIVIL ENGINEERING
I TO VIII SEMESTERS CURRICULUM AND SYLLABI
SEMESTER I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA1101	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2	22ME1201	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH PRACTICAL COMPONENT											
3	22PH1151	Physics for non-circuit Engineering	BSC	2	0	2	3	4	50	50	100
4	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
5	22IT1151	Python Programming and Practices	ESC	2	0	2	3	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSES											
6	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	-	100
7	22HE1073	Introduction to Soft Skills and Aptitude	AEC	1	0	0	0	1	100	-	100
MANDATORY COURSE											
8	22MC1091/ 22MC1094	தமிழர்மரபு/ Heritage of Tamil	MC	2	0	0	1	2	100	0	100
9	22MC1095	Universal Human Values	MC	2	0	0	0	2	40	60	100
			Total	**16**	**5**	**6**	**18**	**27**	**570**	**330**	**900**

SEMESTER II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA2105	Partial Differential Equations, Fourier Series and Transforms	BSC	3	1	0	4	4	40	60	100
2	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
4	22CE2101	Engineering Mechanics and solid mechanics	ESC	3	0	0	3	3	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CY2152	Applied Chemistry	BSC	2	0	2	3	4	50	50	100
6	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE2071	Design Thinking	AEC	1	0	2	2	2	100	-	100
9	22HE2072	Soft Skills and Aptitude I	SEC	1	0	0	1	1	100	-	100
MANDATORY COURSE											
10	22MC2091/ 22MC2092	தமிழரும்தொழில் நுட்பமும் / Tamils and Technology	MC	2	0	0	1	2	100	-	100
11	22MC2093	NCC/NSS/YRC/Sports/Clubs Enrolment	MC	All the students shall enroll in any one of the personality and character development programmes and undergo training for about 80 hours							
			Total	**18**	**1**	**10**	**23**	**28**	**620**	**380**	**1000**

SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA3108	Statistics & Numerical Methods	BSC	3	1	0	4	4	40	60	100
2	22CE3201	Basic Building Services	ESC	2	0	0	2	2	40	60	100
3	22CE3202	Construction Materials and Techniques	PCC	3	0	0	3	3	40	60	100
4	22CE3203	Water Supply and Wastewater Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CE3251	Strength of Materials	PCC	3	0	2	4	5	50	50	100
6	22CE3252	Mechanics of Fluids	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22CE3001	Water and Wastewater Testing Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE3071	Soft Skills – II	SEC	1	0	0	1	1	100	-	100
9	22CE3072	Computer Aided Building Drawing	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10	22CE3073	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	-	100
			Total	**19**	**1**	**12**	**24**	**31**	**580**	**420**	**1000**

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2	22CE4201	Structural Analysis	PCC	3	1	0	4	4	40	60	100
3	22CE4202	Concrete Technology	PCC	3	0	0	3	3	40	60	100
4	22CE4203	Highway and Railway Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CE4251	Surveying	PCC	2	0	2	3	4	50	50	100
6	22CE4252	Soil Mechanics	PCC	2	0	2	3	4	50	50	100
7	22CE4253	Hydraulic Engineering	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8	22CE4001	Concrete and Highway Engineering Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
9	22HE4071	Soft Skills – III	SEC	1	0	0	1	1	100	-	100
			Total	**18**	**1**	**10**	**24**	**30**	**470**	**430**	**900**

SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5201	Design of RC Elements	PCC	3	1	0	4	4	40	60	100
2	22CE5202	Foundation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE53XX	Professional Elective - I	PEC	3	0	0	3	3	40	60	100
4	22CE53XX	Professional Elective - II	PEC	3	0	0	3	3	40	60	100
5	22CE53XX	Professional Elective - III	PEC	3	0	0	3	3	40	60	100
THEORY WITH PRACTICAL COMPONENT											
6	22CE5251	Construction Project Management	PCC	3	0	2	4	5	50	50	100
PRACTICAL											
7	22CE5001	Design and Drawing of RC Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE5071	Soft Skills – IV / Foreign Language	SEC	1	0	0	1	1	100	-	100
9	22CE5072	Survey Camp*	SEC	0	0	0	1	0	100	-	100
			Total	**19**	**1**	**6**	**24**	26	**510**	**390**	**900**

***Survey camp of one week has to be undergone by the student during fourth semester vacation.**

SEMESTER VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6201	Design of Steel Elements	PCC	3	1	0	4	4	40	60	100
2	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3	22CE63XX	Professional Elective - IV	PEC	3	0	0	3	3	40	60	100
4	22CE63XX	Professional Elective - V	PEC	3	0	0	3	3	40	60	100
5	22XX64XX	Open Elective - I	OEC	3	0	0	3	3	40	60	100
6	22XX64XX	Open Elective - II	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7	22CE6001	Design and Drawing of Steel Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE6071	Soft Skills - V	SEC	2	0	0	2	2	100	-	100
			Total	**20**	**1**	**4**	**23**	**25**	**400**	**400**	**800**

SEMESTER VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7201	Estimation, Costing and Valuation	PCC	3	1	0	4	4	40	60	100
2	22CE7202	Water Resources and Irrigation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE73XX	Professional Elective - VI	PEC	3	0	0	3	3	40	60	100
4	22XX74XX	Open Elective - III	OEC	3	0	0	3	3	40	60	100
5	22XX74XX	Open Elective - IV	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6	22CE7001	Computer Aided Analysis of Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
7	22CE7701	Internship *	SEC	-	-	-	1	-	100	-	100
			Total	**15**	**1**	**4**	**19**	**20**	**360**	**340**	**700**

*** Two weeks internship to be completed before the end of VI semester vacation**

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
EMPLOYABILITY ENHANCEMENT COURSES										
1	22CE8901	Project Work / Granted Patent	SEC	0	0	20	10	100	100	200
			Total	**0**	**0**	**20**	**10**	**100**	**100**	**200**

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	24	24	24	23	19	10	165

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Structural Engineering	VERTICAL II Construction Techniques and Practices	VERTICALIII Geotechnical Engineering	VERTICAL IV Geo-Informatics	VERTICAL V Transportation Infrastructure	VERTICAL VI Environmental Engineering	VERTICAL VII Water Resources
22CE5301 Repair and Rehabilitation of Structures	22CE5304 Formwork Engineering	22CE5307 Geo-Environmental Engineering	22CE5310 Total Station and GPS Surveying	22CE5313 Airports, Docks and Harbour Engineering	22CE5316 Climate Change Adaptation and Mitigation	22CE5319 Hydrology
22CE5302 Advanced Structural Analysis	22CE5305 Construction Equipment and Machinery	22CE5308 Ground Improvement Techniques	22CE5311 Remote Sensing Concepts	22CE5314 Traffic Engineering and Management	22CE5317 Air and Noise Pollution Control Engineering	22CE5320 Ground water Engineering
22CE5303 Prefabricated Structures	22CE5306 Sustainable Construction and Lean Construction	22CE5309 Soil Dynamics and Machine Foundations	22CE5312 Satellite Image Processing	22CE5315 Urban Planning and Development	22CE5318 Environmental Impact Assessment	22CE5322 Water Resources Systems Engineering
22CE6301 Pre-Stressed Concrete Structures	22CE6303 Construction Safety and Risk Management	22CE6305 Rock Mechanics	22CE6307 Cartography and GIS	22CE6309 Smart cities	22CE6311 Industrial Wastewater Management	22CE6313 Watershed Conservation and Management
22CE6302 Concrete Structures	22CE6304 Advanced Construction Techniques	22CE6306 Earthand Earth Retaining Structures	22CE6308 Photogrammetry	22CE6310 Intelligent Transport Systems	22CE6312 Solid and Hazardous Waste Management	22CE6314 Integrated Water Resources Management
22CE7301 Dynamics and Earthquake Resistant Structures	22CE7303 Energy Efficient Buildings	22CE7305 Pile Foundation	22CE7307 Airborne and Terrestrial laser mapping	22CE7309 Pavement Engineering	22CE7311 Environmental Policy and Legislations	22CE7313 Urban Water Infrastructure
22CE7302 Wind and cyclone Effect on Structures	22CE7304 Green Buildings	22CE7306 Tunneling Engineering	22CE7308 Hydrographic Surveying	22CE7310 Transportation planning Process	22CE7312 Environment, Health and Safety	22CE7314 Water Quality and Management

PROFESSIONAL ELECTIVE COURSES - I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5301	Repair and Rehabilitation of Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5304	Formwork Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5307	Geo- Environ mental Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE5310	Total Station and GPS Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE5313	Airports, Docks and Harbour Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE5316	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3	40	60	100
7	22CE5319	Hydrology	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5302	Advanced Structural Analysis	PEC	3	0	0	3	3	40	60	100
2	22CE5305	Construction Equipment and Machinery	PEC	3	0	0	3	3	40	60	100
3	22CE5308	Ground Improvement Techniques	PEC	3	0	0	3	3	40	60	100
4	22CE5311	Remote Sensing Concepts	PEC	3	0	0	3	3	40	60	100
5	22CE5314	Traffic Engineering and Management	PEC	3	0	0	3	3	40	60	100
6	22CE5317	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3	40	60	100
7	22CE5320	Ground water Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5303	Prefabricated Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5306	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3	40	60	100
3	22CE5309	Soil Dynamics and Machine Foundations	PEC	3	0	0	3	3	40	60	100
4	22CE5312	Satellite Image Processing	PEC	3	0	0	3	3	40	60	100
5	22CE5315	Urban Planning and Development	PEC	3	0	0	3	3	40	60	100
6	22CE5318	Environmental Impact Assessment	PEC	3	0	0	3	3	40	60	100
7	22CE5322	Water Resources Systems Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6301	Pre-Stressed Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6303	Construction Safety and Risk Management	PEC	3	0	0	3	3	40	60	100
3	22CE6305	Rock Mechanics	PEC	3	0	0	3	3	40	60	100
4	22CE6307	Cartography and GIS	PEC	3	0	0	3	3	40	60	100
5	2CE6309	Smart cities	PEC	3	0	0	3	3	40	60	100
6	22CE6311	Industrial Wastewater Management	PEC	3	0	0	3	3	40	60	100
7	22CE6313	Watershed Conservation and Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES- V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6302	Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6304	Advanced Construction Techniques	PEC	3	0	0	3	3	40	60	100
3	22CE6306	Earthand Earth Retaining Structures	PEC	3	0	0	3	3	40	60	100
4	22CE6308	Photogrammetry	PEC	3	0	0	3	3	40	60	100
5	22CE6310	Intelligent Transport Systems	PEC	3	0	0	3	3	40	60	100
6	22CE6312	Solid and Hazardous Waste Management	PEC	3	0	0	3	3	40	60	100
7	22CE6314	Integrated Water Resources Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES- VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7301	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7303	Energy Efficient Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7305	Pile Foundation	PEC	3	0	0	3	3	40	60	100
4	22CE7307	Airborne and Terrestrial laser Mapping	PEC	3	0	0	3	3	40	60	100
5	22CE7309	Pavement Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE7311	Environmental Policy and Legislations	PEC	3	0	0	3	3	40	60	100
7	22CE7313	Urban Water Infrastructure	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES- VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7302	Wind and cyclone Effect on Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7304	Green Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7306	Tunneling Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE7308	Hydrographic Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE7310	Transportation planning Process	PEC	3	0	0	3	3	40	60	100
6	22CE7312	Environment, Health and Safety	PEC	3	0	0	3	3	40	60	100
7	22CE7314	Water Quality and Management	PEC	3	0	0	3	3	40	60	100

B.E. / B. Tech. (Honours)

Vertical I (Structural Engineering)	Vertical II (Environmental Engineering)	Vertical III (Geotechnical Engineering)	Vertical IV (Remote Sensing and GIS)
22CE5206 Advanced Concrete Technology	22CE5207 Transport of Water and Wastewater	22CE5208 Soil Properties and Behaviour	22CE5209 Fundamentals of Remote Sensing
22CE6205 Advanced Concrete Structures	22CE6206 Design of Physico-Chemical Treatment Systems	22CE6207 Site Exploration and Soil Investigation	22CE6208 Advanced Remote Sensing
22CE6209 Experimental Techniques and Instrumentation	22CE6210 Design of Biological Treatment Systems	22CE6211 Environmental Geo-technology	22CE6212 Fundamentals of Geodesy
22CE7204 Advanced Steel Structures	22CE7205 Solid and Hazardous Waste Management	22CE7206 Advanced Foundation Engineering	22CE7207 Geographical Information System
22CE7208 Design of Steel-Concrete Composite Structures	22CE7209 Environmental Impact and Risk Assessment	22CE7210 Foundation in Expansive Soils	22CE7211 Modern Surveying
22CE8201 Design of Industrial Structures	22CE8202 Resource and Energy Recovery from Waste	22CE8203 Reinforced Soil Structures	22CE8204 Urban Geo-informatics
22CE8205 Structural Health Monitoring	22CE8206 Remote Sensing and GIS Application in Environmental Management	22CE8207 Remote Sensing and its Application in Geotechnical Engineering	22CE8208 Remote Sensing and GIS Application for Earth Sciences

B.E. / B. Tech. (Minor Degree)

S.No.	Course Code	Vertical I	Course Code	Vertical II
1	22CE5601	Principles of Surveying	22CE5602	Sustainable infrastructure Development
2	22CE6601	Construction Technology	22CE6603	Sustainable Agriculture and Environmental Management
3	22CE6602	Soil and Foundations	22CE6604	Sustainable Bio Materials
4	22CE7601	Basic Structural Engineering	22CE7603	Materials for Energy Sustainability
5	22CE7602	Water and Wastewater Treatment	22CE7604	Green Technology
6	22CE8601	Quantity Estimation and Valuation	22CE8603	Environmental Quality Monitoring and Analysis
7	22CE8602	Transportation Engineering	22CE8604	Integrated Energy Planning for Sustainable Development

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Signature of the Dean Academics

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HiCET

Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
BE	22MA3108	STATISTICS AND NUMERICAL METHODS (CIVIL)	3	1	0	4

Course Objective

The learner should be able to

1. Introduce Correlation and Regression concepts .
2. Describe some basic concepts of statistical methods for testing the hypothesis.
3. Analyze the design of experiment techniques to solve various engineering problems.
4. Apply various methods to find the intermediate values for the given data
5. Explain concepts of numerical differentiation and numerical integration of the unknown functions..

Unit	Description	Instructional Hours
I	**CORRELATION AND REGRESSION** Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines (problems based on Raw data only).	12
II	**HYPOTHESIS TESTING** Large sample test based on Normal distribution – test of significance for single mean and difference of means - Tests based on t (for single mean and difference of means) - F distribution – for testing difference of variance, Chi – Square test for Contingency table (Test for Independency) – Goodness of fit	12
III	**ANALYSIS OF VARIANCE** Introduction, assumptions of analysis of variance, completely randomized design, randomized block design, Latin square design.	12
IV	**INTERPOLATION** Interpolation: Newton's forward and backward difference formulae - Lagrangian interpolation for unequal intervals – Divided differences- Newton's divided difference formula.	12
V	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Differentiation using interpolation formula – Newton's forward and backward interpolation formulae for equal intervals – Newton's divided difference formula for unequal intervals - Numerical integration by Trapezoidal and Simpson's 1/3 rules.	12
	Total Instructional Hours	**60**

Course Outcome

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

CO1: Compute correlation and predict unknown values using regression.
CO2: Understand the concepts of statistical methods for testing the hypothesis.
CO3: Apply Design of Experiment techniques to solve various engineering problems.
CO4: Understand the concept of interpolation in both cases of equal and unequal intervals.
CO5: Identify various methods to perform numerical differentiation and integration

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018

T2 - Grewal.B.S. " Higher Engineering Mathematics", 44th Edition, Khanna Publications, New Delhi, 2012.

REFERENCE BOOKS :

R1 - Kreyszig.E. "Advanced Engineering Mathematics", Eight Edition, John Wiley & sons (Asia) ltd 2010.

R2 - C.MontGomery "Applied statistics and Probability for Engineers", 6th Edition, Wiley Publications.

R3 - Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007..

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	-	-	1	2	2	2	1
CO2	3	3	3	2	2	1	1	-	-	1	2	2	2	2
CO3	3	3	3	2	3	1	1	-	-	1	2	2	2	2
CO4	3	3	3	3	3	1	1	-	-	1	2	2	2	3
CO5	3	3	3	3	3	1	1	-	-	1	3	2	1	2
Average	3	3	3	2.6	2.8	1	1	-	-	1	2.2	2	1.8	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3201	BASIC BUILDING SERVICES	3	0	0	3

Course Objective

1. To gain knowledge on the various electrical systems and components in building construction.
2. To be conversant with the principles of illumination and lighting design.
3. To understand the various methods of ventilation systems and air-conditioning facilities.
4. To emphasize the importance of fire safety in buildings.
5. To learn about plumbing and drainage systems in buildings.

Unit	Description	Instructional Hours
I	**ELECTRICAL SYSTEMS IN BUILDINGS** Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planningelectrical wiring for building – Main and Distribution boards – Transformers and switch gears - Layout ofsubstations.	9
II	**PRINCIPLES OF ILLUMINATION AND DESIGN** Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering – Design of modern lighting – Lighting for stores and house lighting - Lighting for offices, schools, hospitals.	9
III	**VENTILATION AND AIR CONDITIONING** Ventilation – Requirements – Natural and mechanical systems – Ventilation rate measurements - Thermodynamics – Terms and definitions - Refrigerants – Vapour compression cycle – Compressors – Evaporators – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire.	9
IV	**FIRE SAFETY INSTALLATIONS** Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems - Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Firefighting pump and water storage – Dry and wet risers – Automatic sprinklers - Fire alarm system, snorkel ladder.	9
V	**PLUMBING AND DRAINAGE** Plumbing fixtures and fittings – Water conserving fittings – Over flows – Strainers and connectors – Prohibited fixtures – Special fixtures – Installation of water closets – Urinals – Flushing devices – Floor drains – Shower stalls – Bath tubs – Bidets – Minimum plumbing facilities – Rainwater harvesting systems – Necessity – Construction and types.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Illustrate and design the electrical supply systems, systems of wiring and protective electrical installations included in buildings.
CO2: Incorporate the concepts of illumination and its principles while designing the lighting system of a building.
CO3: Integrate the principles of ventilation and air conditioning in the design of buildings
CO4: Recognize the proper fire safety systems and devices used in the various types of buildings.
CO5: Understand the importance of plumbing, drainage and rain water harvesting systems involved in buildings.

TEXT BOOKS:

T1 -David V. Chadderton, "Building Services Engineering", Taylor & Francis, New York, 2007.
T2 - Steffy G, "Architectural Lighting Design", John Wiley and Sons, 2008.
T3 - Arora C P, "Refrigeration and Air Conditioning", Tata McGraw Hill, New Delhi, 2010.

REFERENCE BOOKS:

R1 -National Building Code of India, NBC, 2016.
R2 - Uniform Plumbing Code of India, IAPMO, 2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3202	CONSTRUCTION MATERIALS AND TECHNIQUES	3	0	0	3

Course Objective

1. To understand the quality of basic materials for construction and its tests.
2. To learn the material properties of cement, aggregates and concrete.
3. To illustrate the properties and applications of other miscellaneous materials and finishes.
4. To study the various Methods of Sub structure and Super structure construction.
5. To gain knowledge on Construction of Special Structures.

Unit	Description	Instructional Hours
I	**STONES - BRICKS** Stone as building material - criteria for selection - Tests on stones –Stones – Stone Masonry - Bricks - Classification - Manufacturing of clay bricks - Tests on bricks - Compressive strength - Water Absorption - Efflorescence - Bricks for special use – Brick Masonry	9
II	**CEMENT – AGGREGATES - CONCRETE** Cement - Ingredients - Manufacturing process - Types and grades - Properties of cement and Cement mortar - Tests on Cement - Fineness, Soundness, Consistency, Setting time - Coarse Aggregate -Crushing strength, Impact strength, Flakiness Index, Elongation Index, Abrasion resistance, Grading - Fine aggregate –Grading, Bulking- Concrete - Ingredients - Properties of fresh concrete - Slump , Flow and Compaction factor - Properties of Hardened concrete - Compressive, Tensile and Shear strength.	9
III	**MISCELLANEOUS MATERIALS AND FINISHES** Timber products – properties, application - Tiles - Ceramics – Refractories - Terracotta and Glazed products - Rubber – Plastics – Fibres and Composites – M-sand - Aluminium – Glass – Asbestos - Paints – Varnishes – Distempers – Emulsions	9
IV	**SUB STRUCTURE &SUPER STRUCTURE CONSTRUCTION** Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam – cableanchoring and grouting - Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques ofconstruction for continuous concreting operation in tall buildings of various shapes and varyingsections – Erection techniques of tall structures, Large span structures.	9
V	**CONSTRUCTION OF SPECIAL STRUCTURES** Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Identify the good quality materials for construction.
CO2: Understand the material properties of cement, aggregates and concrete.
CO3: Compare the typical and potential applications of other miscellaneous materials and finishes.
CO4: Apply the knowledge of various techniques for Sub Structure and Super Structure Construction.
CO5:Gain the knowledge on construction techniques for Special Structures.

TEXT BOOKS:

T1 –Varghese PC, Building Construction,Second Edition, PHI Learning ltd., 2016.
T2 - Shetty M S, Concrete Technology: Theory and Practice, S.Chand& Company Ltd., 2005
T3 - Peurifoy R L, SchexnayderCJ, Shapira A, Schmitt R, Construction Planning Equipment and Methods, Tata McGraw-Hill,2011.

REFERENCE BOOKS:

R1 - Ganapathy C, Modern Construction Materials, Eswar Press, 2015.
R2 - Sankar S K and Saraswati S, Construction Technology, Oxford University Press, NewDelhi, 2008.
R3 - Punmia,BC, Building construction ,LaxmiPublication (p) Ltd.,2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	-	1	-	2	3	-	-
CO2	3	3	1	1	2	-	-	-	1	-	2	2	-	-
CO3	3	2	1	2	2	-	-	-	1	-	1	2	-	-
CO4	3	3	1	2	2	1	-	-	1	-	1	2	-	-
CO5	3	2	2	3	2	1	2	-	1	-	2	2	-	-
Average	3	2.4	1.2	1.8	1.8	1	1.5	-	1	-	2	3	-	-

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3203	WATER SUPPLY AND WASTEWATER ENGINEERING	3	0	0	3

Course Objective

1. To gain knowledge on the characteristics of water, water quality standards and water supply system based on demand
2. To learn the unit operations and understand the design of various components of water treatment plants.
3. To acquire adequate knowledge on water distribution, systems of plumbing and house service connections.
4. To understand the design of sewerage system.
5. To be conversant with the methods of water distribution, systems of plumbing and house service connections.

Unit	Description	Instructional Hours
I	**WATER SUPPLY SYSTEM** Estimation of surface and subsurface water sources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological characteristics -Waterborne diseases - Standards for potable water, Intakes of water- Pumping and gravity systems.	9
II	**WATER TREATMENT** Objectives - Unit operations - Principles, functions, and design of water treatment plant units, Plain sedimentation tanks - Aerators of flash mixers, Coagulation and flocculation – Clari flocculator - Sand filters - Disinfection - Water softening - removal of iron and manganese - Defluoridation - Desalination - Residue Management - Operation and Maintenance of Water Treatment Plants.	9
III	**WATER STORAGE AND DISTRIBUTION** Storage and balancing reservoirs - types, location and capacity- Pipe materials - Laying, joining and testing of pipes - Distribution system: layout, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.	9
IV	**PLANNING AND DESIGN OF SEWERAGE SYSTEM** Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materialsand joints - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Prevention and control – Sewage pumping-Drainage in buildings –Systems of plumbing.	9
V	**SEWAGE TREATMENT AND DISPOSAL** Objectives –Stages of Wastewater Treatment - Selection of Treatment Methods - Principles, Functions - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - UASB - Waste Stabilization Ponds - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Operation and Maintenance aspects - Discharge standards-Sludge treatment -Disposal of sludge.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Understand the importance of water quality standards and demand of water
CO2: Interpret the unit operations and maintenance of water treatment plants
CO3: Comprehend thewater storage and distribution systems
CO4: Design the sewers and sewerage systems
CO5: Recognize the various sewage treatment and sludge disposal methods

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TEXT BOOKS:

T1 - Punmia, B. C. , Ashok K. Jain, and Arun K. Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
T2 - Garg, S. K, "Environmental Engineering" Vol. I, Khanna Publishers, New Delhi, 2015.
T3 - Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2015.

REFERENCE BOOKS:

R1 - Birdie, G.S, and Birdie. J. S., "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 2012.
R2 - Metcalf and Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill Company, New Delhi, 2010.
R3 - Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
R4 - Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning, Design and Operation", Prentice Hall of India Learning Private Limited, New Delhi, 2009.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3251	STRENGTH OF MATERIALS	3	0	2	4

Course Objective

1. To gain knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and loadingand learn the concepts of internal stress in beams of various cross sections
2. To analyze the members under complex state of stress by means of analytical and graphical methods, understand the behaviour of members subjected to pure torsion and shear
3. To understand the deflection of beams by various methods.
4. To study the behaviour of short and long column under axial and eccentric loads
5. To know the concepts of truss analysis.

Unit	Description	Instructional Hours
	SHEAR FORCE AND BENDING MOMENT&STRESSES IN BEAMS	
I	Introduction - Types of beams, loads and reactions - Shear force and bending moment - Relationships between load, shear force and bending moment – Shear force and bending moment diagrams for simply supported and cantilever beams –Theory of simple bending-Bending stresses in beams – Shear stresses in beams of rectangular, circular, T and I sections.	12
	PRINCIPAL STRESS AND STRAIN&TORSION OF SHAFTS	
II	Plane stress - Principal stresses and maximum shear stress - Determination of principal stresses and principal planes - plane strain – Derivation of shear stress produced in circular shaft subjected to torsion – Maximum torque transmitted by a circular solid shaft. *Shear Test, Impact Test, Torsion Test*	9+ 6(P)
	DEFLECTION OF BEAMS	
III	Deflection of beams - Double integration method – Macaulay's method – Moment-Area method - Conjugate beam method- Maxwell Betti's Theorem *Deflection Test*	9+2(P)
	COLUMNS AND STRUTS	
IV	Short and slender columns- Axial and bending stress – Columns with various support conditions - Columns with eccentric loads - Euler theory and Rankine's formula.	9
	ANALYSIS OF TRUSSES	
V	Perfect, deficient and redundant trusses - Degree of redundancy – Internal and external redundancy – Methods of analysis - Method of joints - Method of sections - Method of tension coefficients. *Tension Test, Compression Test*	9+4(P)
	Total Instructional Hours	60

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Determine Shear force and bending moment in beams and understand concept of theory of simple bending

CO2: Evaluate the elements subjected to complex state of stress by means of analytical and graphical methods, Comprehend the behaviour of members under pure torsion and shear

CO3: Determine slope and deflection in beams using various methods.

CO4: Interpret the behaviour of short and long column under axial and eccentric loads.

CO5:Analyse the determinate trusses.

TEXT BOOKS:

T1 -Bansal R.K. "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, 2018

T2 - Rajput RK.," A Textbook of Strength of Materials", S.Chand Publishing, New Delhi, 2018

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REFERENCE BOOKS:

R1 - William A. Nash, “Strength of Materials”, Schaum’s Outline Series, Tata McGraw-Hill Publishing Co., New Delhi, 2008
R2 - Ramamrutham S. and Narayanan R., “Strength of Materials”, Dhanpat Rai Publishing Co. (P) Ltd., 2011.
R3 - Gambhir M L., “Fundamentals of Solid Mechanics”, PHI Learning Private Limited., New Delhi, 2009.
R4 - James M.Gere, “Mechanics of Materials”, Thomas Canada Ltd., Canada, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	1	-	-	-	1	-	-	-	1	1	1	2
CO2	3	3	2	1	-	-	1	-	-	-	1	1	1	2
CO3	3	3	1	-	-	1	1	-	-	1	1	-	1	1
CO4	3	3	2	1	-	2	1	-	-	1	1	1	1	1
CO5	3	3	2	1	-	3	1	-	-	1	1	1	1	1
Average	3	3	1.6	1		2	1			1	1	1	1	1.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3252	**MECHANICS OF FLUIDS**	2	0	2	3

Course Objective

1. To understand the properties of fluids
2. To learn the basic concepts of fluid statics and pressure measurements
3. To acquire knowledge on the concepts of fluid kinematics and dynamics
4. To understand the behavior of flow through pipes
5. To gather knowledge on dimensional analysis

Unit	Description	Instructional Hours
	FLUID PROPERTIES	
I	Fluid – definition, distinction between solid and fluid - Properties of fluids - Density, Specific Weight, Specific Volume, Specific Gravity, Temperature, Viscosity, Compressibility, Vapour Pressure, Capillarity and Surface Tension	9
	FLUID STATICS	
II	Pascal's and Hydrostatic Law – Pressure measuring devices (simple manometers, differential manometers: U tube, inclined and Mechanical gauges), Centre of pressure, Total pressure on plane -Forces on plane – Buoyancy - Metacentric height	(9)
	FLUID KINEMATICS & FLUID DYNAMICS	
III	Types of fluid flow – Velocity and Acceleration –Continuity equation in Cartesian co-ordinates - Velocity potential function and Stream function- Flow net -Euler's and Bernoulli's equations – Application of Bernoulli's equation – Momentum principle. ***Flow through Venturimeter, Orificemeter, Bernoulli's Experiment***	(6+3)
	FLOW THROUGH PIPES	
IV	Flow through pipes – Laminar flow through pipes and between plates – Hagen-Poiseuille equation – Turbulent flow- ***Determination of major and minor losses of flow in pipes*** - Darcy Weisbach's equation - Moody's diagram –Pipes in series and paralle! – Equivalent pipe - Pipe network. ***Flow through Orifice (CHM & VHM).***	(6+3)
	DIMENSIONAL ANALYSIS	
V	Units and Dimensions – Dimensional homogeneity – Rayleigh's method – Buckingham's Pi theorem – Hydraulic similitude – Model studies.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Comprehend the properties of fluids.

CO2: Understand the working of pressure measuring devices and measure fluid pressure.

CO3: Distinguish between various types of fluid flows and find the fluid velocity and discharge using principles of Kinematics and Dynamics.

CO4: Identify the laminar and turbulent flow through pipes and compute the energy losses in pipe flow.

CO5:Select appropriate model to provide solution to a real time problem related to hydraulics.

TEXT BOOKS:

T1 –Streeter V.L., Wylie E. B. and Bedford K. W., "Fluid Mechanics", Tata McGraw Hill Publishing Co. Ltd., 2017.

T2 - Modi P. N. and Seth S M., "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard BookHouse, New Delhi, 2013.

REFERENCE BOOKS:

R1 - Bansal R.K., "Fluid Mechanics & Hydraulic Machines", Laxmi Publications, 2015.

R2 - Kumar .K.L, "Engineering Fluid Mechanics", Eurasia Publishing House, 2002.

R3 - Pani B.S., "Fluid Mechanics: A concise introduction" PHI Learning EEE 2016.

R4 - Narayana Pillai N. "Principles of Fluid Mechanics and Fluid Machines",3rd. Ed. University Press (India) Pvt. Ltd. 2009.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	-	1	3	1	2	-	1	1	2	1	-	3	3
CO2	3	-	1	1	-	1	-	1	1	2	1	-	3	3
CO3	3	3	3	3	-	-	-	3	2	3	2	1	3	3
CO4	3	-	1	3	1	2	-	2	3	2	2	-	3	3
CO5	3	-	2	2	1	2	3	1	2	2	1	2	3	3
Average	**3**	**3**	**1.6**	**2.4**	**1**	**1.75**	**3**	**1.6**	**1.8**	**2.2**	**1.4**	**1.5**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3001	**WATER AND WASTEWATER TESTING LAB**	0	0	3	1.5

Course Objective

1. Gain insight on sampling, preservation methods and the significance of characterization of water and wastewater
2. Study the physical characterization of water and wastewater samples as per BIS water quality and effluent standards
3. Learn to analyze and measure the various chemical parameters of water and wastewater through modern instrumentation methods
4. Understand the principles and operational procedures of flame photometry and atomic absorption spectrophotometry adopted in water quality testing
5. Get conversant with the principles and procedures involved in the bacteriological analysis of water and wastewater

Expt . No.	Description of the Experiment
1.	Sampling, preservation methods and significance of characterization of water and wastewater
2.	Determination of pH and Turbidity
3.	Determination of Total, Fixed, Volatile and Settleable Solids
4.	Determination of Available Chlorine in Bleaching Powder
5.	Determination of Residual Chlorine in water
6.	Determination of Optimum Coagulant Dosage
7.	Determination of Biological Oxygen Demand
8.	Determination of Chemical Oxygen Demand
9.	Determination of Sulphates
10.	Determination of Nitrates
11.	Determination of Ammonia Nitrogen
12.	Determination of Phosphates
13.	Determination of Calcium, Potassium and Sodium
14.	Heavy metals determination – Chromium, Lead and Zinc (Demonstration Only)
15.	Bacteriological Analysis (Demonstration Only)

Total Practical Hours 45

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Collect, store, preserve and characterize water and wastewater samples based on requirements

CO2: Analyze the physical characteristics of water and wastewater as per BIS water quality and effluent standards

CO3: Conduct experiments to determine the various chemical characteristics of water and wastewater samples using modern instrumentation methods

CO4: Demonstrate, analyze and measure the required water quality parameters using flame photometric and atomic absorption spectrophotometric methods

CO5: Carryout the bacteriological analysis of water and wastewater samples

REFERENCE BOOKS

R1 – "Standard Methods for the Examination of Water and Wastewater", WPCF, APHA and AWWA, USA, 17th Edition, 2015.
R2 - IS 10500:2012 "Drinking Water Specifications", Bureau of Indian Standards, New Delhi.
R3 – "Manual on Sewerage & Sewage Treatment", Second Edition, CPHEEO, 2012.
R4 - "Laboratory Manual for the Examination of Water, Wastewater, Soil" Rump H.H. and Krist, H. – Second Edition, VCH, Germany, 3rd Edition, 1999.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	-	1	3	1	2	-	1	1	2	1	-	3	3
CO2	3	-	1	1	-	1	-	1	1	2	1	-	3	3
CO3	3	3	3	3	-	-	-	3	2	3	2	1	3	3
CO4	3	-	1	3	1	2	-	2	3	2	2	-	3	3
CO5	3	-	2	2	1	2	3	1	2	2	1	2	3	3
Average	**3**	**3**	**1.6**	**2.4**	**1**	**1.75**	**3**	**1.6**	**1.8**	**2.2**	**1.4**	**1.5**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	22HE3071	**SOFT SKILLS - II**	1	0	0	1

Course Objective

1. To make the students aware of the importance, the role and the content of softskills through instruction, knowledge acquisition. demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**GROUP DISCUSSION & PRESENTATION SKILLS** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback. - Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback	4
II	**INTERVIEW SKILLS AND PERSONALITY SKILLS** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
III	**BUSINESS ETIQUETTE & ETHICS** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines	3
IV	**QUANTITATIVE APTITUDE** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration	3
V	**LOGICAL REASONING** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Coded inequalities - Conditions and Grouping	2
	Total Instructional Hours	**15**

Course Outcome

CO1: Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict
CO2: Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3: Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4: Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems
CO5: Students will excel in complex reasoning

REFERENCE BOOKS:

R1 - Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan.
R2 - Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha.
R3 - How to crack test of Reasoning - Jaikishan and Premkishan
R4 - The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE3072	**COMPUTER AIDED BUILDING DRAWING**	0	0	4	2

Course Objective

1. To understand the principles of planning and bylaws
2. To draw plan, elevation and section of load bearing and framed structures
3. To draw plan, elevation and section of residential, public and industrial structures
4. To prepare detailed drawing for doors and windows

Expt . No.	Description of the Experiment
1.	Classification of buildings - Principles of planning – Dimensions of building- NBC
2.	Orientation of buildings – Lighting and Ventilation - Building bye-laws – FSI, Open spaces
3.	Introduction to AutoCAD - Layers
4.	Detailed drawings of component parts – Doors and Windows
5.	Planning and preparing sketches / drawings of Residential Building (Flat & Sloping Roof)
6.	Planning and preparing sketches / drawings of School or Hospital Building
7.	Planning and preparing sketches / drawings of single-storeyed factory buildings with trusses
8.	Building Information Modeling
	Total Practical Hours **45**

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Apply the principles of planning and bye-laws for building planning
CO2: Prepare plan, elevation and section of residential buildings
CO3: Prepare plan, elevation and section of institutional and industrial buildings
CO4: Prepare detailed drawings of building component parts such as doors and windows
CO5: Efficiently plan and design buildings using BIM process

TEXT BOOKS:

T1 - Sikka V. B., "A Course in Civil Engineering Drawing", 4th Edition, S.K. Kataria and Sons, 2015.
T2 - George Omura and Brian C. Benton, "Mastering AutoCAD 2019 and AutoCAD LT 2019", John Wiley & Sons, 2018.

REFERENCE BOOKS:

R1 - Shah M. G., Kale C. M. and Patki S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2007.
R2 - Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 2010.
R3 - MarimuthuV.M.,MurugesanR.andPadminiS., "CivilEngineeringDrawing-I",Pratheeba Publishers, 2008

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2		2	3	1	2		2	3	3	3
CO2	3	3	1	2			2		2		2	3	3	3
CO3	3	3		1	2		3	1	2	2	2	3	3	2
CO4	3	2	1	1		2	3		1		3	2	3	2
CO5	3	2		1			3		1		2	3	3	3
Average	**3**	**2.6**	**4**	**1.4**	**2**	**2**	**2.8**	**1**	**1.6**	**2**	**2.2**	**2.8**	**3**	**2**

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HINDUSTHANCOLLEGEOFENGINEERINGANDTECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

COIMBATORE 641 032

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

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CURRICULUM

&

SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION-2022

(For the students admitted during the academic year 2022 – 2023 and onwards)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTE

IV: To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

IM1: To provide academic excellence in technical education through novel teaching methods

IM2: To empower students with creative skills and leadership qualities

IM3: To produce dedicated professionals with social responsibility

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT

DV: To be recognized globally for pre-eminence in Civil Engineering education, research and service

MISSION OF THE DEPARTMENT

DM1: To impart scientific and technical knowledge for professional practice, advanced study and research in Civil Engineering

DM2: To equip the students with ingenious leadership and organizational skills for a successful professional career

DM3: To inculcate professional and ethical responsibilities related to industry, society and environment

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates will be able to:

PEO1: Excel as practicing engineers, academicians and researchers with a comprehensive knowledge in Civil Engineering

PEO2: Play a significant role as team players and leaders in challenging environments for nation's infrastructure development, environmental protection and sustainability

PEO3: Uphold professional and ethical responsibilities as engineers, consultants and entrepreneurs while addressing the demands of the society

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The graduates will be able to:

PSO1: Apply their engineering knowledge, communication skills, professional and ethical principles to solve problems in civil engineering and contribute to the infrastructure development in a sustainable way

PSO2: Use their engineering background to excel in competitive exams for advanced study, research and professional career

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid

REGULATION–2022

CIVIL ENGINEERING

CURRICULUM

B.E.CIVIL ENGINEERING
I TO VIII SEMESTERS CURRICULUM AND SYLLABI
SEMESTER I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA1101	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2	22ME1201	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH PRACTICAL COMPONENT											
3	22PH1151	Physics for non-circuit Engineering	BSC	2	0	2	3	4	50	50	100
4	22HE1151	English for Engineers	HSC	2	0	2	3	4	50	50	100
5	22IT1151	Python Programming and Practices	ESC	2	0	2	3	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSES											
6	22HE1095	Universal Human Values	AEC	2	0	0	2	3	40	60	100
7	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	-	100
MANDATORY COURSE											
8	22MC1091 / 22MC1092	அறிவியல் தமிழ் / Indian Constitution	MC	2	0	0	0	2	100	0	100
			Total	**15**	**5**	**6**	**19**	**27**	**470**	**330**	**800**

SEMESTER II

S.No.	Course Code	CourseTitle	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA2105	Partial Differential Equation , Fourier Series and Transforms	BSC	3	1	0	4	4	40	60	100
2	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
4	22CE2101	Engineering Mechanics and Solid mechanics	ESC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CY2152	Applied Chemistry	BSC	2	0	2	3	4	50	50	100
6	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22ME2001	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE2071	Design Thinking	AEC	1	0	2	2	2	100	-	100
9	22HE2072	Soft Skills and Aptitude I	AEC	1	0	0	1	1	100	-	100
MANDATORY COURSE											
10	22MC2091 / 22MC2092	தமிழர மரபு/ Heritage of Tamil	MC	2	0	0	0	2	100	0	100
11	22MC2093	NCC/NSS/YRC/Sports/Clubs Enrolment	MC	All the students shall enroll in any one of the personality and character development programmes And undergo training for about 80 hours							
			Total	**18**	**1**	**10**	**22**	**29**	**620**	**380**	**1000**

SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22MA3108	Statistics & Numerical Methods	BSC	3	1	0	4	4	40	60	100
2	22CE3201	Basic Building Services	ESC	2	0	0	2	2	40	60	100
3	22CE3202	Construction Materials and Techniques	PCC	3	0	0	3	3	40	60	100
4	22CE3203	Water Supply and Wastewater Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITH PRACTICAL COMPONENT											
5	22CE3251	Strength of Materials	PCC	3	0	2	4	5	50	50	100
6	22CE3252	Mechanics of Fluids	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7	22CE3001	Water and Wastewater Testing Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE3071	Soft Skills–II	SEC	1	0	0	1	1	100	-	100
9	22CE3072	Computer Aided Building Drawing	AEC	0	0	4	2	4	60	40	100
MANDATORY COURSE											
10	22MC3073	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	-	100
			Total	**19**	**1**	**12**	**24**	**31**	**580**	**420**	**1000**

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2	22CE4201	Structural Analysis	PCC	3	1	0	4	4	40	60	100
3	22CE4202	Concrete Technology	PCC	3	0	0	3	3	40	60	100
4	22CE4203	Highway and Railway Engineering	PCC	3	0	0	3	4	40	60	100
THEORY WITHPRACTICAL COMPONENT											
5	22CE4251	Surveying	PCC	2	0	2	3	4	50	50	100
6	22CE4252	Soil Mechanics	PCC	2	0	2	3	4	50	50	100
7	22CE4253	Hydraulic Engineering	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8	22CE4001	Concrete and Highway Engineering Lab	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
9	22HE4071	Soft Skills – III	SEC	1	0	0	1	1	100	-	100
			Total	**18**	**1**	**10**	**24**	**30**	**470**	**430**	**900**

SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5201	Design of RC Elements	PCC	3	1	0	4	4	40	60	100
2	22CE5202	Foundation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE53XX	Professional Elective-I	PEC	3	0	0	3	3	40	60	100
4	22CE53XX	Professional Elective-II	PEC	3	0	0	3	3	40	60	100
5	22CE53XX	Professional Elective-III	PEC	3	0	0	3	3	40	60	100
THEORY WITH PRACTICAL COMPONENT											
6	22CE5251	Construction Project Management	PCC	3	0	2	4	5	50	50	100
PRACTICAL											
7	22CE5001	Design and Drawing of RC Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE5071	Soft Skills–IV/Foreign Language	SEC	1	0	0	1	1	100	-	100
9	22CE5072	Survey Camp*	SEC	0	0	0	1	0	100	-	100
			Total	**19**	**1**	**6**	**24**	26	**510**	**390**	**900**

***Survey camp of one week has to be under gone by the student during fourth semester vacation.**

SEMESTER VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6201	Design of Steel Elements	PCC	3	1	0	4	4	40	60	100
2	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3	22CE63XX	Professional Elective-IV	PEC	3	0	0	3	3	40	60	100
4	22CE63XX	Professional Elective-V	PEC	3	0	0	3	3	40	60	100
5	22XX64XX	Open Elective – I	OEC	3	0	0	3	3	40	60	100
6	22XX64XX	Open Elective - II	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7	22CE6001	Design and Drawing of Steel Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
8	22HE6071	Soft Skills- V	SEC	2	0	0	2	2	100	-	100
			Total	**20**	**1**	**4**	**23**	**25**	**400**	**400**	**800**

SEMESTER VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7201	Estimation, Costing and Valuation	PCC	3	1	0	4	4	40	60	100
2	22CE7202	Water Resources and Irrigation Engineering	PCC	3	0	0	3	3	40	60	100
3	22CE73XX	Professional Elective-VI	PEC	3	0	0	3	3	40	60	100
4	22XX74XX	Open Elective-III	OEC	3	0	0	3	3	40	60	100
5	22XX74XX	Open Elective-IV	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6	22CE7001	Computer Aided Analysis of Structures	PCC	0	0	4	2	4	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES											
7	22CE7701	Internship*	SEC	-	-	-	1	-	100	-	100
			Total	**15**	**1**	**4**	**19**	**20**	**360**	**340**	**700**

***Two weeks internship to be completed before the end of VI semester vacation**

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
EMPLOYABILITY ENHANCEMENT COURSES										
1	22CE8901	Project Work / Granted Patent	SEC	0	0	20	10	100	100	200
			Total	**0**	**0**	**20**	**10**	**100**	**100**	**200**

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	24	24	24	23	19	10	165

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Structural Engineering	VERTICAL II Construction Techniques and Practices	VERTICALIII Geotechnical Engineering	VERTICAL IV Geo-Informatics	VERTICAL V Transportation Infrastructure	VERTICAL VI Environmental Engineering	VERTICAL VII Water Resources
22CE5301 Repair and Rehabilitation of Structures	22CE5304 Formwork Engineering	22CE5307 Geo-Environmental Engineering	22CE5310 Total Station and GPS Surveying	22CE5313 Airports, Docks and Harbour Engineering	22CE5316 Climate Change Adaptation and Mitigation	22CE5319 Hydrology
22CE5302 Advanced Structural Analysis	22CE5305 Construction Equipment and Machinery	22CE5308 Ground Improvement Techniques	22CE5311 Remote Sensing Concepts	22CE5314 Traffic Engineering and Management	22CE5317 Air and Noise Pollution Control Engineering	22CE5320 Ground water Engineering
22CE5303 Prefabricated Structures	22CE5306 Sustainable Construction and Lean Construction	22CE5309 Soil Dynamics and Machine Foundations	22CE5312 Satellite Image Processing	22CE5315 Urban Planning and Development	22CE5318 Environmental Impact Assessment	22CE5322 Water Resources Systems Engineering
22CE6301 Pre-Stressed Concrete Structures	22CE6303 Construction Safety and Risk Management	22CE6305 Rock Mechanics	22CE6307 Cartography and GIS	22CE6309 Smart cities	22CE6311 Industrial Wastewater Management	22CE6313 Watershed Conservation and Management
22CE6302 Concrete Structures	22CE6304 Advanced Construction Techniques	22CE6306 Earthand Earth Retaining Structures	22CE6308 Photogrammetry	22CE6310 Intelligent Transport Systems	22CE6312 Solid and Hazardous Waste Management	22CE6314 Integrated Water Resources Management
22CE7301 Dynamics and Earthquake Resistant Structures	22CE7303 Energy Efficient Buildings	22CE7305 Pile Foundation	22CE7307 Airborne and Terrestrial laser mapping	22CE7309 Pavement Engineering	22CE7311 Environmental Policy and Legislations	22CE7313 Urban Water Infrastructure
22CE7302 Wind and cyclone Effect on Structures	22CE7304 Green Buildings	22CE7306 Tunneling Engineering	22CE7308 Hydrographic Surveying	22CE7310 Transportation planning Process	22CE7312 Environment, Health and Safety	22CE7314 Water Quality and Management

PROFESSIONAL ELECTIVE COURSES - I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5301	Repair and Rehabilitation of Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5304	Formwork Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5307	Geo- Environ mental Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE5310	Total Station and GPS Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE5313	Airports, Docks and Harbour Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE5316	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3	40	60	100
7	22CE5319	Hydrology	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5302	Advanced Structural Analysis	PEC	3	0	0	3	3	40	60	100
2	22CE5305	Construction Equipment and Machinery	PEC	3	0	0	3	3	40	60	100
3	22CE5308	Ground Improvement Techniques	PEC	3	0	0	3	3	40	60	100
4	22CE5311	Remote Sensing Concepts	PEC	3	0	0	3	3	40	60	100
5	22CE5314	Traffic Engineering and Management	PEC	3	0	0	3	3	40	60	100
6	22CE5317	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3	40	60	100
7	22CE5320	Ground water Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5303	Prefabricated Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5306	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3	40	60	100
3	22CE5309	Soil Dynamics and Machine Foundations	PEC	3	0	0	3	3	40	60	100
4	22CE5312	Satellite Image Processing	PEC	3	0	0	3	3	40	60	100
5	22CE5315	Urban Planning and Development	PEC	3	0	0	3	3	40	60	100
6	22CE5318	Environmental Impact Assessment	PEC	3	0	0	3	3	40	60	100
7	22CE5322	Water Resources Systems Engineering	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6301	Pre-Stressed Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6303	Construction Safety and Risk Management	PEC	3	0	0	3	3	40	60	100
3	22CE6305	Rock Mechanics	PEC	3	0	0	3	3	40	60	100
4	22CE6307	Cartography and GIS	PEC	3	0	0	3	3	40	60	100
5	2CE6309	Smart cities	PEC	3	0	0	3	3	40	60	100
6	22CE6311	Industrial Wastewater Management	PEC	3	0	0	3	3	40	60	100
7	22CE6313	Watershed Conservation and Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE6302	Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE6304	Advanced Construction Techniques	PEC	3	0	0	3	3	40	60	100
3	22CE6306	Earth and Earth Retaining Structures	PEC	3	0	0	3	3	40	60	100
4	22CE6308	Photogrammetry	PEC	3	0	0	3	3	40	60	100
5	22CE6310	Intelligent Transport Systems	PEC	3	0	0	3	3	40	60	100
6	22CE6312	Solid and Hazardous Waste Management	PEC	3	0	0	3	3	40	60	100
7	22CE6314	Integrated Water Resources Management	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7301	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7303	Energy Efficient Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7305	Pile Foundation	PEC	3	0	0	3	3	40	60	100
4	22CE7307	Airborne and Terrestrial laser Mapping	PEC	3	0	0	3	3	40	60	100
5	22CE7309	Pavement Engineering	PEC	3	0	0	3	3	40	60	100
6	22CE7311	Environmental Policy and Legislations	PEC	3	0	0	3	3	40	60	100
7	22CE7313	Urban Water Infrastructure	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES - VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE7302	Wind and cyclone Effect on Structures	PEC	3	0	0	3	3	40	60	100
2	22CE7304	Green Buildings	PEC	3	0	0	3	3	40	60	100
3	22CE7306	Tunneling Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE7308	Hydrographic Surveying	PEC	3	0	0	3	3	40	60	100
5	22CE7310	Transportation planning Process	PEC	3	0	0	3	3	40	60	100
6	22CE7312	Environment, Health and Safety	PEC	3	0	0	3	3	40	60	100
7	22CE7314	Water Quality and Management	PEC	3	0	0	3	3	40	60	100

B.E. / B. Tech. (Honours)

Vertical I (Structural Engineering)	Vertical II (Environmental Engineering)	Vertical III (Geotechnical Engineering)	Vertical IV (Remote Sensing and GIS)
22CE5206 Advanced Concrete Technology	22CE5207 Transport of Water and Wastewater	22CE5208 Soil Properties and Behaviour	22CE5209 Fundamentals of Remote Sensing
22CE6205 Advanced Concrete Structures	22CE6206 Design of Physico-Chemical Treatment Systems	22CE6207 Site Exploration and Soil Investigation	22CE6208 Advanced Remote Sensing
22CE6209 Experimental Techniques and Instrumentation	22CE6210 Design of Biological Treatment Systems	22CE6211 Environmental Geo-technology	22CE6212 Fundamentals of Geodesy
22CE7204 Advanced Steel Structures	22CE7205 Solid and Hazardous Waste Management	22CE7206 Advanced Foundation Engineering	22CE7207 Geographical Information System
22CE7208 Design of Steel-Concrete Composite Structures	22CE7209 Environmental Impact and Risk Assessment	22CE7210 Foundation in Expansive Soils	22CE7211 Modern Surveying
22CE8201 Design of Industrial Structures	22CE8202 Resource and Energy Recovery from Waste	22CE8203 Reinforced Soil Structures	22CE8204 Urban Geo-informatics
22CE8205 Structural Health Monitoring	22CE8206 Remote Sensing and GIS Application in Environmental Management	22CE8207 Remote Sensing and its Application in Geotechnical Engineering	22CE8208 Remote Sensing and GIS Application for Earth Sciences

B.E. / B. Tech. (Minor Degree)

S.No.	Course Code	Vertical I	Course Code	Vertical II
1	22CE5601	Principles of Surveying	22CE5602	Sustainable infrastructure Development
2	22CE6601	Construction Technology	22CE6603	Sustainable Agriculture and Environmental Management
3	22CE6602	Soil and Foundations	22CE6604	Sustainable Bio Materials
4	22CE7601	Basic Structural Engineering	22CE7603	Materials for Energy Sustainability
5	22CE7602	Water and Wastewater Treatment	22CE7604	Green Technology
6	22CE8601	Quantity Estimation and Valuation	22CE8603	Environmental Quality Monitoring and Analysis
7	22CE8602	Transportation Engineering	22CE8604	Integrated Energy Planning for Sustainable Development

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Signature of the Dean Academics

Dean (Academics)
HiCET

Signature of the Principal

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COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	22CE5202	**DESIGN OF RC ELEMENTS**	3	1	0	4

Course Objective

1. To learn the basic concepts of design and to analyze and design RC beam by working stress method
2. To gain knowledge on the design the RC beams by limit state method of design
3. To learn the design concepts of RC slabs and staircases by limit state method
4. To understand the design of columns by limit state method
5. To gain knowledge on the design concept of RC footings by limit state method with reinforcement detailing.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Objective of structural design -Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC – Properties of Concrete and Reinforcing Steel - Design of Singly reinforced and doubly reinforced rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods	9+3
II	**LIMIT STATE DESIGN OF BEAMS** Design of singly reinforced and doubly reinforced rectangular beams by Limit State Method - Design of flanged beams – Behaviour of RC beams in shear, bond and anchorage - Design requirements as per IS code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion	9+3
III	**LIMIT STATE DESIGN OF SLABS AND STAIRCASE** Behaviour of one way and two way slabs – Design of one way simply supported, cantilever and continuous slabs – Design of two way slabs for various edge conditions – Torsion reinforcement at corners - Design of flat slabs - Types of Staircases – Design of dog-legged staircase	9+3
IV	**LIMIT STATE DESIGN OF COLUMNS** Types of columns –Axially Loaded columns – Design of short rectangular, square and circular columns –Design of slender columns- Design for uniaxial and biaxial bending using column curves	9+3
V	**LIMIT STATE DESIGN OF FOOTING** Introduction and selection of footing under different site conditions - Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Combined footing - Standard method of detailing of RC footing	9+3
	Total Instructional Hours	**45+15 = 60**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Illustrate the various design philosophies and design RC beam by working stress method
CO2: Design beams using limit state method under different loading and end conditions
CO3: Design slabs and staircases using limit state method
CO4: Design RC columns with different end conditions using limit state method
CO5: Select and design RC footing under various site conditions using limit state method

TEXT BOOKS:

T1 - Punmia, B. C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd., New Delhi, 2007.
T2 - Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi , 2016.

REFERENCE BOOKS:

R1 - Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2017.
R2 -Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2008.
R3 - Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2019.
R4- Krishna Raju, N., Pranesh R N., " Reinforced Concrete Design – Principles and Practice", New Age International Publishers, 2018.

CODE BOOKS:

C1 – IS 456:2000 (R2016), "Code of practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2016.
C2 – SP 16:1980 "Design Aids for Reinforced Concrete to IS456:1978", Bureau of Indian Standards, New Delhi, 1999.

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5202	DESIGN OF RC ELEMENTS	3	1	0	4

Course Objective

1. To learn the basic concepts of design and to analyze and design RC beam by working stress method
2. To gain knowledge on the design the RC beams by limit state method of design
3. To learn the design concepts of RC slabs and staircases by limit state method
4. To understand the design of columns by limit state method
5. To gain knowledge on the design concept of RC footings by limit state method with reinforcement detailing.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Objective of structural design -Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC – Properties of Concrete and Reinforcing Steel - Design of Singly reinforced and doubly reinforced rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods	9+3
II	**LIMIT STATE DESIGN OF BEAMS** Design of singly reinforced and doubly reinforced rectangular beams by Limit State Method - Design of flanged beams – Behaviour of RC beams in shear, bond and anchorage - Design requirements as per IS code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion	9+3
III	**LIMIT STATE DESIGN OF SLABS AND STAIRCASE** Behaviour of one way and two way slabs – Design of one way simply supported, cantilever and continuous slabs – Design of two way slabs for various edge conditions – Torsion reinforcement at corners - Types of Staircases – Design of dog-legged staircase	9+3
IV	**LIMIT STATE DESIGN OF COLUMNS** Types of columns –Axially Loaded columns – Design of short rectangular, square and circular columns –Design of slender columns- Design for uniaxial and biaxial bending using column curves	9+3
V	**LIMIT STATE DESIGN OF FOOTING** Introduction and selection of footing under different site conditions - Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Combined footing - Standard method of detailing of RC footing	9+3
	Total Instructional Hours	**45+15 = 60**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Illustrate the various design philosophies and design RC beam by working stress method
CO2: Design beams using limit state method under different loading and end conditions
CO3: Design slabs and staircases using limit state method
CO4: Design RC columns with different end conditions using limit state method
CO5: Select and design RC footing under various site conditions using limit state method

TEXT BOOKS:

T1 - Punmia, B. C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd., New Delhi, 2007.
T2 - Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi , 2016.

REFERENCE BOOKS:

R1 - Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2017.
R2 -Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2008.
R3 - Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2019.
R4- Krishna Raju, N., Pranesh R N., " Reinforced Concrete Design – Principles and Practice", New Age International Publishers, 2018.

CODE BOOKS:

C1 – IS 456:2000 (R2016), "Code of practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2016.
C2 – SP 16:1980 "Design Aids for Reinforced Concrete to IS456:1978", Bureau of Indian Standards, New Delhi, 1999.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	-	-	-	-	2	2	-	3	-	3	2	3	-
CO2	3	3	3	2	2	-	2	2	3	-	2	2	3	1
CO3	3	3	3	2	2	2	-	1	3	-	2	2	3	3
CO4	2	3	-	-	1	1	1	2	3	-	2	2	3	3
CO5	2	1	2	3	-	-	-	-	2	-	3	3	3	-
Average	**2.4**	**2**	**1.6**	**1.4**	**1**	**1**	**1**	**1**	**2.8**	**-**	**2.4**	**2.2**	**3**	**1.4**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5202	FOUNDATION ENGINEERING	3	0	0	3

Course Objective

1. To understand various methods of site investigation
2. To study the behavior of shallow foundations
3. To gain knowledge on types and proportioning of footing
4. To study the types, functions and load carrying capacity of piles
5. To learn the characteristics of retaining walls

Unit	Description	Instructional Hours
I	**SOIL EXPLORATION AND SITE INVESTIGATION** Introduction of soil exploration - Scope and objectives –Methods of exploration – Auguring and Boring – Wash boring and Rotary drilling – Depth of boring and Spacing of bore hole – Types of samples and sampling methods – Split spoon sampler – Piston sampler - Penetration test (SPT and SCPT) - Data Interpretation - Strength parameters and Evaluation of liquefaction potential - Selection of foundation based on soil condition - Site investigation Reports.	9
II	**SHALLOW FOUNDATIONS AND SETTLEMENT** Introduction – Location and depth of foundation– Codal provisions -Bearing capacity of shallow foundation on homogeneous deposit - Terzaghi's formula and BIS formula –Factors affecting bearing capacity - Allowable bearing capacity –Bearing capacity from plate load test - Determination of settlement of foundation on granular and clay deposits - Total and Differential settlement – Method of minimizing total and differential settlements.	9
III	**FOOTINGS AND RAFT** Types of footings – Proportioning of Isolated footing, Combined footing, Strap footing and Mat foundation - Contact pressure and settlement distribution below footing - Floating foundation - Foundation stitch slab – Grade slab – Rock anchoring - Codal provision - Seismic force consideration.	9
IV	**PILE FOUNDATION** Types of piles and their function – Factors influencing the selection of pile - Load carrying capacity of single pile in granular and cohesive soil - Static & Dynamic formulae (Engineering News and Hileys) - Pile load tests - Negative skin friction –Group capacity by different methods (Feld's rule, Converse Labarre formula and block failure criterion) – Settlement of pile group - Under reamed piles – Capacity under compression and uplift – Pull out test - Codal provision	9
V	**RETAINING WALLS** Plastic equilibrium in soil - Active and passive states - Rankine's theory – Cohesionless and Cohesive soil - Coulomb's wedge theory – Conditions for critical failure plane -Earth pressure on retaining walls of simple configuration –Culmann's graphical method – Pressure on wall due to line load - stability analysis of retaining wall – Codal provisions.	9
	Total Instructional Hours	45

Course Outcome

The students will be able to:

CO1:Select the suitable method of site investigation based on the soil condition
CO2: Calculate the bearing capacity and settlement of shallow foundation
CO3: Comprehend the types and proportioning of footing
CO4: Estimate the pile load capacity
CO5: Realize retaining wall failure mechanisms and stability of retaining walls

TEXT BOOKS:

T1. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2017.
T2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2014.
T3. Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", Pearson Education, 2nd Edition, 2013.
R2. Gopal Ranjan and Rao A.S.R. "Basic and Applied Soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
R3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3		2	1	1	2	1	2	3	3	3
CO2	2	2	3	3		2		1	1	1		3	2	3
CO3	2	3	3	3		2	1	1	1	1		3	3	3
CO4	3	3	3	3		1		1	1	1	1	3	3	2
CO5	3	2	3	3		2	1	1	1	1	2	3	2	3
Average	2.4	2.6	3	3	0	1.8	0.6	1	1.2	1	1	3	2.6	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5001	**DESIGN AND DRAWING OF RC STRUCTURES**	0	0	4	2

Course Objective

1. To understand the design and reinforcement details of Structural Elements
2. To gain knowledge on the design and reinforcement details of Multistorey Building and Staircase
3. To acquire knowledge on the design and detailing of Retaining wall
4. To learn the design concepts and reinforcement details of T beam Bridge
5. To acquire knowledge on the design and drawing of water tank

Expt. No.	Description of the Experiment
1.	Analysis, Design and Drawing of RC Beam by STAAD Pro.
2.	Analysis, Design and Drawing of RC Frame by STAAD Pro.
3.	Analysis, Design and Drawing of RC Multi Storey Building by STAAD Pro.
4.	Analysis, Design and Drawing of Staircase (doglegged) by STAAD Pro.
5.	Design and Drawing of Retaining wall (Cantilever)
6.	Design and Drawing of T beam Bridge for IRC loading
7.	Design and Drawing of Circular Overhead water tank
8.	Design and Drawing of Underground water tank

Total Practical Hours 45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Design and prepare structural drawings of Structural Elements
CO2: Design and prepare structural drawings of Multistorey Building and Staircase
CO3: Design and prepare structural drawings of Retaining wall.
CO4: Design and prepare structural drawings of T beam Bridge.
CO5: Design and prepare structural drawings of water tank

REFERENCE BOOKS:

R1- Krishnaraju N., "Structural Design & Drawing: Reinforced Concrete and Steel", Universities Press, 2022.
R2- Punmia B C., Ashok Kumar Jain, Arun Kumar Jain., "Comprehensive Design of Steel Structures", Laxmi Publication Pvt. Ltd., 2017.
R3 -Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2014.
R4 -Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2010.

CODE BOOKS:

C1- IS 456:2000 (R2021), "Plain and Reinforced Concrete - Code of Practice", BIS, New Delhi, 2021.
C2- IS 875 (Part 1, 2, 3):2015, "Indian Standard Specification for Design Loads for Buildings", BIS, New Delhi, 2015.
C3- IRC 112: 2020, "Code of Practice for Concrete Road Bridges", Indian Road Congress, New Delhi, 2020.
C4- IS 3370 (Part 1, 2, 4):2021, "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2021.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	2	2	2	-	2	1	2	3	2
CO2	3	3	3	2	2	1	2	2	2	2	2	2	3	2
CO3	3	2	3	2	2	1	2	2	-	2	1	2	3	2
CO4	3	2	3	2	2	1	2	2	-	2	1	2	3	2
CO5	3	2	3	2	2	1	2	2	-	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	19HE5071	**SOFT SKILLS - I**	1	0	0	1

Course Objective

1. To employ soft skills to enhance employability and ensure workplace and career success.
2. To enrich students' numerical ability of an individual and is available in technical flavor.
3. To interpret things objectively. to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFT SKILLS** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills - Self Management-Critical Thinking-Reflective thinking and writing- p2p Interaction	3
II	**ART OF COMMUNICATION** Verbal Communication - Effective Communication - Active listening –Paraphrasing - Feedback - Non-Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve nonverbal Communication - Importance of feelings in communication - dealing with feelings in communication.	4
III	**WORLD OF TEAMS** Self Enhancement - importance of developing assertive skills- developing self-confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making	3
IV	**QUANTITATIVE APTITUDE** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based on boats and streams	3
V	**LOGICAL REASONING** Clocks - Calendars - Direction Sense - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	2
	Total Instructional Hours	**15**

Course Outcome

CO1: Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path
CO2: Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3: Students will understand how teamwork can support leadership skills
CO4: Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them
CO5: Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems

REFERENCE BOOKS:

R1 - Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz.
R2 -How to prepare for data interpretation for CAT by Arun Sharma.
R3 - How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.
R4 - A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali.
R5 - Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	22CE5001	**SURVEY CAMP**	0	0	0	1

Course Objective

1. To enhance the practical skill in surveying under actual field conditions
2. To learn the various types of setting out works
3. To get conversant with the operating procedures of total station
4. To gain knowledge on topographical surveying and preparation of topographical map
5. To understand the significance and principles of horizontal and vertical control network

Expt . No.	Description of the Experiment
1.	Traverse – using Theodolite
2.	Fly Levelling using Dumpy Level (Height of Instrument and Rise & Fall Method along the vertical axis)
3.	Sun observation to determine azimuth
4.	Setting out (Spread footing marking for residential building)
5.	Measurement of Area using Total Station
6.	Establishment of Horizontal Control Network (Grid Contouring)
7.	Establishment of Vertical Control Network (Radial Contouring)
8.	Drone Surveying

Total Practical Hours 1 week

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Carry out various surveying works based on actual field conditions
CO2: Conduct different types of setting out works
CO3: Follow the standard operating procedure when measuring an area using total station
CO4: Perform topographical surveying and prepare the topographical map of an area
CO5: Establish horizontal and vertical control network using total station

REFERENCE BOOKS:

R1- James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", McGraw Hill, 7th Edition, 2012.
R2- Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.
R3-Arora K.R., "Surveying", Vol. I & II, Standard Book House, 11th Edition, 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	3	-	2	2	2	1	2	3	3
CO2	3	3	2	2	3	3	-	2	2	2	1	2	3	3
CO3	3	3	3	2	1	3	-	2	2	2	1	2	3	3
CO4	3	3	2	3	3	3	-	2	2	1	1	2	3	3
CO5	3	3	2	3	3	3	-	2	2	1	1	2	3	3
Average	**3**	**3**	**2.2**	**2.4**	**2.6**	**3**	**-**	**2**	**2**	**1.6**	**1**	**2**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5315	URBAN PLANNING AND DEVELOPMENT	3	0	0	3

Course Objective	1. To gain the knowledge on urban development concepts, trends and classification 2. To apply the principles, stages and tools of effective urban planning 3. To explore the regional, masterand detailed development plan 4. To learnthe site analysis, layout design and urban development project financing 5. To gainthe legal frameworks, standards and stakeholder involvement in planning

Unit	Description	Instructional Hours
I	**BASIC ISSUES** Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanization, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.	9
II	**PLANNING PROCESS** Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.	9
III	**DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION** Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies	9
IV	**PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS** Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.	9
V	**LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM** Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.	9
	Total Instructional Hours	**45**

Course Outcome	Upon successful completion of the course, the students will have ability to: CO1:Comprehend the knowledge on urban development concept and trends CO2: Apply the principles and tools of effective urban planning CO3: Analyze the regional, master and detailed development plans for sustainable urban growth CO4: Conduct site analysis, design layouts and understand the financing for urban development projects effectively. CO5: Navigate the legal frameworks, standards and stakeholders for urban planning processes.

TEXT BOOKS:

T1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
T2.Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001
T3. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

REFERENCE BOOKS:

R1. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
R2.CMDA, Second Master Plan for Chennai, Chennai 2008
R3. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	2	3	2	2	1	1		2	3	3
CO2	3	3	3	1	2	3	2	2	1	1		2	3	3
CO3	3	3	3	1	2	3	3	2	1	2	2	1	3	3
CO4	3	3	3	1	2	3	2	2	1	2	2	1	3	3
CO5	3	3	3	1	2	3	2	2	1	1		1	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5316	CLIMATE CHANGE ADAPTATION AND MITIGATION	3	0	0	3

Course Objective

1. To understand earth's climate system
2. To gain knowledge on the patterns and drivers of climate change and also on international agreements
3. To know about the diverse impacts of climate change across various sectors and regions
4. To familiarize with IPCC guidelines and to design & implement adaptation measures
5. To study the climate change adaptation and climate-resilient practices in agriculture.

Unit	Description	Instructional Hours
I	**EARTH'S CLIMATE SYSTEM** Introduction-Climate in the spotlight - The Earth's Climate Machine – ClimateClassification - Global Wind Systems - Trade Winds and the Hadley Cell – TheWesterlies - Cloud Formation and Monsoon Rains - Storms and Hurricanes – TheHydrological Cycle – Global Ocean Circulation – El Nino and its Effect.	9
II	**OBSERVED CHANGES AND ITS CAUSES** Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise - Observed effects of Climate Changes – Patterns of Large ScaleVariability – Drivers of Climate Change - Climate Sensitivity and Feedbacks – TheMontreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate andEnvironment – on a Global Scale and in India – climate change modeling.	9
III	**IMPACTS OF CLIMATE CHANGE** Impacts of Climate Change on various sectors - Agriculture, Forestry and Ecosystem –Water Resources – Human Health – Industry, Settlement and Society – Methods andScenarios – Projected Impacts for Different Regions– Uncertainties in the ProjectedImpacts of Climate Change – Risk of Irreversible Changes.	9
IV	**CLIMATE CHANGE MITIGATION** IPCC Technical Guidelines for Assessing Climate Change Impact and Adaptation -Identifying adaption options – designing and implementing adaption measures – surface albedo environmentreflective roofing and reflective paving – enhancement of evapotranspiration - tree planting programme – green roofing strategies – energy conservation in buildings – energy efficiencies – carbon sequestration.	9
V	**CLIMATE CHANGE ADAPTATION** Loss and Damages due to climate change - Climate Change adaptation in agriculture sector - Climate resilient practices – Crop management – Drought tolerant crops, short duration crops, optimizing crop calendars, crop rotation - Water Resource management – Drip irrigation systems, programmed irrigation systems, small scale reservoirs.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Analyse and classify different climate systems
CO2: Evaluate the patterns and drivers of climate change and interpret the significance of international agreements
CO3: Assess the impacts of climate change on various sectors and regions.
CO4:Apply the IPCC guidelines to assess climate change impacts, and design & implement adaptation measures
CO5: Comprehendthe Climate Change adaptation in agriculture sector.

TEXT BOOKS:

T1 -Maximilian Lackner, BaharakSajjadi and Wei-Yin Chen, Handbook of Climate Change Mitigation and Adaptation, Third Edition, Springer Nature, 2022.

T2 - Kendal McGuffie, Ann Henderson, "A Climate Modelling" Primer 4th Edition, John Wiley & Sons, Ltd, Chichester, UK 2014

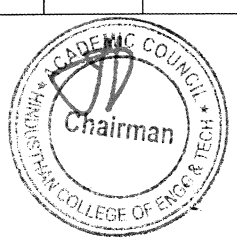
REFERENCE BOOKS:

R1- Jan C. van Dam, Impacts of "Climate Change and Climate Variability on HydrologicalRegimes", Cambridge University Press, 2003

R2 -Dash Sushil Kumar, "Climate Change – An Indian Perspective", CambridgeUniversity Press India Pvt. Ltd, 2007

R3 -IPCC Fourth Assessment Report – The AR4 Synthesis Report.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1			3			1		2		
CO2	2	3	2	3	2	2	3	1		2	2	2	2	



CO3	1	3	3	3	2	3	3	1	2	2	2	2		
CO4	2	2	3	2	2	3	3	2	1	2	3	2		2
CO5	2	2	3	2	2	3	3	2	1	2	3	3	2	2

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5318	**ENVIRONMENTAL IMPACT ASSESSMENT**	3	0	0	3

Course Objective

1. To have an overview on EIA and EIS
2. To study about the EIA methods
3. To assess the impacts on the environment
4. To acquire knowledge on Environmental Management Systems
5. To gain knowledge on EIA and EIS from case studies

Unit	Description	Instructional Hours
I	**OVERVIEW** Impact of development on environment - Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) - Objectives - Historical development - EIA capability and limitations - Legal provisions on EIA.	9
II	**EIA METHODS** Methods of EIA - Strengths, weaknesses and applicability - Appropriate methodology - Case studies.	9
III	**PREDICTION AND ASSESSMENT** Assessment of impact on land, water, air, social & cultural activities and on flora & fauna-Socio Economic Impact Assessment: Baseline monitoring of Socio Economic environment - Cost Benefit Analysis - Economic evaluation-Mathematical models- Public participation.	9
IV	**ENVIRONMENTAL MANAGEMENT PLAN** Plan for mitigation of adverse impact on environment - Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People - Post project monitoring.	9
V	**CASE STUDIES** EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - Highways-Airports-Industrial Estates- Thermal Power Plants-Common Effluent Treatment Plants - Water Supply and Drainage Projects.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Summarize the need for EIA, its development, capabilities and limitations
CO2: Demonstrate the EIA methods
CO3: Assess the impacts on the environment
CO4: Implement Environmental Management Systems in development projects
CO5:Comprehend and prepare EIA report based on case studies

TEXT BOOKS:

T1 - Anjaneyalu,Y. , "Environmental Impact Assessment Methodologies", B.S. Publications, Hyderabad, 2017.
T2 - Canter R.L. ,"Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 2014.

REFERENCE BOOKS:

R1 -Environmental Assessment Source Book, Vol.I, II & III, The World Bank, Washington, D.C., 2013.
R2 - Judith Petts ,"Hand book of Environmental Impact Assessment", Vol.I& II, Blackwell Science, 2011.
R3 - Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 2013.s
R4- Peter Morris, RikiTherivel, "Methods of Environmental Impact Assessment", Routledge Publishers, 2009.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2		-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5251	CONSTRUCTION PROJECT MANAGEMENT	2	0	2	3

Course Objective

1. To study the fundamentals of construction project management.
2. To know the appropriate techniques for planning and organizing of construction project.
3. To have exposure on various design and construction process.
4. To study the various methods of project resource utilization.
5. To provide awareness on risk management and project controlling.

Unit	Description	Instructional Hours
	FUNDAMENTALS OF CONSTRUCTION PROJECT MANAGEMENT	
I	Introduction of construction Project Management – Construction Scope – Construction Project Characteristics - Project development and Life Cycle – Construction Project Management Practice - Roles and Functions and Responsibility of Construction Managers and Major causes of Project failure.	06
	PLANNING AND ORGANIZING CONSTRUCTION PROJECT	
II	Construction Project organization – Planning Project work Scope and integration Processes - Defining Project Activities - Scheduling Project - CPM, PERT, Precedence Network Analysis – Planning and organizing project resources such as manpower, material, equipment, Time and cost for construction site.	06
	DESIGN AND CONSTRUCTION PROCESS	
III	Design and Construction as an Integrated System – Innovation, Economic and Technological Feasibility - Design Methodology - Functional Design - Construction Site Environment - Case Studies - Project Clearance requirement, Procedure and Necessary Documentation for Major Works Like Dams, Multistoried Structures, Ports, Tunnels.	06
	PROJECT RESOURCES UTILIZATION	
IV	Labor productivity variations, productivity improvement - work study - Materials purchase & inventory control - Construction Equipment - Choice of Equipment and Standard Production Rates – Time management and Cost management - Measuring project progress and performance – Tools and Techniques	06
	RISK MANAGEMENT AND PROJECT CONTROLLING	
V	Risks management at construction site - Controlling resource productivity –Schedule and Cost Controlling system –Cost Control Problem - Project Budget – Forecast for Activity Cost Control - Control of Project Cash flows – Schedule Control -Earned value management system – Project Management Information systems.	09

1. Create a Calendar. It should have 6 working days per week and 11 hours of working time with a break of 1 hour in between.(1hr)

2. Create an activity for a project 'Residential Building'.(2hr)
   a. Create a calendar and assign it to the project which has 6 working days and working hours.
   b. Draw the network diagram of the project.
   c. Find the critical path and duration of the project.
   d. Make Task Name "1" as "Start of Project" and "11" as Finish of project and analyze the difference in Gantt charts.

S.No.	Task Name	Duration	Predecessor
1	Start of Project	0	-
2	Site Marking	5	1
3	Excavation	10	2
4	PCC	15	3
5	Footing Concrete	20	4
6	Column Concrete	25	5
7	Ground Floor Concrete	35	6

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8	Finishers	45	7
9	External Work	45	8
10	Painting Work	25	9
11	Finish of Project	0	10

3. Draw the CPM Network. Calculate the project duration and critical path.(3hr)

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor				A	B	B	C	C	D,E	F,G	I,J,K
Duration	3	11	9	7	9	5	5	19	17	5	3

4. Assign the resources to the project activities as shown in the table below.(3hr)

	Construction stage		
	Substructure		
1.	Excavation	10 days	
2.	PCC	10 days	3
3.	Footing concrete	10 days	4FS-6 days
4.	Column concrete	15 days	5FS-6 days
5.	Plinth beam concrete	10 days	6FS-4 days
6.	Basement brick work	5 days	7FS-6 days
7.	Grade slab concrete	2 days	8
	Super structure		
	Ground floor		
8.	Column concrete	10 days	9
9.	Beam and roof slab shuttering	25 days	12FS-6 days
10.	Roof slab concrete	5 days	13FS-5 days
	Finishes		
11.	Deshuttering	5 days	14FS+21 days
12.	Brick work	15 days	16
13.	Electrical work	15 days	17FS-8 days
14.	Plumbing work	10 days	18FS-8 days
15.	Plastering	20 days	19FS-8 days
16.	Tile work	20 days	20FS-8 days
17.	Putty work	10 days	21
18.	Painting	10 days	22
	Terrace		
19.	Parapet wall	10 days	23
	External work		
20.	Painting	10 days	25FS-8 days
21.	Plumbing	10 days	27FS-6 days
22.	Electrical work	5 days	28FS-6 days

5. Create the project "Commercial Building" (3hr)

a. Create WBS for Commercial Building which is representing in Bold.
b. Create an activity for assigning the relationship to that activity.

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c. Find the network diagram of the project.
d. Find the critical path and duration of the project.
e. Total Budgeted cost.

Total Instructional Hours 45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Interpret the stages involved in a project and analyze the obligatory services to be taken up while performing a construction activity.
CO2: Apply the scheduling techniques for planning construction project.
CO3: Develop the ability to integrate design and construction Process
CO4: Analyzing Resources utilization and resource productivity
CO5: Assess the risk and controlling systems using project management Information system.

TEXT BOOKS:

T1 – Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 3rd Edition, 2014.
T2 - Choudhury S, Project Management, McGraw-Hill Publishing Company, New Delhi, 2017.

REFERENCE BOOKS:

R1 - Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2nd edition, 2000.
R2 - Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology,4th Edition, 2013.
R3 - Kumar NeerajJha, Construction Project Management Theory and Practices, Pearson, 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	1	1	2	2	3	3	3	3	3	3	3	3	2
CO2	2	2	3	2	2	3	3	3	3	3	3	3	3	2
CO3	2	2	3	3	3	3	3	3	3	3	3	3	3	2
CO4	2	2	2	3	3	3	3	3	3	3	3	3	3	2
CO5	2	2	2	3	3	3	3	3	3	3	3	3	3	2
Average	**2**	**1.8**	**2.2**	**2.6**	**2.6**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5206	**ADVANCED CONCRETE TECHNOLOGY**	3	0	0	3

Course Objective

1. To comprehend the properties, applications and environmental impacts of conventional and alternative cementitious materials.
2. To gain knowledge on various methods of concrete design mix
3. To explore advanced concreting methods
4. To analyze various types of special concretes
5. To understand concrete durability, deterioration processes, and protective measures.

Unit	Description	Instructional Hours
	CEMENTS AND BINDERS	
I	Clay, Lime, Hydraulic Lime, OPC, PPC and other conventional cements, Polymers as Cements, Geopolymer, Secondary Cementitious Materials, Gypsum, Limestone Calcined Clay Cement, Waste Plastics as binders, Alternative Binders - Reactive Belite Rich Portland Cement (RBPC), Belite Calcium Sulfo-Aluminate (BCSA) cement, Wollastonite-based cement, Pre-hydrated calcium silicate cement, Magnesium silicate cement, Alkali-activated binders – Ecological effect of different binders.	9
	MIX DESIGN	
II	Principles of concrete mix design - Methods of concrete mix design: IS method, ACI method, DOE method - Mix design for special concretes - Statistical quality control - Sampling and acceptance criteria as per IS 456 - 2000.	9
	CONCRETING METHODS	
III	Extreme Weather Concreting (Hot and Cold Weathers), Underwater Concreting, Concrete Pumping for large heights, depths and distances, 3D Printing, Vacuum Dewatering, Special Concrete Casting methods for Shells, Domes, Ferrocement, Precast, Pavements, (Spraying, Guniting, Shotcreting, Slip forming), identifying the relevant equipment,	9
	SPECIAL CONCRETES	
IV	Light weight concrete - Fiber reinforced concrete - Polymer concrete - High performance concrete -Self-compacting concrete - Geopolymer concrete - Waste material-based concrete - Cellular concrete – No fines concrete - Roller compacted concrete.	9
	DURABILITY OF CONCRETE	
V	Definitions, Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for ensuring durability, Corrosion of reinforcing steel, protective measures. Durability issues in concretes –carbonation – sulphate attack – chloride attack – permeability, Acid attack – Seawater attack etc.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Evaluate and apply sustainable cementitious materials with reduced environmental impact.

CO2: Apply various methods of concrete mix design to achieve desired concrete properties and performance criteria

CO3: Apply advanced concreting methods effectively to overcome challenges.

CO4: Demonstrate comprehensive knowledge of different types of special concretes, their ingredients and manufacturing methods.

CO5: Identify, prevent, and mitigate various concrete durability and deterioration issues.

TEXT BOOKS:

T1 - Shetty, M.S., "Concrete Technology (Theory & Practice)", S.Chand and Company Ltd., Revised edition, 2015.

T2 - Gambhir, M.L., "Concrete Technology", Tata McGraw Hill, fifth edition, 2013.

REFERENCE BOOKS:

R1 –Krishnaraju.N., "Design of Concrete Mixes", CBS Publishers , New Delhi, 2002.
R2 - Neville, A.M. and Brooks, J. J., "Concrete Technology", 2nd Edition, Pearson, 2019.
R3 - Santhakumar, A., R., "Concrete Technology", 2nd Edition, Oxford University Press, 2018.
R4 - Zongjin Li, "Advanced Concrete Technology", John Wiley & Sons, 2011
R5 - Pierre-Claude Aïtcin, Sidney Mindess, "Sustainability of Concrete", 1st Edition, CRCPress, 2011.

CODE BOOKS:

C1- IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi,2009
C2 - ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete, Published by American Concrete Institute (ACI), 2009

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	3	2	2	2	2	2	3	3
CO2	3	2	3	1	1	2	2	3	2	3	2	2	3	3
CO3	3	2	3	2	2	2	2	2	3	2	2	2	3	3
CO4	3	2	2	2	2	2	3	2	2	2	2	2	3	3
CO5	3	2	2	2	2	2	2	2	2	3	2	2	3	3
Average	**3**	**2**	**2.4**	**1.8**	**1.8**	**2**	**2.4**	**2.2**	**2.2**	**2.4**	**2**	**2**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5207	TRANSPORT OF WATER AND WASTEWATER	3	0	0	3

Course Objective

1. To gain knowledge on fluid properties and principles governing the flow and its measurement.
2. To study the components of water transmission and distribution systems.
3. To learn the various components, functions and working of wastewater collection and conveyance systems.
4. To understand the necessities of storm water drainage and its application.
5. To explore the various software applications adopted in water transmission, distribution and sewer design.

Unit	Description	Instructional Hours
	GENERAL HYDRAULICS AND FLOW MEASUREMENT	
I	Fluid properties; fluid flow – continuity principle, energy principle and momentum principle;frictional head loss in free and pressure flow, minor head losses. Carrying Capacity–Flowmeasurement.	9
	WATER TRANSMISSION AND DISTRIBUTION	
II	Need for Transport of water and wastewater-Planning of Water System –Selection of pipematerials, Water transmission main design - gravity and pumping main; Selection of Pumps - characteristics- economics; Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design and analysis– appurtenances –minimization of water losses – leak detection - Storage reservoirs.	9
	WASTEWATER COLLECTION AND CONVEYANCE	
III	Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design;Wastewater pumps and pumping stations- sewer appurtenances; material, construction,inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance ofcorrosive wastewaters.	9
	STORM WATER DRAINAGE	
IV	Necessity - combined and separate system; Estimation of storm water run-off Formulation ofrainfall intensity duration and frequency relationships- Rational methods	9
	INTRODUCTION TO SOFTWARE APPLICATION	
V	Introduction to computer software in water transmission, water distribution and sewer design – EPANET 2.0, LOOP version 4.0, SEWER, BRANCH, Canal ++ and GIS based software – case studies.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Interpret the various fluid properties and principles governing the flow and its measurement.
CO2: Analyze and design water supply mains and distribution network for various field conditions.
CO3: Analyze and design sewers and sewage network for various field conditions.
CO4: Estimate the storm water run-off.
CO5: Apply computer software for the analysis and design of water transmission, distribution and sewer systems.

TEXT BOOKS:

T1. Punmia, B. C. , Ashok K Jain, and Arun K Jain, "Water Supply Engineering", Laxmi Publications, Pvt. Ltd., New Delhi, 2012.
T2. Birdie, G.S, and Birdie. J. S , "Water supply and Sanitary Engineering", DhanpatRai& Sons, 2010.
T3. Garg, S. K, "Environmental Engineering" Vol. I&II, Khanna Publishers, New Delhi, 2010.

REFERENCE BOOKS:

R1. "Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
R2. Bajwa, G.S. "Practical Handbook on Public Health Engineering", Deep Publishers,Shimla, 2003
R3. CPHEEO Manual on Sewerage and Sewage Treatment Systems Part A, B & C, Ministry ofUrban Development, Government of India, New Delhi, 2013.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5208	SOIL PROPERTIES AND BEHAVIOUR	3	0	0	3

Course Objective

1. To understand the classification and engineering properties of soil.
2. Togain knowledge on the physio-chemical behaviour of soil.
3. To study the causes and consequences of problems associated with the behaviour of soil.
4. To understand the various engineering properties of soil and its significance.
5. To know the suitability of soils for various geotechnical applications

Unit	Description	Instructional Hours
I	**ORIGIN OF SOIL AND CLAY MINERALS** Introduction – formation of soils – different soil deposits and their engineering properties – Genesis of clay minerals –identification and classification – Anion and cation exchange capacity of clays – specific surface area – bonding in clays.	9
II	**PHYSICAL &CHEMICAL BEHAVIOUR** Physical and physio-chemical behaviour of soils – diffused double layer theory – computation of double layer distance – effect of ion concentration, ionic valency, pH, dielectric constant, temperature on double layer – stern layer – attractive and repulsive forces in clays – types of soil water – mechanism of soil – water interactions	9
III	**SWELLING AND SHRINKAGE CHARACTERISTICS OF CLAY** Swelling and shrinkage behaviour of soils –Causes, consequences– factors influencing swell – shrink characteristics – swell potential – osmotic swell pressure –measurement – sensitivity, thixotrophy of soils – soil suction – soil compaction – factors affecting soil compaction	9
IV	**COMPRESSIBILITY, PERMEABILITY BEHAVIOUR OF SOIL** Compressibility, permeability behaviour of fine and coarse grained soils – mechanisms and factors influencing engineering properties – liquefaction potential – causes and consequences.	9
V	**CONDUCTION PHENOMENA AND PREDICTION OF SOIL BEHAVIOUR** Conduction in soils – hydraulic, electrical, chemical and thermal flows in soils – applications - coupled flows – Electro-kinetic process – thermo osmosis - electro osmosis – prediction of engineering behaviour of soils using index properties – empirical equations and their applicability.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Classify soil based on origin and engineering properties.
CO2: Illustratethe principle of the physio-chemical behaviour of soil.
CO3: Identify the causes for the problems associated with the behaviour of soil.
CO4: Interpret the various engineering properties of soil.
CO5:Comprehend the suitability of soils for various geotechnical applications.

TEXT BOOKS:

T1 -Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi,2020.
T2 - Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1 - Mitchell, J.K., "Fundamentals of Soil Behaviour", John Wiley, New York, 1993.
R2 - Yong, R.N. and Warkentin, B.P., "Introduction to Soil Behaviour", Macmillan, Limited, London, 1979.
R3 - Coduto, D.P., "Geotechnical Engineering – Principles and practices", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
R4 - Das, B.M., "Principles of Geotechnical Engg", PWS Publishing Comp, Boston, 1998
R5 - McCarthy D.F., "Essentials of Soil Mechanics & Foundations", Prentice-Hall, 2002.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	3	1	2	2	2	3	3	3	3
CO2	3	3	3	3	-	2	1	1	2	1	1	3	3	3
CO3	3	3	3	2	-	1		1	2	1	2	3	3	3
CO4	3	3	3	3	-	3	1	3	3	2	1	3	3	3
CO5	3	3	3	2	-	2		1	1	1	2	3	3	3
Average	**3**	**3**	**2.8**	**2.6**	**-**	**2.2**	**1**	**1.6**	**2**	**1.4**	**1.8**	**3**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5209	FUNDAMENTALS OF REMOTE SENSING	3	0	2	3

Course Objective

1. To understand the principles of remote sensing as a tool for mapping.
2. To explore the various platforms, sensors, scanners and data products used in remote sensing.
3. To understand the various classification of remote sensing images.
4. To gainknowledge onmicrowave remote sensing and its application
5. To learn the principles and applications of thermal remote sensing.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO REMOTE SENSING** Introduction of Remote Sensing,Electro Magnetic Spectrum - Effects of Atmosphere- Scattering – Absorption-Atmospheric window- Energy interaction with surface features – Spectral reflectance of earth objects and land covers – Resolution concepts – types – Satellites, orbits and missions.	9
II	**DATA ACQUISITION AND DATA PRODUCTS** Historical development – Medium and high resolution mission – Future mission- Characteristics of different types of platforms - Opto mechanical electro optical sensors – Across track and Along track scanners – Multi spectral scanners –-Data products and characteristics – Formats.	9
III	**DATA ANALYSIS** Sources of Errors – scene, sensor and atmospheric causes - correction: geometric and Radiometric – visual and digital interpretation- elements of interpretation – interpretation keys - digital analysis and classification – image formation, visualization : Image enhancement, filters– Baye's theorem - Image classification: unsupervised and supervised – thematic mapping - accuracy assessment.	9
IV	**PASSIVE SURVEY SYSTEM** Introduction - plane waves, antenna systems, Resolution Concepts, Radiometry - Passive microwave sensing components – Emission laws - Roughness and Dielectric Constant – Radiometers – Components - Brightness temperature.	9
V	**THERMAL REMOTE SENSING** Radiation science basics - Thermal radiation principles, thermal interaction behavior of terrainelements, thermal sensors and specifications – MUST (Medium Scale Surface Temperature Missions) infrared sensors and radiometers - aerial thermal images - Image characters, spatial and radiometry-sources of image degradation –radiometric and geometric errors and correction – interpretation of thermal image.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1:Illustrate theprinciples and concepts of remote sensing and theircharacteristics.

CO2: Comprehend the various platforms, sensors, scanners and data products used in remote sensing.

CO3: Analyze and interpret variousremote sensing images.

CO4:Recognize the characteristics, components and applications of microwave remote sensing.

CO5:Interpret the principles and applications of thermal remote sensing.

TEXT BOOKS:

T1 –Rees. W. G., "Physical Principles of Remote Sensing", Second edition, Cambridge University Press, 2001.

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T2 - Emilio Chuvieco, Alfredo Huete,"Fundamentals of Satellite Remote Sensing", CRCPress 2009.

REFERENCE BOOKS:

R1 –UlabyF.T.,Moore,K.R. and Fung, "Microwave Remote Sensing"vol-1,vol-2 and vol- Addison London,1986.

R2 - Robert A. Schowengerdt,"Remote Sensing,: Models and Methods for Image Processing", 3rd Edition2007.

R3 - Iain H.Woodhouse, "Introduction to Microwave Remote Sensing", CRC Press; 1st edition,2004.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	3	-	2	2	2	1	2	3	3
CO2	3	3	2	2	3	3	-	2	2	2	1	2	3	3
CO3	3	3	3	2	1	3	-	2	2	2	1	2	3	3
CO4	3	3	2	3	3	3	-	2	2	1	1	2	3	3
CO5	3	3	2	3	3	3	-	2	2	1	1	2	3	3
Average	**3**	**3**	**2.2**	**2.4**	**2.6**	**3**	**-**	**2**	**2**	**1.6**	**1**	**2**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5301	REPAIR AND REHABILITATION OF STRUCTURES	3	0	0	3

Course Objective

1. To get awareness on maintenance and repair strategies
2. To understand the factors influencing the strength and durability of concrete
3. To learn the various repair techniques
4. To gain knowledge on the principles of various corrosion protection methods
5. To know thetechniques for strengthening of structural elements and demolition of structures

Unit	Description	Instructional Hours
I	**MAINTENANCE AND REPAIR STRATEGIES** Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.	9
II	**STRENGTH AND DURABILITY OF CONCRETE** Quality assurance for concrete - need – components – conceptual bases for quality assurance schemes - Strength, Durability and Thermal properties of concrete - Cracks, different types, causes – Effects due to climate, temperature, chemicals, Design and construction errors, Effects of cover thickness	9
III	**TECHNIQUES FOR REPAIR** Maintenance and repair strategies –Inspection – Structural appraisal – Economic appraisal – Diagnosis of distress – Procedure - Non-destructive Testing Techniques, Epoxy injection, shotcrete, Gunite, Shoring, Underpinning	9
IV	**CORROSION AND PROTECTION METHODS** Corrosion - Mechanism of corrosion – Effects of corrosion - Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection, rust eliminators.	9
V	**REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES** Need for retrofitting - Techniques available for strengthening of structural elements - Repair of structures distressed due to corrosion, fire, leakage, earthquake - Demolition techniques - Engineered demolition methods - Case studies.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Recollect the facets and importance of maintenance and also know how to evaluate a damaged building

CO2: Deduce the factors affecting the strength and durability of concrete

CO3: Illustrate the principles of non-destructive testing and the techniques for repair

CO4: Interpret the mechanism, effects and suggest methods of corrosion protection.

CO5: Recommend suitable techniques for strengthening of structural elements and comprehend the principles of various demolition methods.

TEXT BOOKS:

T1 - Allen, R.T. and Edwards, S.C., "Repair of Concrete Structures", SponPress, Taylor & Francis group, 2014.

T2 - Modi, P. I. and Patel, C.N., "Repairs and Rehabilitation of Concrete Structures", PHI Publication, 2016.

REFERENCE BOOKS:

R1 - Shetty M.S. and Jain, A.K., "Concrete Technology - Theory and Practice", S. Chand and Company, 8th Edition, 2019.

R2 - DovKominetzky, "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001.

R3 - Amarnath, C., Devdas Menon, Amlan Kumar, S., "Handbook on Seismic Retrofit of Buildings", Alpha Science International Limited, 2008.

R4 - "Repair and Strengthening of Concrete Structures", FIP Guide to Good Practice, Thomas Telford Ltd., London, 1991.

CODE BOOKS:

C1 - **IS 13311: Part 2: 1992 (R 2018)** - Method of Non-destructive Testing of Concrete-methods of Test: Part 2 Rebound Hammer

C2 - **IS 9012: 1978 (R 2021)**- Recommended Practice for Shotcreting

C3 - **IS 15988: 2013** - Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings - Guidelines

C4 - **IS 13935: 2009 (R 2019)** - Guidelines for Repair and Seismic Strengthening of Buildings

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	2	2	2	2	2	1	2	3	2
CO2	3	2	2	2	2	2	1	1	2	1	1	1	3	2
CO3	3	2	3	2	3	1	1	1	2	1	1	2	3	2
CO4	3	2	3	3	2	2	1	1	2	1	2	2	3	2
CO5	3	2	3	3	2	2	2	1	2	2	2	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5304	**FORMWORK ENGINEERING**	3	0	0	3

Course Objective

1. To study about formwork and false work and its basic requirements.
2. To know the appropriate formwork materials, accesories and pressures.
3. To have exposure on the design and erection of formwork.
4. To study about the different types of form work used for special structures.
5. To provide awareness on errors in design and judge the formwork failures through case studies.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FORMWORK** Introduction to Formwork and false work, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork, General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork.	09
II	**FORMWORK MATERIALS ACCESORIES & PRESSURES** Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood - Steel – Aluminum Plywood - Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish - Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.	09
III	**FORMWORK DESIGN** Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.	09
IV	**FORMWORK FOR SPECIAL STRUCTURES** Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing system, Table lifting system.	09
V	**CASE STUDIES** Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.	09
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: To understand the overall and detailed planning of formwork

CO2: To impart knowledge on formwork materials, accessories, pressures and labour requirement

CO3: To develop the conceptual understanding of design, construction and erection of formwork.

CO4: To impart the knowledge about different types of form work used for special structures.

CO5: To understand the errors in design and judge the formwork failures through case studies.

TEXT BOOKS:

T1 – Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015

T2 - Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.

REFERENCE BOOKS:

R1 - Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.

R2 - Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996.

R3 - Michael P. Hurst, Construction Press, London and New York, 2003.

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R4 - Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.
R5 - IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	-	-	-	-	2	2	-	3	-	3	2	3	-
CO2	3	3	3	2	2	-	2	2	3	-	2	2	3	1
CO3	3	3	3	2	2	2	-	1	3	-	2	2	3	3
CO4	2	3	-	-	1	1	1	2	3	-	2	2	3	3
CO5	2	1	2	3	-	-	-	-	2	-	3	3	3	-
Average	**2.4**	**2**	**1.6**	**1.4**	**1**	**1**	**1**	**1**	**2.8**	**-**	**2.4**	**2.2**	**3**	**1.4**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5307	GEO ENVIRONMENTAL ENGINEERING	3	0	0	3

Course Objective

1. To study the fundamental concepts and role of soil in Geo environmental applications.
2. To identify the source of soil contamination and its impact on geoenvironment.
3. To acquire knowledge on waste containment system.
4. To familiarize with different contaminant site remediation techniques.
5. To understand and study the contaminant soil characterization.

Unit	Description	Instructional Hours
	FUNDAMENTALS OF GEO-ENVIRONMENTAL ENGINEERING	
I	Scope of Geo-Environmental engineering – multiphase behaviour of soil – role of soil in Geo-Environmental applications – importance of soil physics, soil chemistry, hydrogeology, biological process – sources and type of ground contamination – impact of ground contamination on geo-environment – case histories on geoenvironmental problems.	9
	SOIL-WATER-CONTAMINANT INTERACTION	
II	Soil-water interaction and concepts of Double layer – forces of interaction between soil particles. Concepts of unsaturated soil – importance of unsaturated soil in geo-environmental problems – measurement of soil suction – water retention curves – Soil-watercontaminant interactions and its implications.	9
	WASTE CONTAINMENT SYSTEM	
III	Evolution of waste containment facilities and disposal practices – Site selection based on environmental impact assessment – different role of soil in waste containment – different components of waste containment system and its stability issues – property evaluation for checking soil suitability for waste containment – design of waste containment facilities.	9
	CONTAMINANT SITE REMEDIATION TEHNIQUES	
IV	Non-destructive techniques - electromagnetic, thermal and seismic, Soil remediation - Need and approach, Techniques - soil washing, permeable reactive barriers, solidification, vacuum extraction, electro-kinetic remediation, thermal desorption.	9
	ADVANCED SOIL CHARACTERIZATION	
V	Contaminant analysis – water content and permeability measurements – electrical and thermal property evaluation – use of GPR for site evaluation – introduction to geotechnical centrifuge modeling.	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:

CO1:Understand the scope and importance of Geo- Environmental Engineering.
CO2: Understand the soil water contaminant interaction and its implications.
CO3: Design and select a suitable site selection for safe disposal of contaminant waste.
CO4: Select a suitable contaminant site remediation techniques for improve the soil properties.
CO5: Evaluate the influence of contaminants on water and get introduced to geotechnical centrifuge modeling.

TEXT BOOKS:

T1. Sharma H.D. and Reddy K.R., Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, 3rd Ed., John Wiley & Sons, Inc., 2004.
T2. Rowe R.K., Geotechnical and Geoenvironmental Engineering Handbook, 5th Ed., Kluwer Academic Publications, 2000.
T3. Yong, R. N., Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation, 4th Ed., CRC Press, 2001.

REFERENCE BOOKS:

R1. Berkowitz, B. Dror, I. and Yaron, B., Contaminant Geochemistry, 3rd Ed., Springer, 2008.
R2. Mohamed, A. M. O., Principles and Applications of Time Domain Electrometry in Geoenvironmental Engineering, 2nd Ed., Taylor and Francis, 2006.
R3. Alvarez-Benedi J. and Munoz-Carpena, R., Soil-Water-Solute Process Characterization: An Integrated Approach, 2nd Ed., CRC Press, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1	2		3	3	2	2	1	2	3	3	3
CO2	3	2	3	3	2	2	2	1	3	2	3	3	3	3
CO3	3	1	3	3	2	3	3	3	3	2	3	3	3	3
CO4	3	2	2	1	1	2	3	1	3	2	3	3	3	3
CO5	3	2	3	1	1	3	2	3	3	2	3	3	3	3
Average	2.8	1.4	2.4	2	1.2	2.6	2.6	2	2.8	1.8	2.8	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	22CE5310	TOTAL STATION AND GPS SURVEYING	3	0	0	3

Course Objective

1. To study the principles of total station and electromagnetic waves for precise surveying and data collection.
2. To understand the working principles of electro-optical and microwave total stations for precise geospatial data collection.
3. To understand GPS fundamentals and applications for accurate global navigation and positioning.
4. To learn to process GPS data accurately using various software tools.
5. To have an exposure to use Total Station and GNSS for accurate mapping and positioning.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES** Methods of Measuring Distance, Basic Principles of Total Station, Classifications, applications and comparison with conventional surveying - Applications of Electromagnetic waves, Refractive index (RI) – factors affecting RI -Computation of group for light and near infrared waves at standard and ambient conditions – Computation of RI for microwaves at ambient condition – Reference refractive index -Real-time application of first velocity correction. Measurement of atmospheric parameters - Mean refractive index – Second velocity correction -Total atmospheric correction - Use of temperature -pressure, transducers.	9
II	**ELECTRO-OPTICAL AND MICROWAVE TOTAL STATION** Electro - optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. COGO functions: Area, Inverse / MLM, REM, Resection, offsets and stakeout - Land survey applications.	9
III	**SATELLITE SYSTEM** Basic concepts of GPS – Historical perspective and development – applications -Geoid and Ellipsoid – satellite orbital motion – Keplerian motion – Kepler's Law – Perturbing forces -Geodetic satellite – Doppler effect – Positioning concept – GNSS and IRNSS – SBAS: GAGAN and WAAS Different segments - space, control and user segments – satellite configuration – GPS signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability -Task of control segment – GPS receivers.	9
IV	**GPS DATA PROCESSING** GPS observables – code and carrier phase observation – linear combination and derived observables – concept of parameter estimation – downloading the data – RINEX Format–Differential data processing – software modules - solutions of cycle slips, ambiguities - Multi path and other observational errors – satellite geometry and accuracy measures – Continuously Operating Reference System (CORS)– long base line processing - use of different processing software's: Open Source, Scientific and Commercial.	9
V	**SURVEYING METHODS AND APPLICATIONS** Total Station: Traversing and Trilateration measurement and adjustment –Planimetric map and Contour map and Topography Mapping. GNSS: Concepts of rapid, static, semi-Kinematic, pure Kinematic and RTK methods. Observation by Radiation, Lee frog and Trilateration measurement and processing -Topography mapping using PPK and RTK methods Total Station and GNSS applications.	9
	Total Instructional Hours	**45**

Course Outcome

On completion of the course, the student is expected to

CO1: Identify the principles of total station and electromagnetic waves for precise surveying and data collection.
CO2: Describe the working principles of electro-optical and microwave total stations for precise geospatial data collection.
CO3: Explain GPS fundamentals for accurate global navigation and positioning in diverse environments.
CO4: Demonstrate the process of accurately processing GPS data using various software tools.
CO5: Apply Total Station and GNSS technologies for accurate mapping and positioning in different scenarios.

TEXT BOOKS:

T1: Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
T2: SatheeshGopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2nd Edition,2017. isbn: 978-81317 00679.
T3: Gunter Seeber , Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition, 2003.

REFERENCE BOOKS:

R1; R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
R2: Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983
R3: Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin,3rd Edition, 2016.
R4: Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 4th Edition, 2015.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	2			1			2	3	2
CO2	3	2	3	2	3	3			1			2	3	2
CO3	3	2	2	2	3	2			1			2	3	2
CO4	3	2	3	3	3	3			2			2	3	2
CO5	3	3	3	3	3	3			1			2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5313	AIRPORTS, DOCKS AND HARBOUR ENGINEERING	3	0	0	3

Course Objective

1. To understand the components of aircraft and stipulations of airport site selection.
2. To gain knowledge on the concept of layout and location of airport buildings.
3. To get exposed to the principles in design of runway and taxiway.
4. To learn the technical terms of docks &harbour and its design principles.
5. To gain an insight of various coastal structures and coastal regulations.

Unit	Description	Instructional Hours
	INTRODUCTION TO AIRPORT PLANNING	
I	Air transport characteristics – Advantages and limitations of air transportation – Aircraft component parts and important technical terms – Selection of sites, engineering survey – Socio-economic characteristics of catchment area – ICAO stipulations	9
	AIRPORT LAYOUT	
II	Typical airport layouts – Characteristics of good layout – Location of terminal buildings – Aprons and Hangers – Sequence of construction - Airport Zones – Zoning Requirements – Height of construction and landing within the airport boundary	9
	AIRPORT DESIGN	
III	Runway Design: Orientation, Wind Rose Diagram – Runway Length – Basic and Actual Length Problems – Geometric Design of Runways, Design of runways – Configuration and Pavement Design Principles – Elements of Taxiway Design – Runway and Taxiway Markings and Lighting – Recent innovations in airport design	9
	DOCKS AND HARBOUR	
IV	Definition of Terms – Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth - Requirements and Classification of Harbours& Docks – Site Selection, Layout and Investigation – Speed of Water, Range of Tides, Waves and Tidal Currents, Anchoring Grounds, Geological Characteristics	9
	COASTAL STRUCTURES	
V	Coastal Structures: Breakwaters, Piers, Wharves, Jetties, Quays, Dolphins and Fenders Navigational Aids and Dredging: Navigational Aids and Mooring Accessories, Dredging - Methods. Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Understand the components of aircraft and airport characteristics
CO2: Illustrate the various components and zones of an airport layout
CO3: Compare the types of runway, taxiway, their markings and lightings
CO4: Classify harbours and suggest a proper layout based on geographical conditions
CO5: Comprehend the various coastal structures and costal protection regulations

TEXT BOOKS:

T1- Khanna S. K., Arora M. G. and Jain S. S., "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
T2- Bindra S. P., "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2013.

REFERENCE BOOKS:

R1 - Rangwala, "Aiport Engineering", Charotar Publishing House Pvt. Ltd., Gujarat, 17th Edition, 2018.
R2 -OzaH. P. &Oza G. H. "Dock and Harbour Engineering", Charotar Publishing House Pvt. Ltd., Gujarat, 2016.
R3 -Khanna, S.K. Arora, M.G and Jain, S.S, Airport Planning and Design, Nemchand and Bros, Roorkee, 1994.
R4 -Subramanian, K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	2	2	1	2	1	2	2	2	1	-	-	1	3
CO2	3	2	3	-	-	-	-	2	2	2	1	-	2	3
CO3	2	-	-	1	-	1	-	-	1	-	-	-	1	2
CO4	3	2	3	1	3	-	2	-	2	2	1	-	2	2
CO5	2	-	-	-	-	-	-	-	1	-	-	-	1	1
Average	**2.4**	**2**	**2.6**	**1**	**2.5**	**1**	**2**	**2**	**1.6**	**1.6**	**1**	**-**	**1.4**	**2.2**

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Program	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5319	Hydrology	3	0	0	3

Course Objectives

- To learn the basic principles and components of hydrometeorology, including the interaction between the atmosphere and the hydrosphere.
- To understand the different types and forms of precipitation and the methods used for its measurement.
- To explore the concept of hydrographs, their types, and applications in hydrology and water resource management.
- To study the fundamental principles of groundwater hydrology, aquifer types and artificial recharge methods.
- To comprehend the significance of floods, flood routing methods, and their implications in water management and flood control.

Unit	Description	Instructional Hours
I	**HYDROMETEOROLOGY** Definition - Development of hydrology - Hydrologic design - Hydrologic failures - Importance in Engineering - Hydrological budget - Weather and hydrology - General circulation – Temperature - Humidity - Wind systems - Introduction to climate change and its effects on hydrological process.	9
II	**PRECIPITATION** Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.	9
III	**HYDROGRAPH ANALYSIS** Flood hydrograph - Components of flood hydrograph - Factors affecting shape of hydrograph - Base flow separation– Unit hydrograph - Advantages – Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph - Applications.	9
IV	**GROUNDWATER HYDROLOGY** Occurrence of ground water - Types of aquifer – Dupuit's assumptions – Darcy's law - Estimation of aquifer parameters – Pump tests - Steady state discharge in confined and unconfined aquifers - Leaky aquifer - Well loss - Aquifer loss - Problems - Methods of artificial recharge.	9
V	**FLOODS AND FLOOD ROUTING** Flood frequency studies – Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's channel routing - Flood control.	9
	Total Instruction Hours	**45**

Course Outcomes

On the completion of this course, the student will be able to:

- Interpret the interaction between the atmosphere and hydrosphere and their influence on weather patterns.
- Identify the various types and forms of precipitation and measure them using appropriate methods.
- Prepare different types of hydrographs to understand the run-off dynamics for effective water management.
- Apply the principles of groundwater hydrology to determine losses and suggest suitable recharge methods.
- Analyze flood routing methods and adopt strategies for effective water management and flood control.

Text Books:

1. P. Jaya Rami Reddy, 'A Textbook of Hydrology', Third Edition, University Science Press, Laxmi Publications, New Delhi, 2016.
2. K. Subramanya, Priyank J Sharma, 'Engineering Hydrology', Sixth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2024.

Reference Books:

1. Rajesh Srivastava, Ashu Jain, 'Engineering Hydrology', First Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. H.M. Raghunath, 'Hydrology: Principles, Analysis and Design', Fourth Edition, New Age International Private Limited, New Delhi, 2022.
3. Ghanshyam Das, 'Hydrology and Soil Conservation Engineering', Second Edition, Prentice-Hall of India, New Delhi, 2009.
4. Santosh Kumar Garg, 'Hydrology, Flood Control and Ground Water Engineering', Khanna Publications Private Limited, New Delhi, 2019.

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CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	-	-	-	3	3	1	2	2	-	2	2	2
CO2	3	3	2	2	-	2	2	1	2	2	-	2	2	2
CO3	3	3	2	2	1	2	2	1	2	2	-	2	2	2
CO4	3	3	2	2	1	3	3	1	2	2	1	2	3	3
CO5	3	3	2	2	1	3	3	1	2	2	1	2	2	2
Average	**3**	**3**	**1.6**	**1.6**	**0.6**	**2.6**	**2.6**	**1**	**2**	**2**	**0.4**	**2**	**2.2**	**2.2**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5302	ADVANCED STRUCTURAL ANALYSIS	3	0	0	3

Course Objective

1. To analyze continuous beams and frames, including symmetrical and side sway, using Kani's Method.
2. To analyse space trusses and beams curved in plan for moment, shear, and torsion using standard methods.
3. To apply the stiffness method for analysing trusses, including thermal changes and fabrication errors.
4. To construct influence lines and calculate critical stress resultants for beams and pin-jointed frames.
5. To introduce and apply the finite element method for analysing truss and beam elements.

Unit	Description	Instructional Hours
I	**KANI'S METHOD** Introduction – Continuous beams and Frames without Joint Translation – Symmetrical Frame – Frames with Side Sway	9
II	**SPACE TRUSSES AND BEAMS CURVED IN PLAN** **SPACE TRUSSES:** Introduction – Basic Forms – Method of Tension Coefficients – Tension Coefficient for Space Trusses – Analysis Procedure – Guidelines on Joint Forces – Problems **BEAMS CURVED IN PLAN:** Introduction – Solving for Moment, Shear and Torsion – Sign Convention – Circular Beams on Several Supports - Problems	9
III	**ANALYSIS OF TRUSS USING THE STIFFNESS METHOD** Fundamentals of the Stiffness Method - Member Stiffness Matrix - Displacement and Force Transformation Matrices - Member Global Stiffness Matrix - Truss Stiffness Matrix – Application of the Stiffness Method for Truss Analysis - Nodal Coordinates - Trusses having Thermal Changes and Fabrication Errors – Space Truss Analysis.	9
IV	**MOVING LOADS AND INFLUENCE LINES** Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.	9
V	**FINITE ELEMENT METHOD** Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:
CO1: Analyze continuous beams and frames for various conditions using Kani's Method.
CO2: Analyze space trusses and curved beams for moment, shear, and torsion using standard techniques.
CO3: Apply the stiffness method to analyze trusses, accounting for thermal changes and fabrication errors.
CO4: Construct influence lines and determine critical stress resultants for beams and pin-jointed frames.
CO5: Implement the finite element method to analyze truss and beam elements.

TEXTBOOKS:

T1 - Vaidyanathan, R. and Perumal, P., "Structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 4th Edition 2018.
T2 - Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 13th Edition, 2017
T3 - Hibbeler R.C., "Structural Analysis", Pearson Education, 11th Edition, 2023.

REFERENCE BOOKS:

R1 - Negi L.S. & Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2016
R2 - Devadas Menon, "Structural Analysis", Narosa Publishing House, 2nd Edition 2018
R3 - Pandit G.S., Gupta S.P. and Gupta, "Throry of structure (vol I & II)", Tata McGraw Hill, 2017.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	-	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	-	2	2	1	2	3	2
CO3	3	2	3	3	2	1	2	-	2	2	2	3	3	2
CO4	3	2	3	3	1	2	2	-	2	2	2	3	3	2
CO5	3	2	3	3	1	1	2	-	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5305	CONSTRUCTION EQUIPMENT AND MACHINERY	3	0	0	3

Course Objective

1. To study the various construction equipment available and its selection.
2. To know the appropriate equipment for earthwork.
3. To have exposure on various types of equipment for other construction works.
4. To study about asphalt and concrete plants.
5. To provide awareness on various material handling equipment for safety.

Unit	Description	Instructional Hours
	CONSTRUCTION EQUIPMENTS	
I	Identification - Planning of equipment - Selection of equipment - Equipment management in projects - Maintenance management - Equipment cost - Operating cost - Cost control of equipment - Depreciation analysis - Replacement analysis - Safety management.	09
	EQUIPMENT FOR EARTHWORK	
II	Fundamentals of earthwork operations - Earth moving operations - Types of earthwork equipment - Tractors, motor graders, scrapers, front end waders - Dozer, excavators, rippers, loaders, trucks and hauling equipment, compacting equipment, finishing equipment - Case studies on earthwork equipment.	09
	OTHER CONSTRUCTION EQUIPMENT	
III	Equipment for dredging, trenching, drag line and clamshells, tunneling - Jacking equipment - Equipment for drilling and blasting - Pile driving equipment - Erection equipment - Crane, mobile crane - Types of pumps used in construction - Equipment for dewatering, grouting and demolition.	09
	ASPHALT AND CONCRETE PLANTS	
IV	Aggregate production - Different crushers - Feeders - Screening equipment - Handling equipment - Batching and mixing equipment - Ready mix concrete equipment, concrete pumping equipment - Asphalt plant - Asphalt pavers - Asphalt compacting equipment.	09
	MATERIALS HANDLING EQUIPMENT	
V	Forklifts and related equipment - Portable material bins - Material handling conveyors - Material handling cranes - Industrial trucks - Aerial transporting equipment.	09
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Develop knowledge on planning of equipment and selection of equipment.

CO2: Explain the knowledge on fundamentals of earth work operations, earth moving operations and types of earth work equipment.

CO3: Develop the knowledge on special construction equipment.

CO4: Apply the knowledge on asphalt and concrete plants.

CO5: Apply the knowledge and select the proper materials handling equipment

TEXT BOOKS:

T1 – Peurifoy, R.L., Schexnayder, C., Schmitt, R.L. and Aviad Shapira., Construction Planning, Equipment and Methods, 9th Edn. McGraw Hill, Singapore, 2018.

T2 - Granberg G.,Popescu M Construction Equipment and Management for Engineers Estimators and Owners, Taylor and Francis Publishers, New York, 2006.

REFERENCE BOOKS:

R1 - Deodhar, S.V. Construction Equipment and Job Planning, 4th Edn. Khanna Publishers, New Delhi, 2020.

R2 - Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 2018.

R3 - Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 2008.

R4 - Dr. Mahesh Varma., Construction Equipment and its Planning and Application, Metro-politan Book Company, New Delhi., 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	2	3	2	2	3	2	2	3	2	2	2	3	2
CO2	3	3	2	2	3	2	2	2	2	2	3	3	2	2
CO3	2	3	2	2	2	3	2	2	3	2	2	2	2	3
CO4	2	2	3	3	2	3	3	2	3	2	2	2	3	2
CO5	3	2	3	2	3	2	3	3	3	2	2	2	2	2
Average	**2.4**	**2.4**	**2.6**	**2.2**	**2.4**	**2.6**	**2.4**	**2.2**	**2.8**	**2**	**2.2**	**2.2**	**2.4**	**2.2**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5308	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

Course Objective

1. Study the role and methods of ground improvement and the geotechnical problems in soils.
2. Explore the application of engineering methods to improve the engineering properties of soil.
3. Gain knowledge in existing insitu treatment of cohesive and cohesion less soil.
4. Gather information on how to use geotextile in various functions such as filtration, drainage, and separation in highway projects.
5. Understand the principles of grouting methods, techniques and machinery.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.	9
II	**DRAINAGE AND DEWATERING** Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).	9
III	**INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOIL** Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.	9
IV	**EARTH REINFORCEMENT** Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.	9
V	**GROUT TECHNIQUES** Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring, Stabilization with cement, lime and chemicals - Stabilization of expansive soils.	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:

CO1:Interpret the geotechnical problem and select suitable method for ground improvement.
CO2: Implement drainage and dewatering techniques for improving the properties of soil.
CO3: Apply the concepts of insitu treatment methodsfor ground improvement.
CO4: Select and use a suitable geosynthetic material for various functions.
CO5: Employ suitable grouting techniques and other soil stabilization methods for ground improvement.

TEXT BOOKS:

T1. Purushothama Raj, P. "Ground Improvement Techniques", Laxmi publication, New Delhi, 2016.
T2. Bikash Chandra chattopadyay and Joyantamaity, " Ground improvement techniques" PHI learning private Ltd, Delhi, 2017.
T3. NiharRanjanPatra, "Ground Improvement Techniques"Vikas Publishing House Private Limited, Noida, 2020

REFERENCE BOOKS:

R1. Peter. G. Nicholson, " Soil improvement and ground modification methods",ElsevierInc, 2015
R2. Jones J.E.P., "Earth Reinforcement and Soil Structure", Butterworths, 2004.
R3. Raison C. A ,"Ground and soil improvement", Thomas Telford publishing, 2004.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3		3	2	3		3	2	3	3	3
CO2	2	3	1	2		2	1	1	2	2	1	3	3	3
CO3	3	3	1	2		2	2	1	2	1	1	3	3	3
CO4	2	3	2	1		2	1	1	1	1	1	3	2	3
CO5	2	3	2	2		2	2	1	2	1	1	3	3	3
Average	2.4	2.8	1.6	2	0	2.2	1.6	1.4	1.4	1.6	1.2	3	2.8	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	22CE5311	REMOTE SENSING CONCEPTS	3	0	0	3

Course Objective

1. To understand the concepts and laws related to remote sensing
2. To understand the interaction of electromagnetic radiation with atmosphere and Earth material
3. To acquire knowledge about satellite orbits and different types of satellites.
4. To understand the different types of remote sensors.
5. To gain knowledge about the concepts of interpretation of satellite imagery.

Unit	Description	Instructional Hours
I	**REMOTE SENSING AND ELECTROMAGNETIC RADIATION** Definition – components of RS – History of Remote Sensing – Merits and demerits of Data Collation between conventional and remote sensing methods – Electromagnetic Spectrum – Radiation principles - Wave theory, Planck's law, Wien's Displacement Law, Stefan's Boltzmann law, Kirchhoff's law – Radiation sources: active & passive – Radiation Quantities.	9
II	**EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL** Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows – Energy balance equation – Specular and diffuse reflectors – Spectral reflectance&emittance– Spectroradiometer – Spectral Signature concepts – Typical spectral 64 reflectance curves for vegetation, soil and water – solid surface scattering in microwave region.	9
III	**ORBITS AND PLATFORMS** Motions of planets and satellites – Newton's law of gravitation – Gravitational field and potential - Escape velocity - Kepler's law of planetary motion - Orbit elements and types – Orbital perturbations and maneuvers – Types of remote sensing platforms - Ground based, Air borne platforms and Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Lagrange Orbit.	9
IV	**REMOTE SENSING TECHNIQUES** Classification of Remote Sensors – Resolution concept: spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors – Microwave sensors – Calibration of sensors – High Resolution Sensors - LIDAR, UAV – Orbital and sensor characteristics of live Indian earth observation satellites.	9
V	**DATA PRODUCTS AND INTERPRETATION** Photographic and Digital products – Types, levels and open-source satellite data products – selection and procurement of data – Visual interpretation: basic elements and interpretation keys - Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification.	9
	Total Instructional Hours	**45**

Course Outcome

On completion of the course, the student is expected to

CO1: Demonstrate a comprehensive understanding of remote sensing concepts and laws.
CO2: Analyze the interaction between electromagnetic radiation and the atmosphere, as well as Earth materials.
CO3: Explain the characteristics of satellite orbits and differentiate between various types of satellites.
CO4: Identify and describe the different types of remote sensors used in remote sensing applications.
CO5: Apply the concepts of satellite imagery interpretation to analyze and extract valuable information from satellite data.

TEXT BOOKS:

T1: Thomas M. Lillesand, Ralph W. Kieferand Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc., New York, 2015.
T2: George Joseph and C Jeganathan, Fundamentals of Remote Sensing, Third Edition Universities Press (India) Private limited, Hyderabad, 2018.

REFERENCE BOOKS:

R1: Stanley A Morain; Amelia M Budge; Michael S Renslow. Manual of Remote Sensing. Vol. I, American Society for Photogrammetry and Remote Sensing, Virginia, USA,2019, 4th edition
R2: Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2020 third edition.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2						1	1	1	2	2
CO2	3	2	2	2						1	1	1	2	2
CO3	3	2	2		2					1	1	1	2	2
CO4	3	3	3	2	3	3	2	2	2	1	3	2	2	2
CO5	3	3	3	2	3	3	2	2	2	1	3	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5314	TRAFFIC ENGINEERING AND MANAGEMENT	3	0	0	3

Course Objective

1. Understand the road dynamics, traffic flow, urban challenges and sustainability
2. Gain the knowledge on master traffic survey, analysis, forecasting and level of service.
3. Expertise in intersection design, signal coordination and pedestrian/cycle network.
4. Address the road safety, environmental impacts and sustainable transportation promotion.
5. Implement the traffic management strategies with intelligent transport systems.

Unit	Description	Instructional Hours
I	**TRAFFIC PLANNING AND CHARACTERISTICS** Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performancecharacteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integratedplanning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. –land use & transport and modal integration.	9
II	**TRAFFIC SURVEYS** Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized transports – Methods and interpretation – Origin Destination Survey – Methods andpresentation – Parking Survey – Accident analyses -Methods, interpretation and presentation –Statistical applications in traffic studies and traffic forecasting – Level of service – Concept,applications and significance.	9
III	**TRAFFIC DESIGN AND VISUAL AIDS** Intersection Design - channelization, Rotary intersection design – Signal design – Coordination ofsignals — Grade separation - Traffic signs including VMS and road markings – Significant roles oftraffic control personnel - Networking pedestrian facilities & cycle tracks.	9
IV	**TRAFFIC SAFETY AND ENVIRONMENT** Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environmenthazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration ofpublic transportation – Promotion of non-motorized transport.	9
V	**TRAFFIC MANAGEMENT** Area Traffic Management System - Traffic System Management (TSM) with IRC standards –- TrafficRegulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods –Congestion and parking pricing – All segregation methods- Coordination among different agencies –Intelligent Transport System for traffic management, enforcement and education.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, the students will have ability to:
CO1:Analyse the traffic problems and plan for traffic systems for various uses.
CO2: Perform the surveys and forecast traffic applications
CO3: Design Intersections, signals and parking arrangements
CO4: Comprehend the road safety, environmental impacts and promote sustainable transportation
CO5: Develop Traffic management Systems

TEXT BOOKS:

T1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013
T2.Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of HighwayEngineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
T3. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, NewDelhi, 2010

REFERENCE BOOKS:

R1. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on TrafficPlanning and Management.
R2.SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" forUrban Areas, 1994
R3. John E Tyworth, "Traffic Management Planning, Operations and control", Addison WeslyPublishing Company, 1996

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	2	2	2	1	1	1	3	3
CO2	3	3	3	3	3	3	2	2	2	1	1	1	3	3
CO3	3	3	3	2	2	2	2	2	2	2	1	1	3	3
CO4	3	3	2	1	2	2	1	1	1	2			3	3
CO5	3	3	2	1	2	2	1	1	1	2	2		3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5317	AIR AND NOISE POLLUTION CONTROL ENGINEERING	3	0	0	3

Course Objective

1. To classify the sources and understand the effects of air pollution.
2. To study the dispersion of pollutants.
3. To know the various techniques and equipment for control of air pollution.
4. To learn about the air quality standards and legislation.
5. To gain knowledge on indoor air pollution and noise pollution.

Unit	Description	Instructional Hours
	SOURCES AND EFFECTS OF AIR POLLUTION	
I	Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings, vegetation, animals and property – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles	9
	DISPERSION OF AIR POLLUTANTS	
II	Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric Stability and turbulence – Plume rise – Wind profiles and plume patterns - Dispersion of pollutants – Dispersion models – Applications	9
	AIR POLLUTION CONTROL	
III	Concepts of control – Principles and design of control measures – Particulates control by Gravity separators, Centrifugal separators, Fabric filters, Scrubbers,Electrostatic precipitators – Selection criteria for equipment – Gaseous pollutant control by Adsorption, Absorption, Condensation, Combustion, Bio-scrubbers, Biofilters - CO_2 capturing	9
	AIR QUALITY MONITORING AND MANAGEMENT	
IV	Ambient air quality and Emission standards– Air quality monitoring- National Ambient Air Quality Monitoring Programme– Air quality index – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality–– Air Pollution Climatology	9
	INDOOR AIR QUALITY AND NOISE POLLUTION	
V	Sources, types and control of indoor air pollutants - Sick building syndrome – Sources of noise - Units and measurement of noise, Characterization of Noise from Construction, Mining - Transportation and Industrial Activities - Airport Noise-Noise measuring equipment, Effects of noise pollution - Prevention and control of noise pollution.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Recognize the different sources of air pollution and predict the impacts
CO2: Interpret the dispersion of pollutants based on meteorological conditions
CO3: Propose suitable control equipment for various air pollutants
CO4: Comprehend the regulatory requirements for air quality monitoring
CO5: Categorize the sources and suggest control measures for indoor air pollution and noise pollution

TEXT BOOKS:

T1-Rao.C.S, "Environmental Pollution Control Engineering", Wiley Eastern Ltd., New Delhi, 2006.
T2 - Rao, M.N, and Rao, H. V. N, "Air Pollution Control", Tata-McGraw-Hill, New Delhi, 2007.

REFERENCE BOOKS:

R1 - Noel de Nevers, "Air pollution Control Engineering", Waveland Press Inc., 2017.
R2 - Lawrence K. Wang, Norman C. Pereira, Yung-Tse Hung, Air Pollution Control Engineering, Humana Press, 2004.
R3 - Heumann, W.L., "Industrial Air Pollution Control Systems", McGraw-Hill, New York, 2007.
R4 -Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw-Hill Publishing Company, New Delhi, 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Program	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5320	Groundwater Engineering	3	0	0	3

Course Objectives

- To understand groundwater systems, aquifer properties and methods of estimation of groundwater potential.
- To learn about well hydraulics, aquifer types, properties and the laws governing the groundwater movement.
- To study groundwater modeling and database management for effective groundwater conservation.
- To comprehend groundwater quality standards, groundwater pollution and environmental regulatory requirements.
- To explore sources of groundwater contamination, remedial measures and recharge techniques.

Unit	Description	Instructional Hours
I	**HYDROGEOLOGICAL PARAMETERS** Introduction – Water bearing properties of rock – Types of aquifers - Aquifer properties – Permeability, Specific yield, Transmissivity and Storage coefficient – Methods of estimation – GEC norms - Steady state flow - Darcy's law - Groundwater velocity – DupuitForchheimer assumption – Steady radial flow into a well.	9
II	**WELL HYDRAULICS** Unsteady state flow - Theis method - Jacob method – Chow's method – Law of times – Theis recovery – Bailer method – Slug method - Tests - Image well theory – Partial penetrations of wells -Well losses – Specific capacity and Safe yield - Collector wells and Infiltration gallery.	9
III	**GROUNDWATER MANAGEMENT** Need for management model – Database for groundwater management – Groundwater balance study – Introduction to mathematical models – Model conceptualization – Initial and boundary conditions – Calibration – Validation – Future prediction – Sensitivity analysis – Uncertainty – Development of a model.	9
IV	**GROUNDWATER QUALITY** Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water - Industrial water – Irrigation water - Groundwater pollution and legislation - Environmental regulatoryrequirements.	9
V	**GROUNDWATER CONSERVATION** Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater intrusion and remediation – Ground water basin management and conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes.	9
	Total Instruction Hours	**45**

Course Outcomes

On the completion of this course, the student will be able to:

- Analyze groundwater systems and aquifer properties to estimate the potential of confined and unconfined aquifers.
- Apply the knowledge of well hydraulics to determine losses, specific capacity and safe yield of wells.
- Illustrate the concepts of groundwater modelling and data base management for groundwater conservation.
- Interpret the significance of groundwater quality standards and environmental regulatory requirements.
- Identify the sources of groundwater contamination and suggest suitable remedial measures and recharge techniques.

Text Books:

1. H. M. Raghunath, 'Groundwater', Fourth Edition, New Age International Private Limited, New Delhi, 2021.
2. David K. Todd, Larry W. Mays, 'Groundwater Hydrology', Third Edition, Wiley India Private Limited, New Delhi, 2011.

Reference Books:

1. Charles R. Fitts, 'Groundwater Science', Third Edition, Elsevier, Academic Press, USA, 2022.
2. Bhagu R. Chahar, 'Groundwater Hydrology, First Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.
3. S. Ramakrishnan, 'Groundwater', Second Edition, Scitech Publications (India) Private Limited, Chennai, 2010.
4. A. K. Rastogi, 'Numerical Groundwater Hydrology', Third Edition, Penram International Publishing (India) Private Limited, Mumbai, 2011.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	-	-	2	2	1	1	1	-	2	2	2
CO2	3	3	2	-	-	2	2	1	1	1	-	2	3	3
CO3	3	3	2	1	2	3	3	1	1	1	2	2	3	3
CO4	3	3	1	-	-	3	3	1	1	1	1	2	3	3
CO5	3	3	1	-	-	3	3	1	1	1	2	2	3	3
Average	**3**	**3**	**1.6**	**0.2**	**0.4**	**2.6**	**2.6**	**1**	**1**	**1**	**1**	**2**	**2.8**	**2.8**

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Program	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5322	WATER RESOURCES SYSTEMS ENGINEERING	3	0	0	3

Course Objectives

- To understand objectives, characteristics, and basic analysis concepts of water resources systems.
- To comprehend linear programming principles and problem formation to optimize water resources problems.
- To gain knowledge on dynamic programming concepts for water resources systems engineering.
- To learn aboutdeterministic and stochastic simulation models for reservoir operation.
- To explore advanced techniques like goal programming and evolutionary algorithms for water resources planning.

Unit	Description	Instructional Hours
I	**SYSTEM APPROACH** Definition, classification, and characteristics of systems - Philosophy of modelling – Goals and objectives – Basics of system analysis concept – Steps in systems engineering.	9
II	**LINEAR PROGRAMMING** Introduction to operation research - Linear programming - Problem formulation - Graphical solutions - Simplex method –Sensitivity analysis - Application to operation of single purpose reservoir.	9
III	**DYNAMIC PROGRAMMING** Bellman's optimality criteria, problem formulation and solutions – Water Allocation for three state(user), Forward and Backward Recursion techniques in Dynamic Programming - Shortest pipe lineroute problem - Application to reservoirs capacity expansion.	9
IV	**SIMULATION** Basic principles and concepts – Monte Carlo techniques – Model development – Inputs and outputs– Single and multipurpose reservoir simulation models – Deterministic simulation – Rule curvedevelopment for reservoir	9
V	**ADVANCED OPTIMIZATION TECHNIQUES** Integer and parametric linear programming – Goal programming types – Applications to reservoir release optimization – Application of evolutionary algorithms like Genetic algorithm, Particle swarm,Simulated Annealing to reservoir release optimization.	9
	Total Instruction Hours	45

Course Outcomes

On the completion of this course, the student will be able to:

- Describe the objectives, characteristics and basic analysis concepts of water resources systems.
- Apply the principles of linear programming for operation research and optimization of water resources problems.
- Explain the concepts of dynamic programming and its application in water resource systems engineering.
- Develop a simulation model based on deterministic and stochastic simulation for reservoir operation.
- Adopt advanced optimization techniques, such as goal programming and evolutionary algorithms for water resources planning and management.

Text Books:

1. S. Vedula, P. P. Majumdar, 'Water Resources Systems-Modelling Techniques and Analysis', McGraw Hill Higher Education, New Delhi, 2005.
2. Pramod R Bhave, 'Water Resources Systems', Narosa Publishing House, New Delhi, 2011.

Reference Books:

1. Sharad K. Jain, V.P. Singh, 'Water Resources Systems Planning and Management', Second Edition, Elsevier Science, USA, 2023.
2. P. K. Gupta, Man Mohan, 'Problems in Operation Research', Sultan Chand and Sons, New Delhi, 2010.
3. Hamdy A. Taha, 'Operation Research: An Introduction', Ninth Edition, Pearson Education India, Chennai, 2014.
4. Frederick S. Hillier, Gerald J. Lieberman, Bodhibroto Nag, PreetamBasu, 'Introduction to Operations Research', Eleventh Edition, McGraw Hill Higher Education, New Delhi, 2021.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	1	-	-	2	2	1	1	1	-	2	2	2
CO2	3	3	1	1	2	2	2	1	1	1	2	2	2	2
CO3	3	3	2	1	2	2	2	1	1	1	2	2	2	2
CO4	3	3	2	1	3	2	2	1	1	1	2	2	2	2
CO5	3	3	2	2	3	2	2	1	1	1	2	2	2	2
Average	**3**	**3**	**1.6**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**2**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5303	PREFABRICATED STRUCTURES	3	0	0	3

Course Objective

1. To understand the basics of prefabrication.
2. To understand the behavior of prefabricated components.
3. To know about design principles of prefabricated components.
4. To acquire knowledge about joints for different structural connections.
5. To get familiar with the design for abnormal loads.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Shuttering and mould design – Dimensional tolerances - Disuniting of Structures.	9
II	**PREFABRICATED COMPONENTS** Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.	9
III	**DESIGN PRINCIPLES** Design of Structural components – Beam, Column - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces - Design and detailing of prefabricated units.	9
IV	**JOINTS IN STRUCTURAL MEMBERS** Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.	9
V	**DESIGN FOR EARTHQUAKES AND CYCLONES** Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to
CO1:Demonstrate foundational knowledge of prefabrication principles.
CO2: Know the behavior of prefabricated components
CO3: Design the structural components
CO4: Identify the different types of connections between structural members
CO5: Explain the design considerations for accommodating abnormal loads in structures.

TEXT BOOKS:

T1- Hubert Bachmann and Alfred Steinle, "Precast Concrete Structures", John Wiley & Sons, 2019.
T2 - Laszlo Mokk, "Prefabricated Concrete for Industrial and Public Structures", AkademiaiKiado, Budapest, 2020.

REFERENCE BOOKS:

R1 – "PCI Design Hand Book", 8th Edition, 2021.
R2 – "Handbook on Precast Concrete for Buildings", ICI Bulletin 02, First Edition, 2016.
R3 - Bruggeling,A S G. and Huyghe, G. F., "Prefabrication with concrete" A.A. Balkema Publishers, Netherlands, 1991.
R4 - Glover C.W, "Structural Precast Concrete", Asia Publishing House, 1964.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	2	2	2	2	2	1	2	3	2
CO2	3	2	2	1	1	2	2	2	2	1	1	2	3	2
CO3	3	2	3	2	2	2	2	2	2	2	2	2	3	2
CO4	3	2	2	2	2	2	2	2	2	1	1	1	3	2
CO5	3	2	2	2	2	1	2	2	2	1	2	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5306	SUSTAINABLE CONSTRUCTION AND LEAN CONSTRUCTION	3	0	0	3

Course Objective

1. To study the various sustainable materials used in construction.
2. To know the method of estimating the amount of energy required for building.
3. To have exposure on various features of LEED, TERI and GRIHA ratings of buildings.
4. To study the various concepts of lean construction tools and techniques.
5. To provide awareness on lean tools & techniques for sustainability in construction projects.

Unit	Description	Instructional Hours
	INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION	
I	Introduction and definition of Sustainability - Carbon cycle - role of construction material: concreteand steel, etc. - CO2 contribution from cement and other construction materials - Recycled andmanufactured aggregate - Role of QC and durability - Life cycle and sustainability.	09
	ENERGY CALCULATIONS	
II	Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditionedbuilding - Life Cycle energy use.	09
	GREEN BUILDINGS	
III	Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboringtropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings -Role of insulation and thermal properties of construction materials - influence of moisture contentand modeling -Performance ratings of green buildings - Zero energy building'.	09
	CORE CONCEPTS IN LEAN	
IV	Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement;Productivity Measurement System (PMS).	09
	LEAN CONSTRUCTION TOOLS AND TECHNIQUES	
V	Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S ,Collaborative Planning System (CPS)/ Last Planner™ System (LPS) – Big Room Approach, IT/BIMand Lean, How to Start Practicing Lean Tools in Project Site.	09
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Describe the various sustainable materials used in construction.

CO2: Explain the method of estimating the amount of energy required for building.

CO3: Describe the features of LEED, TERI and GRIHA ratings of buildings.

CO4: Explain the core concepts of lean construction tools and techniques and their importance in achieving better productivity.

CO5: Apply lean tools & techniques to achieve sustainability in construction projects.

TEXT BOOKS:

T1 – Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.

T2 - Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.

REFERENCE BOOKS:

R1 - Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

R2 - Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.

R3 - Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	-	1	1	-	2	3	1	1	-	2	1	3	2
CO2	3	1	3	2	1	2	2	-	1	1	1	2	3	2
CO3	2	2	3	1	1	1	1	-	-	-	3	1	3	3
CO4	3	1	3	2	2	1	3	1	1	1	3	2	3	3
CO5	3	1	2	2	2	2	3	1	-	1	3	2	3	3
Average	**2.6**	**1.2**	**2.4**	**1.6**	**1.2**	**1.6**	**2.4**	**1**	**1**	**1**	**2.4**	**1.6**	**3**	**2.6**

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5309	SOIL DYNAMICS AND MACHINE FOUNDATION	3	0	0	3

Course Objective

1. To learn the fundamentals of vibrations due to dynamic forces acting in machine foundation.
2. To study the dynamic soil property by suitable field test.
3. To familiarize with the types and design approach of machine foundation.
4. To gain knowledge on parameters considered for design of machine foundation.
5. Gain knowledge on different vibration isolation materials and its properties.

Unit	Description	Instructional Hours
I	**THEORY OF VIBRATION** Introduction – Nature of dynamic loads – Basic definitions – Simple harmonic motion – Fundamentals of vibration – Single degree and multi degree of freedom systems – Free vibrations of spring – Mass systems – Forced vibrations – Resonance – Viscous damping – Principles of vibrations measuring systems – Effect of transient and pulsating loads.	9
II	**DYNAMIC SOIL PROPERTIES** Dynamic stress-strain characteristics – Principles of measuring dynamic properties – Laboratory techniques – Field tests – Block vibration test – Factors affecting dynamic properties – Typical values. Mechanism of liquefaction – Influencing factors – Evaluation of liquefaction potential – Analysis from SPT test – Dynamic bearing capacity – Dynamic earth pressure.	9
III	**MACHINE FOUNDATIONS** Introduction – Types of machine foundations – General requirements for design of machine foundations – Design approach for machine foundation – Vibration analysis – Elastic Half- Space theory – Mass-spring-dashpot model – Permissible amplitudes – Permissible bearing pressures.	9
IV	**DESIGN OF MACHINE FOUNDATION** Evaluation of design parameters – Types of Machines and foundations – General requirements – their importance – Analysis and design of block type and framed type machine foundations – Modes of vibration of a rigid foundation – Foundations for reciprocating machines, impact machines, Two – Cylinder vertical compressor, Doubleacting steam hammer – Codalre commendations. Emprical approach – Barken's method – Bulb of pressure concept – Pauw's analogy – Vibration table studies.	9
V	**VIBRATION ISOLATION** Vibration isolation – Types of isolation – Transmissibility – Passive and active isolation – Methods of isolation – Use of springs and damping materials –Properties of isolating materials – Vibration control of existing machine foundation.	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:

CO1: Acquire knowledge to apply theories of vibration to solve dynamic soil problems.
CO2: Evaluate the dynamic properties of soil using laboratory and field tests.
CO3: Acquire basic knowledge about machine foundations and design various types of machine foundation.
CO4: Selecting the suitable types of vibration isolation materials.
CO5: Apply vibration isolation techniques for various field problems.

TEXT BOOKS:

T1. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd. New Delhi 2010.
T2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.
T3. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing, New Delhi, 2000.

REFERENCE BOOKS:

R1. Krammer S.L., Geotechnical Earthquake Engineering, Prentice Hall, International series, Pearson Education (Singapore) Pvt Ltd, 2004.
R2. KameswaraRao, Vibration Analysis and Foundation Dynamics, Wheeler Publishing, New Delhi, 1998.
R3. Vaidyanathan, C.V., and Srinivasalu, P., Handbook of Machine Foundations, McGraw Hill, 1995.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	2		2	3	1	3	2	3	3	3	3
CO2	3	2	2	3	3	1	2	1	3	3	3	3	2	3
CO3	2	1	2	3	2	2	3	1	2	1	2	3	3	3
CO4	2		2	1	2	1	2	2	2	1	2	3	3	2
CO5	2	1	2	1	1		2	1	2	2	3	3	3	3
Average	2.4	1	2.2	2	1.6	1.2	2.4	1.2	2.4	1.8	2.6	3	2.8	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	22CE5312	SATELLITE IMAGE PROCESSING	3	0	0	3

Course Objective

1. To understand various components and characteristics of image processing systems
2. To familiarize the concepts of image geometry and radiometry corrections
3. To acquire knowledge about different types of image enhancement techniques used for satellite image processing
4. To gain knowledge about Image classification and accuracy assessment of various classifiers
5. To acquaint with various advanced classification techniques available for feature extraction

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF IMAGE PROCESSING** Definition - Image Representation - Steps in DIP-– Components – Elements of Visual Perception – Image Formation - Image Sampling and Quantization- Image acquisition, storage and retrieval — Relationships between pixels - Color image fundamentals - RGB, HSI models- data products – satellite data formats – Digital Image Processing Systems – Hardware and software design consideration	9
II	**PREPROCESSING** Image Characteristics – Histograms – Scattergrams –Initial statistics – Univariate and multivariate statistics- Initial image display- Ideal display, types, Sensor models - spatial, spectral, radiometric, temporal - IFOV, GIFOV& GSI - geometry and Radiometry – Sources of Image degradation and Correction procedures - Atmospheric, Radiometric, Geometric Corrections- Image Geometry Restoration-Interpolation methods and resampling techniques.	9
III	**IMAGE ENHANCEMENT** Image characteristics- point, local and regional operation – contrast, spatial feature and multi-image manipulation techniques – level slicing, contrast stretching, spatial filtering, edge detections - Fourier transform-FFT, DFT - Band ratio - Principal Component Analysis (PCA) – Scale-space transformmulti-image fusion.	9
IV	**IMAGE CLASSIFICATION** Pattern recognition concepts – Bayes approach – spectral Signature and training sets – Separability test – Supervised Classification – stages – Minimum distance to mean, Parallelepiped, MLC – Unsupervised classifiers – ISODATA, K-means-Support Vector Machine – sub-pixel classifier– Error matrix -Accuracy assessment – accuracy metrics: Kappa statistics, ERGAS, RMS.	9
V	**ADVANCED CLASSIFIERS** Texture based classification -Segmentation (Spatial, Spectral)-regions Fuzzy set classification – Object based classifiers – Deep Learning - Artificial Neural nets: Hebbian leaning - Adaline, Madaline, BPN – hybrid classifiers – Neuro - Fuzzy models- Expert system – Knowledge based systems.	9
	Total Instructional Hours	**45**

Course Outcome

On completion of the course, the student is expected to

CO1: Identify and describe the components and characteristics of image processing systems.
CO2: Apply concepts of image geometry and radiometry corrections in satellite image analysis.
CO3: Utilize various image enhancement techniques to improve the quality and clarity of satellite imagery.
CO4: Evaluate and apply image classification methods, including accuracy assessment of classifiers, for analyzing satellite images.
CO5: Implement advanced classification techniques for feature extraction in satellite imagery analysis.

TEXT BOOKS:

T1: John,R.Jensen, Introductory Digital Image Processing, Prentice Hall, NewJersey, 2021 Fourth edition.
T2: Robert,A.Schowengergt, Techniques for Image Processing and classification in Remote Sensing,1983.

REFERENCE BOOKS:

R1: Robert, G. Reeves,-Manual of Remote Sensing Vol.I &II- American Society of Photogrammetry ,Falls ,Church, USA,1983.
R2: John.A Richards, Remote sensing digital Image Analysis – An Introduction Springer-Verlag, Fifth Edition, 2014.
R3: Digital Image Processing by Rafael C. Gonzalez, Richard Eugene Woods - Pearson/Prentice Hall,Fourth edition, 2022.
R4: Fundamentals of Digital Image Processing by Annadurai Pearson Education, 2007.

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Dean (Academics)
HiCET

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			1	1			3				3	1	1
CO2	2	2	1	2	2		2	2		1		3	1	1
CO3	3	2	2	3	3	2			2	2		3	1	1
CO4	3	3	3	3	3	3	3	2	2	2	2	3	1	1
CO5	3	3	3	3	3	3	3	2	2	3		3		1

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HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

COIMBATORE 641 032

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

CURRICULUM

&

SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION-2019

(For the students admitted during the academic year 2021-2022 and onwards)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTE

IV: To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

IM1: To provide academic excellence in technical education through novel teaching methods

IM2: To empower students with creative skills and leadership qualities

IM3: To produce dedicated professionals with social responsibility

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT

DV: To be recognized globally for pre-eminence in Civil Engineering education, research and service

MISSION OF THE DEPARTMENT

DM1: To impart scientific and technical knowledge for professional practice, advanced study and research in Civil Engineering

DM2: To equip the students with ingenious leadership and organizational skills for a successful professional career

DM3: To inculcate professional and ethical responsibilities related to industry, society and environment

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates will be able to:

PEO1: Excel as practicing engineers, academicians and researchers with a comprehensive knowledge in Civil Engineering

PEO2: Play a significant role as team players and leaders in challenging environments for nation's infrastructure development, environmental protection and sustainability

PEO3: Uphold professional and ethical responsibilities as engineers, consultants and entrepreneurs while addressing the demands of the society

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The graduates will be able to:

PSO1: Apply their engineering knowledge, communication skills, professional and ethical principles to solve problems in civil engineering and contribute to the infrastructure development in a sustainable way

PSO2: Use their engineering background to excel in competitive exams for advanced study, research and professional career

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid

conclusions

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

REGULATION – 2019

CURRICULUM AND SYLLABI

B.E. CIVIL ENGINEERING
I TO VIII SEMESTERS CURRICULUM AND SYLLABI
SEMESTER I

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2	21MA1102	Calculus and Linear Algebra	BS	3	1	0	4	40	60	100
THEORY WITH PRACTICAL COMPONENT										
3	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	21CS1151	Problem Solving Python Programming	ES	2	0	2	3	50	50	100
6	21ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	21HE1071	Language Competency Enhancement Course - I	HS	1	0	0	1	100	-	100
MANDATORY COURSE										
8	21MC1191	Induction Programme	AC	-	-	-	-	-	-	-
9	21HE1072	Career Guidance Level - I Personality, Aptitude and Career Development	EEC	2	0	0	0	100	100	100
10	21HE1073	Entrepreneurship and Innovation	EEC	1	0	0	0	100	100	100
			Total	**16**	**2**	**10**	**20**	**580**	**320**	**900**

*As per AICET Norms 3weeks Induction Programme is added in the first semester as an Audit Course

SEMESTER II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2	21MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	40	60	100
3	21EF2103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
4	21ME2101	Engineering Mechanics	ES	3	0	0	3	40	60	100
THEORY WITH PRACTICAL COMPONENT										
5	21PH2151	Material Science	BS	2	0	2	3	50	50	100
6	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICAL										
7	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	21HE2071	Language Competency Enhancement Course -II	HS	1	0	0	1	100	-	100
MANDATORY COURSE										
9	21HE2072	Career Guidance Level – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100		100
			Total	**18**	**2**	**8**	**22**	**510**	**390**	**900**

SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA3103	Fourier Analysis and Numerical Methods	BS	3	1	0	4	40	60	100
2	21CE3201	Mechanics of Fluids	PC	3	0	0	3	40	60	100
3	21CE3202	Geology and Construction Materials	PC	3	0	0	3	40	60	100
4	21CE3203	Surveying	PC	3	0	0	3	40	60	100
THEORY WITH PRACTICAL COMPONENT										
5	21CE3251	Mechanics of Solids	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21CE3001	Survey Lab	PC	0	0	4	2	50	50	100
7	21CE3002	Computer Aided Building Drawing	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	21MC3191	Indian Constitution	NCM	2	0	0	0	-	-	-
9	21HE3072	Career Guidance Level - III Personality Aptitude and Career Development	EEC	2	0	0	0	100		100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100		100
			Total	**19**	**1**	**10**	**20**	**510**	**390**	**900**

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA4103	Probability and Statistics	BS	3	1	0	4	40	60	100
2	21CE4201	Strength of Materials	PC	3	1	0	4	40	60	100
3	21CE4202	Applied Hydraulics and Hydraulic Machinery	PC	3	0	0	3	40	60	100
4	21CE4203	Soil Mechanics	PC	3	0	0	3	40	60	100
THEORY WITH PRACTICAL COMPONENT										
5	21CE4251	Concrete Technology	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21CE4001	Soil Mechanics Lab	PC	0	0	4	2	50	50	100
7	21CE4002	Fluid Mechanics and Hydraulic Machinery Lab	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	21MC4191	Essence of Indian Traditional Knowledge	NCM	2	0	0	0	-	-	-
9	21HE4072	Career Guidance Level – IV Personality, Aptitude and Career Development	EEC	2	0	0	0	100		100
			Total	**18**	**2**	**10**	**21**	**510**	**390**	**900**

SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21CE5201	Structural Analysis - I	PC	3	0	0	3	40	60	100
2	21CE5202	Design of RC Elements	PC	3	1	0	4	40	60	100
3	21CE5203	Water Supply Engineering	PC	3	0	0	3	40	60	100
4	21CE5204	Foundation Engineering	PC	3	0	0	3	40	60	100
5	21CE5205	Highway and Railway Engineering	PC	3	0	0	3	40	60	100
6	21CE53XX	Professional Elective - I	PE	3	0	0	3	40	60	100
PRACTICAL										
7	21CE5001	Concrete and Highway Engineering Lab	PC	0	0	4	2	50	50	100
8	21CE5002	Survey Camp*	PC	0	0	0	1	50	50	100
MANDATORY COURSE										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	100		100
10	21HE5072	Design Thinking	EEC	1	0	0	1	100		100
			Total	**20**	**1**	**4**	**24**	**540**	**460**	**1000**

***Survey camp of one week has to be undergone by the student during fourth semester vacation.**

SEMESTER VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21CE6201	Structural Analysis - II	PC	3	0	0	3	40	60	100
2	21CE6202	Design of Steel Structural Elements	PC	3	0	0	3	40	60	100
3	21CE6203	Wastewater Engineering	PC	3	0	0	3	40	60	100
4	21CE6204	Construction Management	PC	3	0	0	3	40	60	100
5	21CE63XX	Professional Elective - II	PE	3	0	0	3	40	60	100
6	21XX64XX	Open Elective - I	OE	3	0	0	3	40	60	100
PRACTICAL										
7	21CE6001	Water and Wastewater Testing Lab	PC	0	0	3	1.5	50	50	100
8	21CE6002	Design and Drawing of RC Structures	PC	0	0	3	1.5	50	50	100
9	21CE6701	Internship / Industrial Training*	EEC	0	0	0	1	0	100	100
MANDATORY COURSE										
10	21HE6071	Soft Skills – II	EEC	1	0	0	1	100		100
11	21HE6072	Intellectual Property Rights	EEC	1	0	0	1	100		100
			Total	**20**	**0**	**6**	**24**	**540**	**560**	**1100**

***Internship / Industrial Training of three weeks duration has to be undergone by the students from third to fifth semester vacation**

SEMESTER VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21CE7201	Water Resources and Irrigation Engineering	PC	3	0	0	3	40	60	100
2	21CE7202	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	40	60	100
3	21CE7203	Estimation, Costing and Valuation	PC	3	1	0	4	40	60	100
4	21CE73XX	Professional Elective - III	PE	3	0	0	3	40	60	100
5	21XX74XX	Open Elective - II	OE	3	0	0	3	40	60	100
PRACTICAL										
6	21CE7001	Design and Drawing of Steel Structures	PC	0	0	4	2	50	50	100
7	21CE7901	Project I - Design Project	EEC	0	0	4	2	100	100	200
			Total	**15**	**1**	**8**	**20**	**350**	**450**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21CE83XX	Professional Elective - IV	PE	3	0	0	3	40	60	100
2	21CE83XX	Professional Elective - V	PE	3	0	0	3	40	60	100
PRACTICAL										
3	21CE8901	Project II – Main Project	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**180**	**220**	**400**

B.E. / B. Tech. (Honours)

Vertical I (Structural Engineering)	Vertical II (Environmental Engineering)	Vertical III (Geotechnical Engineering)	Vertical IV (Remote Sensing and GIS)
21CE5206 Advanced Concrete Technology	21CE5207 Transport of Water and Wastewater	21CE5208 Soil Properties and Behaviour	21CE5209 Fundamentals of Remote Sensing
21CE6205 Advanced Concrete Structures	21CE6206 Design of Physico-Chemical Treatment Systems	21CE6207 Site Exploration and Soil Investigation	21CE6208 Advanced Remote Sensing
21CE6209 Finite Element Analysis in Structural Engineering	21CE6210 Design of Biological Treatment Systems	21CE6211 Environmental Geo-technology	21CE6212 Fundamentals of Geodesy
21CE7204 Advanced Steel Structures	21CE7205 Solid and Hazardous Waste Management	21CE7206 Advanced Foundation Engineering	21CE7207 Open Source GIS
21CE7208 Design of Steel-Concrete Composite Structures	21CE7209 Environmental Impact and Risk Assessment	21CE7210 Foundation in Expansive Soils	21CE7211 Modern Surveying
21CE8201 Design of Industrial Structures	21CE8202 Resource and Energy Recovery from Waste	21CE8203 Reinforced Soil Structures	21CE8204 Urban Geo-informatics
21CE8205 Structural Health Monitoring	21CE8206 Remote Sensing and GIS Application in Environmental Management	21CE8207 Remote Sensing and its Application in Geotechnical Engineering	21CE8208 Remote Sensing and GIS Application for Earth Sciences

B.E. / B. Tech. (Minor Degree)

S.No.	Course Code	Vertical I	Course Code	Vertical II
1	21CE5601	Principles of Surveying	21CE5602	Sustainable infrastructure Development
2	21CE6601	Construction Technology	21CE6603	Sustainable Agriculture and Environmental Management
3	21CE6602	Soil and Foundations	21CE6604	Sustainable Bio Materials
4	21CE7601	Structural Analysis and Design	21CE7603	Materials for Energy Sustainability
5	21CE7602	Water and Wastewater Treatment	21CE7604	Green Technology
6	21CE8601	Quantity Estimation and Valuation	21CE8603	Environmental Quality Monitoring and Analysis
7	21CE8602	Transportation Engineering	21CE8604	Integrated Energy Planning for Sustainable Development

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	24	24	20	14	165

LIST OF ELECTIVES

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE - I										
1	21CE5301	Advanced Surveying Techniques	PE	3	0	0	3	40	60	100
2	21CE5302	Traffic Engineering	PE	3	0	0	3	40	60	100
3	21CE5303	Housing Planning and Management	PE	3	0	0	3	40	60	100
4	21CE5304	Construction Techniques, Equipment and Safety	PE	3	0	0	3	40	60	100
5	21CE5305	Hydrology	PE	3	0	0	3	40	60	100
6	21CE5306	Professional Ethics and Laws for Civil Engineers	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE - II										
1	21CE6301	Building Services	PE	3	0	0	3	40	60	100
2	21CE6302	Airports, Docks and Harbour Engineering	PE	3	0	0	3	40	60	100
3	21CE6303	Subsurface Investigation and Field Testing	PE	3	0	0	3	40	60	100
4	21CE6304	Groundwater Engineering	PE	3	0	0	3	40	60	100
5	21CE6305	Architecture and Town Planning	PE	3	0	0	3	40	60	100
6	21CE6306	Disaster Preparedness and Planning	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE - III										
1	21CE7301	Prestressed Concrete Structures	PE	3	0	0	3	40	60	100
2	21CE7302	Air Pollution Management	PE	3	0	0	3	40	60	100
3	21CE7303	Industrial Wastewater Treatment	PE	3	0	0	3	40	60	100
4	21CE7304	Composite Structures	PE	3	0	0	3	40	60	100
5	21CE7305	Finite ElementAnalysis	PE	3	0	0	3	40	60	100
6	21CE7306	Computer Aided Analysis and Design of Structures	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE - IV										
1	21CE8301	Ground Improvement Techniques	PE	3	0	0	3	40	60	100
2	21CE8302	Prefabricated Structures	PE	3	0	0	3	40	60	100
3	21CE8303	Valuation of Land and Buildings	PE	3	0	0	3	40	60	100
4	21CE8304	Municipal Solid Waste Management	PE	3	0	0	3	40	60	100
5	21CE8305	Design of Formwork	PE	3	0	0	3	40	60	100
6	21CE8306	NonDestructive Testing of Structures	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE - V										
1	21CE8307	Construction Economics and Finance	PE	3	0	0	3	40	60	100
2	21CE8308	Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100
3	21CE8309	Disaster Resistant Structures	PE	3	0	0	3	40	60	100
4	21CE8310	Environmental Impact Assessment	PE	3	0	0	3	40	60	100
5	21CE8311	Construction Safety Practices	PE	3	0	0	3	40	60	100
6	21CE8312	IoT for Smart City Planning	PE	3	0	0	3	40	60	100

OPEN ELECTIVES

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
1	21CE6401	Remote Sensing and GIS	OE	3	0	0	3	40	60	100
2	21CE7401	Interior Design	OE	3	0	0	3	40	60	100

Signature of the Chairman (BoS)

Chairman - BoS
CIVIL - HiCET

Signature of the Dean Academics

Dean (Academics)
HiCET

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Signature of the Principal

PRINCIPAL
Hindusthan College Of Engineering & Technolo
COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7201	WATER RESOURCES AND IRRIGATION ENGINEERING	3	0	0	3

Course Objective

1. To gain knowledge on planning and estimation of water resources for irrigation and drinking
2. To perceive the economics of water resource planning, water quality and water budget
3. To understand the fundamentals of irrigation, its efficiencies and crop water requirements
4. To learn about impounding structures, canal drops and cross drainage works
5. To explore the methods of irrigation and participatory irrigation management

Unit	Description	Instructional Hours
	WATER RESOURCES	
I	Water resources survey – Water resources of India and Tamil Nadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-Levees and flood walls	9
	WATER RESOURCE MANAGEMENT	
II	Economics of water resources planning – National Water Policy – Consumptive and non-consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water	9
	IRRIGATION ENGINEERING	
III	Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water	9
	CANAL IRRIGATION	
IV	Types of Weirs and Dams – Causes of failures and remedies – Diversion Head works – Components and functions – Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining – Kennedy's and Lacey's Regime theory – Sedimentation Control	9
	IRRIGATION MANAGEMENT AND METHODS	
V	Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Understand the concepts of planning and estimation of water resources for irrigation and drinking

CO2: Comprehend the significance of economics of water resource planning, water quality and water budget

CO3: Encompass the fundamentals of irrigation engineering to calculate irrigation efficiencies and crop water requirements

CO4: Illustrate the types of impounding structures, canal drops and cross drainage work

CO5: Classify the different methods of irrigation and interpret participatory irrigation management

TEXT BOOKS:

T1- Linsley, R.K., and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc., 2000.

T2- Garg, S.K.., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009.

REFERENCE BOOKS:

R1- Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005.

R2 - Punmia B.C., "Irrigation and Water Power Engineering", Laxmi Publications, 16th Edition, New Delhi, 2009.

R3 - Asawa G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.

R4 - Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7202	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	3	0	0	3

Course Objective

1. To learn the basics of various dynamic forces and the response of structures to it
2. To study the natural frequency and mode shapes for MDOF systems
3. To understand the elements of seismology and understand the guidelines for earthquake resistant design
4. To study the behavior of the structure in response to earthquakes and the importance of ductility in earthquake resistant design
5. To gain knowledge on the various techniques and codal provisions available for the design of earthquake resistant structures

Unit	Description	Instructional Hours
I	**SINGLE DEGREE OF FREEDOM SYSTEM** Concept of inertia and damping – Types of damping – Difference between static forces and dynamic excitation –Degrees of freedom – SDOF idealization – Equations of motion of SDOF system of mass as well as base excitation –Free vibration of SDOF system – Response to harmonic excitation.	9
II	**MULTIPLE DEGREE OF FREEDOM SYSTEM** Formulation of equation of motion for multidegree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Orthogonality and Normality principles – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.	9
III	**ELEMENTS OF SEISMOLOGY** Introduction – Seismic waves – Earthquake magnitude, intensity of earthquake, epicenter – Plate tectonics – Seismic Energy – Earthquake resistance in masonry building – Short column effect – Soft Storey – Centre of stiffness – Centre of mass – Liquefaction – Potential deficiencies of RC building and masonry building – Remedial measures.	9
IV	**EARTHQUAKE EFFECTS ON STRUCTURES** Effect of earthquake on different types of structures – Behaviour of RCC, Steel and PrestressedConcrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Liquefaction of soil – Response Spectra – Causes of damage – Lessons learnt from past earthquakes.	9
V	**CONCEPTS OF EARTHQUAKE RESISTANT DESIGN** Planning considerations and Architectural concepts – Evaluation of Earthquake forces – Lateral load analysis – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry and RCC buildings - Design considerations – Guidelines– Design and ductile detailing as per IS 13920:2016 codal provisions	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Apply the knowledge of science and engineering fundamentals to idealize and formulate the equations of motion for SDOF system

CO2: Develop the equations of motion for MDOF system and to evaluate the natural frequencies and mode shapes

CO3: Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation

CO4: To identify the various causes and effects of earthquakes on structures due to past earthquakes

CO5: To analyze the structures subjected to dynamic loading and to design for seismic loading as per codal provisions

TEXTBOOKS:

T1- Mario Paz, "Structural Dynamics – Theory and Computations", CBS Publishers, 5th Edition, 2006.

T2 – Agarwal, P. and Shrikhande, M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd., 2011.

REFERENCE BOOKS:

R1 - Minoru Wakabayashi, "Design of Earthquake Resistant Buildings", McGraw Hill Book Company, 1986.

R2 - Moorthy, C.V.R., "Earthquake Tips", NICEE, IIT Kanpur, 2002.

R3 – Clough, R.W. and Penzien, J., "Dynamics of Structures", McGraw Hill International Edition, 2nd Edition, 1995.

R4 – Chopra A.K., "Dynamics of Structures -Theory and Applications to Earthquake Engineering", Pearson Education, 5th Edition, 2016.

CODE BOOKS:

C1- IS 1893(Part- I):2016 "Criteria for Earthquake Resistant Structures – General Provisions and Buildings", Bureau of Indian Standards, New Delhi.

C2-IS 13920:2016 "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice", Bureau of Indian Standards, New Delhi.

C3-IS 4326:2013 "Earthquake Resistant Design and Construction of Buildings - Code of Practice", Bureau of Indian Standards, New Delhi.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	1	1	-	3	-	1	3	3
CO2	3	3	3	3	2	2	1	1	-	3	-	1	3	3
CO3	3	3	3	3	2	2	1	1	-	3	-	1	3	3
CO4	3	3	3	3	2	2	1	1	-	3	-	1	3	3
CO5	3	3	3	3	2	2	1	1	-	3	-	1	3	3
Average	3	3	3	3	2	2	1	1	-	3	-	1	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7203	ESTIMATION, COSTING AND VALUATION	3	1	0	4

Course Objective

1. To familiarize the methods of estimates
2. To understand the schedule of rates for rate analysis
3. To get exposed to various detailed and general specifications to meet out legal requirements
4. To emphasize the importance of proper valuation of buildings
5. To study the principles of report preparation

Unit	Description	Instructional Hours
	ESTIMATION OF BUILDINGS AND STRUCTURES	
I	Introduction to estimation – Purpose of estimates - Methods of estimates – Types of estimates – Units of measurement – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit,sanitary and water supply installations and pipe lines, retaining walls and culverts - Estimate of joineries for paneled and glazed doors, windows, ventilators, handrails, etc.,- Estimate of Rain Water Harvesting System	10+3
	RATE ANALYSIS	
II	Analysis of rates – Concepts and Terminologies - Factors affecting the cost of materials and Labour – Standard method of measurement and standard coefficient factor - Measurement and abstract sheets –Schedule as basis of costs – Plant and equipment costs – Hour costs based on total costs and output – Rate analysis for all building works, canals, and Roads – CPWD/ PWD Standard schedule of rates-BOQ (Bill of Quantities) -BOM (Bill of Materials)	10+3
	SPECIFICATION, TENDERS AND CONTRACTS	
III	Data – Specification – Sources – Detailed and general specification – Arbitration and legal requirements – Tender notices – types – tender procedures – Drafting model tenders, e-tendering - Digital signature certificates - Encrypting - Decrypting – Reverse auctions Contract – Types of Contract - Formation of contract – Contract conditions – Contract for labour, material, design, construction	9+3
	FUNDAMENTALS AND METHODS OF VALUATION	
IV	Principles and purpose of valuation – Types of values – Book value, Salvage Value, Scrap value, Replacement value, Reproduction value, Earning value, Market value, Distress value, Capitalized value – Depreciation – Methods of calculation depreciation – Straight line method, Declining balance method, sinking fund method, Quantity survey method – Duties and Responsibilities of Valuers – Mortgage – Lease – Methods of valuation – Rental method, Belting method, Valuation based on land and building – Valuation from yield	10+3
	REPORT PREPARATION	
V	Principles for report preparation – Report on estimate of building, Arches, Culverts, Roads, Water and Sanitary installations, Tube and Open Wells, Retaining walls, Aqueducts – Introduction to Estimation software	9
	Total Instructional Hours	**60**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1. Produce a detailed estimated report considering the building plan and additional amenities
CO2. Do rate analysisbased on the knowledge gained from schedule of rates
CO3. Specify the importance of detailed and general specifications
CO4. Calculate depreciation and valuate the building
CO5. Prepare a detailed report with accurate specification and values

TEXT BOOKS:

T1- Dutta, B. N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2016.
T2- Kohli, D. D. and Kohli, R. C., "A Text Book of Estimating and Costing (Civil)", S. Chand & Company Ltd., 2013.

REFERENCE BOOKS:

R1- "Hand Book of Consolidated Data" – 8/2000, Vol.1, TNPWD.
R2- "Tamilnadu Transparencies in Tender Act", 2000.
R3- "Standard Bid Evaluation Form, Procurement of Goods or Works", The World Bank,1996.
R4- "Standard Data Book for Analysis and Rates", IRC, New Delhi, 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7001	**DESIGN AND DRAWING OF STEEL STRUCTURES**	0	0	4	2

Course Objective

1. Understand the procedure involved in analysis and design of steel structures
2. Get exposure to the various commands used in modeling and designing of structures using software applications
3. Incorporate the design results and values in the steel structural drawings

Expt . No.	Description of the Experiment
1.	Analysis, design and drawing of steel beam by STAAD.Pro
2.	Analysis, design and drawing of steel frame by STAAD.Pro
3.	Analysis, design and drawing of steel truss by STAAD.Pro
4.	Analysis, design and drawing of industrial building by STAAD.Pro
5.	Design and drawing of steel tank
6.	Design and drawing of plate girder
7.	Design and drawing of gantry girder

Total Practical Hours 45

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Acquire hands on experience in designing and proficiently use the software packagesfor steel structural design
CO2: Design and drawsteel roof truss elements
CO3: Design and draw industrial building with different components
CO4: Design and draw various types of steel water tanks
CO5: Design and draw plate girder and gantry girder

REFERENCE BOOKS:

R1- Krishnaraju N., "Structural Design & Drawing Reinforced Concrete and Steel", Universities Press, 2013.
R2- Punmia B C, Ashok Kumar Jain, Arun Kumar Jain., "Comprehensive Design of Steel Structures", Laxmi Publication Pvt. Ltd., 2015.
R3- Krishnamurthy D., "Structural Design and Drawing", Vol.I , II & III, CBS Publishers, 2010.
R4- Shah V L., Veena Gore, "Limit State Design of Steel Structures", 1st Edition , Structures Publications, 2009.

CODE BOOKS:

C1- IS 800: 2007, "General Construction in Steel- Code of Practice", Bureau of Indian Standards, New Delhi, 2007.
C2- IS 875(1, 2, 3): 2015,"Indian Standard Specification for Design Loads for Buildings, BIS, New Delhi, 2015.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7901	**PROJECT I - DESIGN PROJECT**	0	0	4	2

Course Objective To impart knowledge and improve the design capability of the student.

Description	Total Hours
This course conceives purely a design problem in any one of the disciplines of Civil Engineering. e.g. Design of an RC structure, Design of a wastewater treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. The students have to undergo and successfully complete a course on an analysis and design software application of their choice / related to their design project, either in-house or from an authorized training centre. The minimum duration of such courses must be at least 45 hours. At the end of the course, the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.	**45**

Course Outcome Upon successful completion of the course, students will have better experience in designing the various structures / components / processes related to Civil Engineering.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7204	ADVANCED STEEL STRUCTURES	3	0	0	3

Course Objective

1. To design steel members, including purlins and gable wind girders, subjected to combined forces.
2. To explain and design various steel connections, such as welded, bolted, flexible, and moment-resisting connections.
3. To analyze and design industrial structures, including trusses and portal frames, subjected to wind and seismic forces.
4. To understand the impact of axial and shear forces on steel structures, and analyze continuous beams and frames using plastic theory.
5. To evaluate the behavior and design of compression and flexural members in cold-formed steel structures.

Unit	Description	Instructional Hours
I	**GENERAL** Design Philosophies and Design Codes – Stability Criteria –Beam- Columns and Frames (Sway and Non-Sway) – Design of members subjected to combined forces – Design of Purlins, Louver rails, Gable column and Gable wind girder.	9
II	**DESIGN OF CONNECTIONS** Types of connections – Welded and Bolted – Design of simple base, Gusseted base and Moment Resisting Base – Flexible Connections - Seated Connections – Unstiffened and Stiffened Seated Connections – Moment Resistant Connections– Clip angle Connections – Split beam Connections.	9
III	**ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS** Structural Configurations - Functional and Serviceability Requirements- Analysis and design of different types of trusses – Analysis and design of industrial buildings – Sway and non-sway frames –Gantry Girders.	9
IV	**PLASTIC ANALYSIS OF STRUCTURES** Introduction, Shape factor - Moment redistribution - Beam, Sway, Joint and Gable mechanisms - Combined mechanisms– Analysis of portal frames. Effect of axial force and shear force on plastic moment capacity. Connection Requirements– Moment resisting connections - Design of Straight Corner Connections –Design of continuous beams.	9
V	**DESIGN OF LIGHT GAUGE STEEL STRUCTURES** Introduction to Direct Strength Method - Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Design steel members like purlins and gable wind girders under combined forces.

CO2: Explain and design various steel connections, both welded and bolted, including flexible and moment-resisting types.

CO3: Analyze and design industrial structures, including trusses and portal frames, under wind and seismic forces.

CO4: Explain the effects of axial and shear forces on steel structures and apply plastic theory to analyze continuous beams and frames.

CO5: Evaluate and design compression and flexural members in cold-formed steel structures.

TEXT BOOKS:

T1 – Lynn S. Beedle, "Plastic Design of Steel Frames", John Wiley and Sons, 1997.

T2 - Narayanan.R, "Teaching Resource on Structural steel Design", INSDAG, Ministry of Steel Publishing, 2000.

REFERENCE BOOKS:

R1 – Subramanian. N, "Design of Steel Structures", Oxford University Press, 2015.

R2 – Wei-Wen Yu, Roger A. LaBoube, "Cold Formed Steel Design", John Wiley & Sons, Inc., 2010

R3 – S.K. Duggal, "Limit State Design of Steel Structures", McGraw Hill Book Company, 3rd edition, 2019

R4 – Bhavikatti S.S, "Design of Steel Structures", I. K. International Publishing House Pvt. Ltd., 5th edition 2017.

CODE BOOKS:

C1 - IS 800:2007 (R 2017), "General Construction In Steel - Code of Practice", BIS, New Delhi, 2017.

C2 - IS 801:1975 (R 2021), "Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members In General Building Construction", BIS, New Delhi, 2021.

C3 - IS 811 : 1987 (R 2019), "Cold Formed Light Gauge Structural Steel Sections", BIS, New Delhi, 2019.

C4 - IS 875 : Part 1 : 1987 (R 2018), "Code of Practice For Design Loads (Other Than Earthquake)For Buildings And Structures

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Part 1 Dead Loads - Unit Weights of Building Material And Stored Materials", BIS, New Delhi, 2018.
C5 - IS 875 : Part 2 : 1987 (R 2018), "Code of Practice for Design Loads (Other Than Earthquake) For Buildings And Structurres: Part 2 Imposed Loads", BIS, New Delhi, 2018.
C6 - IS 875 : Part 3 : 2015 (R 2020), "Design Loads (Other than Earthquake) for Buildings and Structures - Code of Practice Part 3 Wind Loads (Third Revision)", BIS, New Delhi, 2020.
C7 - IS 875 : Part 5 : 1987 (R 2018), "Code of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures Part 5 Special Loads And Combinations", BIS, New Delhi, 2018.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7208	DESIGN OF STEEL – CONCRETE COMPOSITE STRUCTURES	3	0	0	3

Course Objective

1. To Understand principles of steel-concrete composite construction and serviceability issues.
2. To Explore the design of shear connections and partial shear interaction.
3. To Design composite beams, slabs, columns, and trusses effectively.
4. To Understand behavior and design concepts of composite box girders.
5. To Analyze real-world examples of composite construction and seismic behavior.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to steel - concrete composite construction – Codes – Composite action – Serviceability and - Construction issues.	9
II	**DESIGN OF CONNECTIONS** Shear connectors – Types – Design of connections in composite structures – Degree of shear connection – Partial shear interaction	9
III	**DESIGN OF COMPOSITE MEMBERS** Design of composite beams, slabs, columns, beam – columns - design of composite trusses	9
IV	**COMPOSITE BOX GIRDER BRIDGES** Introduction - behaviour of box girder bridges - design concepts.	9
V	**CASE STUDIES** Case studies on steel - concrete composite construction in buildings - seismic behaviour of composite structures.	9
	Total Instructional Hours	**45**

Course Outcome

The students will be able to:

CO1:Explain composite construction principles and serviceability considerations.
CO2: Design shear connections, considering types and partial interaction.
CO3: Design composite beams, slabs, columns, and trusses effectively.
CO4: Comprehend behavior and design concepts of composite box girders.
CO5: Analyze case studies on composite construction and seismic behavior.

TEXTBOOKS:

T1:Johnson R.P., "Composite Structures of Steel and Concrete Beams. Slabs. Columns and Frames for Buildings", Vol.I, Blackwell Scientific Publications, 2004.
T2:Oehlers D.J. and Bradford M.A., "Composite Steel and Concrete Structural Members, Fundamental behaviour", Pergamon press, Oxford, 1995.

REFERENCE BOOKS:

R1: Owens.G.W and Knowles.P, "Steel Designers Manual", Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.
R2: R. Narayanan, "Steel-Concrete Composite Structures", Spon Press, Taylor & Francis Group London, 2014
R3: Qing Quan Liang, "Analysis and Design of Steel and Composite Structures", CRC Press – 2017

CODE BOOK:

C1: IS3935:1966 (R 2022), "Code of practice for composite construction", BIS, New Delhi, 2022.
C2: IS 11384: 2022, "Composite Construction in Structural Steel and Concrete - Code of Practice", BIS, New Delhi, 2022.
C3: EN1994 (Eurocode 4), "design of composite steel and concrete structures", European Committee for Standardization (CEN), 2004.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	2	1	-	-	2	1	1	3	2
CO2	3	3	3	2	2	-	2	-	-	2	2	-	3	2
CO3	3	3	3	2	2	1	2	-	-	2	2	1	3	2
CO4	3	2	3	2	2	1	2	-	-	2	2	1	3	2
CO5	3	3	3	3	2	2	2	2	2	3	3	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7205	SOLID AND HAZARDOUS WASTE MANAGEMENT	3	0	0	3

Course Objective

1. To develop a comprehensive understanding of waste management, legal frameworks, stakeholders, and financing.
2. To explore waste generation, solid waste composition, and hazardous characteristics.
3. To acquire skills in waste segregation, optimization, and hazardous waste management.
4. To learn technologies for sustainable waste processing and material separation.
5. To explore landfill options, considering design, operation, and environmental factors.

Unit	Description	Instructional Hours
I	**SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK** Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes , plastics and fly ash – Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management.	9
II	**WASTE CHARACTERIZATION AND SOURCE REDUCTION** Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse	9
III	**STORAGE, COLLECTION AND TRANSPORT OF WASTES** Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport	9
IV	**WASTE PROCESSING TECHNOLOGIES** Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes- treatment of biomedical wastes - Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.	9
V	**WASTE DISPOSAL** Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Analyze, propose, and implement diverse waste management strategies with stakeholder engagement.
CO2: Implement source reduction, engage in waste exchange, and understand extended producer responsibility principles.
CO3: Demonstrate proficiency in implementing effective hazardous waste handling and adhering to protocols.
CO4: Apply efficient waste processing, considering health and environmental impact mitigation strategies.
CO5: Acquire landfill management skills, including site selection, operation, closure, and environmental rehabilitation.

TEXT BOOKS:

T1 – George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill International edition, New York, 1993.

T2 - Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.

REFERENCE BOOKS:

R1 – CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2000.

R2 – Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.

R3 – Paul T Williams, Waste Treatment and Disposal, Wiley, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7209	ENVIRONMENTAL IMPACT AND RISK ASSESSMENT	3	0	0	3

Course Objective

1. To analyze India's EIA history, legal frameworks, process intricacies, and public participation.
2. To explore EIA tools for predictions and assessments, including matrices and networks.
3. To examine social impacts, focusing on individual, family, and community aspects.
4. To enhance skills in EIA, management plans, and ethics through case studies.
5. To comprehend environmental risk assessment framework, covering hazard, exposure, and characterization.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA –.EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA	8
II	**IMPACT INDENTIFICATION AND PREDICTION** Matrices – Networks – Checklists –Cost benefit analysis – Analysis of alternatives-– Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment	9
III	**SOCIO-ECONOMIC IMPACT ASSESSMENT AND EIA DOCUMENTATION** Social economic impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation.	9
IV	**ENVIRONMENTAL MANAGEMENT PLAN** Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies	9
V	**ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT** Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs	10
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: InterpretEIA's legal aspects, stages, and public involvement effectiveness.

CO2: Master diverse tools, including modeling, for comprehensive impact assessments.

CO3: Acquire skills in documenting, organizing, and presenting EIA findings effectively.

CO4: Achieve proficiency in ethical EM planning, implementation, and review processes.

CO5: Develop expertise in risk management tools for effective communication and preparedness.

TEXT BOOKS:

T1 – Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996

T2 - Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003

T3 - Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012

REFERENCE BOOKS:

R1 – World Bank –Source book on EIA

R2 – Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.

R3 – Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.

R4 – K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2		-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7206	ADVANCED FOUNDATION ENGINEERING	3	0	0	3

Course Objective

1. To gain the knowledgeselectionoffoundation based on condition
2. To analyze the load bearing capacity of soil.
3. To design shallow and deep foundations in soil.
4. To estimate the capacity of Pilefoundations.
5. To understand the concept of special foundations considering theory of vibration

Unit	Description	Instructional Hours
I	**INTRODUCTION OF FOUNDATION** Introduction - Typesoffoundations–Typesofshallowfoundation–Designconcept-Generalrequirements-Additionalconsideration-selectionoftypeoffoundation–hostileenvironment.	9
II	**BEARING CAPACITY** Bearing capacity of shallow foundations - Homogeneous - Layered soils - Soft and Hard Rocks - Evaluation of bearing capacity from insitu tests - partial safety factor approach –	9
III	**DESIGN OF FOUNDATION** Analysis of foundation - isolated - strip - combined footings - Flat raft – Stiffened raft foundations - Conventional - elastic approach - Soil Structure Interaction Principles – Winkler foundation – Elastic half space approach – Structural design of Shallow foundation	9
IV	**PILE FOUNDATION** Allowable load evaluation of piles and pile groups – Static method – cohesive– cohesion less soil – time effects – Dynamic method – pile driving formulae – Wave equation application – modeling – theoretical analysis – Interpretation of field test results and pile load test results – Introduction to lateral loaded piles - Settlement of Piles and Pile groups.	9
V	**SPECIAL FOUNDATION** Introduction to special foundations - Foundation design in relation to ground movements - Foundation on recent refuse fills - Design of Foundation for seismic forces - recommendations - Introduction to theory of vibration - Design of Block foundation	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: To select the foundation based on condition
CO2: To analyze the load carrying capacity of soil.
CO3: To design shallow and deep foundations on various ground conditions.
CO4: To calculate capacity of pile foundations.
CO5: To understand the basic concepts of special foundations considering theory of vibrations.

TEXT BOOKS:

T1. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2017.
T2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2014.
T3. Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", Pearson Education, 2nd Edition, 2013.
R2. Gopal Ranjan and Rao A.S.R. "Basic and Applied Soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
R3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3		2	1	1	2	1	2	3	3	3
CO2	2	2	3	3		2		1	1	1		3	2	3
CO3	2	3	3	3		2	1	1	1	1		3	3	3
CO4	3	3	3	3		1		1	1	1	1	3	3	2
CO5	3	2	3	3		2	1	1	1	1	2	3	2	3
Average	2.4	2.6	3	3	0	1.8	0.6	1	1.2	1	1	3	2.6	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7210	FOUNDATION IN EXPANSIVE SOILS	3	0	0	3

Course Objective

1. To understand Mineralogy of expansive soil
2. To study the behavior of Swelling in expansive soil
3. To gain knowledge on Shear strength of expansive soils
4. To study the types, functions and Foundation Practices
5. To learn the various types of Ground improvement techniques adopted on expansive soil

Unit	Description	Instructional Hours
	MINERALOGY	
I	Introduction of expansive soil – Identification of expansive soil – Clay Mineralogy: Nature of Soils-Clay mineral structure-Diffused double layer theory- Cation exchange –Soil water - Soil Structure - Soil water interaction	9
	SWELLING CHARACTERISTICS	
II	Swelling Characteristics-Swelling-Factors effecting Swelling-Swelling Potential-Swell Pressure-Methods of Determination- Free swell Index Test – Differential free swell test –Swell potential and Swelling pressure-Factors effecting Swelling potential and swell pressure	9
	SHEAR STRENGTH	
III	Shear strength of expansive soils-Katti's concept of bilinear envelope-Stress –state variables in partly saturated soils-Frelend's strength parameters-Determination of matrix suction by filter paper method-axis translation technique and field suction measurement.	9
	FOUNDATION PRACTICES	
IV	Sand Cushion-Belled Piers-CNS layer technique-Under reamed Pile foundation-Construction Techniques-Design Specifications-Load-carrying capacity in compressive and uplift of single and multi under reamed piles in clays and sands-Granular pile Anchors.	9
	GROUND IMPROVEMENT TECHNIQUES	
V	Ground improvement techniques – introduction – commonly used methods – pre loading, use of sand drains, densification of soils by vibro floatation, Sand compaction piles, simple stone columns, blasting, heating Stabilization of soil - grouting methods (Compaction grouting, slurry injection grouting only), soil reinforcement- geo-grid and geo-textiles.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Demonstrate Mineralogy of expansive soils.
CO2: Comprehend the swelling characteristics on expansive soils.
CO3: Estimate the shear strength of expansive soils.
CO4: Apply the gained knowledge for selection of foundation in expansive soil
CO5: Select additives and methodology for stabilization.

TEXT BOOKS:

T1. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2017.
T2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2014.
T3. Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", Pearson Education, 2nd Edition, 2013.
R2. Gopal Ranjan and Rao A.S.R. "Basic and Applied Soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
R3. Varghese, P.C., "Foundation Engineering". Prentice Hall of India Private Limited, New Delhi, 2005.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	-	2	1	1	2	1	2	3	3	3
CO2	2	2	3	3	-	2	-	1	1	1	-	3	2	3
CO3	2	3	3	3	-	2	1	1	1	1	-	3	3	3
CO4	3	3	3	3	-	1	-	1	1	1	1	3	3	2
CO5	3	2	3	3	-	2	1	1	1	1	2	3	2	3
Average	2.4	2.6	3	3	-	1.8	0.6	1	1.2	1	1	3	2.6	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	21CE7207	GEOGRAPHICAL INFORMATION SYSTEM	3	0	0	3

Course Objective

1. To understand the concepts and protocols used in Open source GIS.
2. To know the functionalities of Open source GIS software in Desktop and Web based environments.
3. To understand the GIS data models.
4. To understand the concepts of DBMS and user interface.
5. To acquire the knowledge of open-source software in web mapping.

Unit	Description	Instructional Hours
	BASICS OPEN SOURCE SOFTWARE	
I	Open Source software and Freeware. Open Source Licensing Models. W3C, WWW and Protocols–Software standards and opensource GIS-OGC. GDALand OSGeo,FOSS4G-Opensource software for Desktop GIS and WEB Mapping- Proprietary vs Opensource- OGC Standards.	9
	DEVELOPMENT ENVIRONMENT	
II	Linux and Windows–PostgreSQL and Database Engines-C,C++,OOP and Java streams-GNU, Mosix–WAP and Android stack–Scripts and Macros	9
	DATA MODELS FOR GIS	
III	View Graphics–Data exchanges-portability and interoperability–Raster handling and Image analysis–vector data management–Raster and vector analysis-2D/3Dvectors with topology,3D Voxel,2D Raster	9
	DATABASE MANAGEMENT AND USER INTERFACE	
IV	Files vs Database-Distributed operations and Architecture–ODBC-Open source Database management tools- Database: Spatial and Attribute queries Spatial functions and Analysis–Map Server, Application Server and Database server concepts.	9
	OPEN SOFTWARE AND WEB MAPPING	
V	Open Source Software: GRASS, QGIS, OSSIM, PostgreSQL and R Environment–WEB Mapping Architecture and components–WEB mapping servers-Thin clients in WEB mappingWMS,WFS,WCS,WPS and Restful web services- Open API.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, the student will have ability to
CO1: Demonstrate a comprehensive understanding of concepts and protocols utilized in Open Source GIS.
CO2: Evaluate the functionalities of Open Source GIS software in both Desktop and Web-based environments.
CO3: Describe and apply various GIS data models effectively.
CO4: Explain the principles of Database Management Systems (DBMS) and their role in GIS.
CO5: Utilize open-source software effectively for web mapping applications.

TEXT BOOKS:

T1. Mitchell T.,"Web mapping illustrated",O'Reilly Media Inc.,Sebastopol, Canada, 2005
T2. Helena M,"Open source GIS:A GRASS GIS approach",3rd edn, Springer, NewYork, 2008
T3. Bill Kropla, "Beginning Map Server: Open Source GIS Development", A press (Springer Verlog) New York, 2005.

REFERENCE BOOKS:

R1. Peng, Z.R. and Tsou, M.H. Internet GIS: distributed geographic information services for the Internet and wireless networks. New York: John Wiley and Sons, New York, 2003.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1		2	1		1	2	2		3	2	2
CO2	3	3	3		3	1		2	2	1	2	3	2	2
CO3	3	3	3		2	1	1	2	2	1	1	3	2	2
CO4	3	3	3		3	1	1	2	1	2	2	3	2	2
CO5	3	3	2		2	1	1	2	2	2	1	3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	21CE7211	MODERN SURVEYING	3	0	0	3

Course Objective

1. To understand the rudiments of various surveying measurement and its adjustment.
2. To imparts knowledge in computation of positions and azimuth using astronomical observation
3. To develop the required skills in route surveying fundamentals necessary to provide geomatic solutions.
4. To understand the procedure of conducting the mine surveying.
5. To Imparts knowledge in computation of positions and levels water bodies.

Unit	Description	Instructional Hours
I	**SURVEY ADJUSTMENTS AND THEORY OF ERRORS** Introduction : Kinds of Errors – The Law of Accidental Errors – General Principle of Least Squares – Law of Weights – Determination of Probable Error – Distribution of Error of the Field Measurements – Normal Equations – Determination of the Most Probable Values – Method of Correlates – Triangulation Adjustments – Figure Adjustment – Adjustment of a Geodetic Triangle – Adjustment of Chain of Triangles – Adjustment of two connected Triangles – Adjustment of a Geodetic Quadrilateral – Adjustment of a Quadrilateral with a central Station by Method of Least Squares – Adjustments of Geodetic Triangles with Central Station by Method of Least Squares	9
II	**FIELD ASTRONOMY** Definition of Astronomical Terms – Co-ordinate Systems – The Terrestrial Latitude and Longitude – Spherical Trigonometry and Spherical Triangle – The Astronomical Triangle Relationship Between Co-ordinates – The Earth and the Sun – Unites of Time – Interconversion of Time – Instrumental and Astronomical Corrections to the observed Altitude and Azimuth – Determination of Azimuth – The Determination of Latitude – Determination of Longitude	9
III	**TOPOGRAPHIC AND ROUTE SURVEYING** Topographic Surveying: Planimetric map, concept of map scale, Mapping software's, Methods of Representing Relief – Contours and Contour Interval – Characteristics of Contours– Methods of Locating Contours – Interpolation of Contours – Procedure in Topographic Surveying Route Surveying for Highways, Railways, Power line and Canal – Reconnaissance survey, Preliminary survey and Location survey by Conventional method and Geomatics techniques - Setting Out Simple curves, Compound curves, Reverse Curve, Transition and Vertical curves – Sight distance.	9
IV	**MINE SURVEYING** Equipment for Mine Surveys: The Transit – The stations and Station Markers – Measurement of Distance and difference in Elevation – Tunnel Alignment and Setting Out – Suspension Mining Compass – Brunton's Universal Pocket Transit – Mountain Compass Transit. Azimuth transfer methods: Single Wire, The Weisbach Triangle, The Weiss Quadrilateral, Azimuth by Gyroscope - Shafts and Adits - Vertical control transfer by shaft plumbing.	9
V	**HYDROGRAPHIC SURVEYING** Tides and Datums: Overview of hydrographic surveying concepts - bathymetric and nautical chart - Basic tidal theory - tidal observations and prediction - common types of recording tide gauges - Different vertical datums - Soundings: Overview of depth data types - Working principle of echo sounder - characteristics of underwater acoustic signals – transducers - Error sources and calibration - Advanced instrumentation - Navigation and Position Fixing: Horizontal positioning methods and 117 requirements - Concept of line and surface of position - Positioning and navigation using satellite positioning systems.	9
	Total Instructional Hours	**45**

Course Outcome

On completion of the course, the student is expected to
CO1: Demonstrate surveying measurement techniques and adjustment procedures.
CO2: Accurately compute positions and azimuth using astronomical observation.
CO3: Develop proficiency in route surveying for geomatic solutions.
CO4: Conduct mine surveying effectively.
CO5: Compute positions and levels of water bodies accurately.

TEXT BOOKS:

T1: J. Uren and W.F. Price, Surveying for Engineers, Palgrave macmillan, Fifth Edition, 2010.
T2: Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 16th Edition, 2019.

REFERENCE BOOKS:

R1: R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
R2: James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
R3: K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.
R4: C. Venkatramaiah, Textbook of Surveying, Universities Press, Second Edition, 2011.
R5: T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.
R6: R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2			2			3	2	2
CO2	3	3	2	3	2	3			2			2	2	2
CO3	3	2	3	3	3	2			2			2	2	2
CO4	3	2	2	3	3	2			2			2	2	2
CO5	3	3	2	2	3	3			2			2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7601	**BASIC STRUCTURAL ENGINEERING**	3	0	0	3

Course Objective

1. To gain knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and loading
2. To know the concepts of truss analysis.
3. To gain knowledge on the design the RC beams and columns by limit state method of design
4. To understand the concept of limit state design and design of connections
5. To gain knowledge on the design of steel compression members and steel beams

Unit	Description	Instructional Hours
I	**INTRODUCTION** Need of analysis, techniques of structural idealization, basic tools of analysis, reactions instructure, notations and sign conventions, free – body diagrams, static determinacy, stability of structures,principle of superposition, loads on structures – Types of beams, loads and reactions - Shear force and bending moment -Relationships between load, shear force and bending moment Shear Force and Bending Moment Diagrams for Simply Supported Beams.	9
II	**ANALYSIS OF TRUSSES** Perfect, deficient and redundant trusses - Degree of redundancy – Internal and external redundancy – Methods of analysis - Method of joints	9
III	**DESIGN OF RC ELEMENTS** Objective of structural design -Steps in RCC Structural Design Process- Concept of Limit State Design Methods for RCC - Design of singly reinforced beams by Limit State Method – Types of columns –Design of short rectangular Axially Loaded column	9
IV	**DESIGN OF CONNECTIONS** Properties of steel -Structural steel sections –Limit state design concepts – Loads on structures – Connections – Design of Bolted and welded joints	9
V	**DESIGN OF STEEL STRUCTURAL ELEMENTS** Basis of current codal provision for compression member design– Design of single section and compound section compression members - Design of laterally supported beams	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Determine Shear force and bending moment in beams and understand concept of Structural Analysis

CO2: Analyse the determinate trusses.

CO3:Design RC beams and columns using limit state method.

CO4: Gain knowledge on the limit state concepts and design connections.

CO5: Design compression members and beams in steel.

TEXT BOOKS:

T1 - Bansal R.K. "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, 2018

T2 - Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2019.

T3 - Bhavikatti S.S., "Design of Steel Structures", I. K. International Publishing House Pvt. Ltd., 2009

REFERENCE BOOKS:

R1 - Rajput R K.," A Textbook of Strength of Materials", S. Chand Publishing, New Delhi, 2018.

R2 - Punmia, B. C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd., New Delhi, 2007.

R3 - Gambhir, M.L., "Fundamentals of Structural Steel Design", McGraw Hill EducationIndia Pvt. Ltd., New Delhi, 2013.

R4 – Dayarathnam P., "Design of Steel Structures", S Chand Publishers, New Delhi, 2012.

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CODE BOOKS:

C1 – IS 456:2000 (R2016). "Code of practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2016.

C2 – SP 16:1980 "Design Aids for Reinforced Concrete to IS456:1978", Bureau of Indian Standards, New Delhi, 1999.

C3 - IS 800:2007 General Construction In Steel - Code of Practice, Bureau of IndianStandards, New Delhi, 2007

C4 – SP6(1)-1964 - Handbook for Structural Engineers –Part 1- Structural SteelSections, Bureau of Indian Standards, New Delhi, 1974.

C5 - IS 875 (Part – 3) 2015 - Design Loads (Other than Earthquake) for Buildings andStructures - Code of Practice – Part 3-Wind Loads, Bureau of Indian Standards, New Delhi.

C6 - Murugesan, R. &Arulmanickam, A. P. "Steel Tables (S.I. Units)" - Fifth Edition, Pratheeba Publishers, 2009.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7602	WATER AND WASTEWATER TREATMENT	3	0	0	3

Course Objective

1. To gain knowledge on the characteristics of water, water quality standards and water supply system based on demand
2. To learn the unit operations and understand the design of various components of water treatment plants.
3. To acquire adequate knowledge on water distribution, systems of plumbing and house service connections.
4. To understand the design of sewerage system.
5. To be conversant with the methods of water distribution, systems of plumbing and house service connections

Unit	Description	Instructional Hours
I	**WATER SUPPLY SYSTEM** Estimation of surface and subsurface water sources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological characteristics -Waterborne diseases - Standards for potable water, Intakes of water- Pumping and gravity systems.	9
II	**WATER TREATMENT** Objectives - Unit operations - Principles, functions, and design of water treatment plant units, Plain sedimentation tanks - Aerators of flash mixers, Coagulation and flocculation – Clari flocculator - Sand filters - Disinfection - Water softening - removal of iron and manganese - Defluoridation - Desalination - Residue Management	9
III	**WATER STORAGE AND DISTRIBUTION** Storage and balancing reservoirs - types, location and capacity- Pipe materials - Laying, joining and testing of pipes - Distribution system: layout, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.	9
IV	**PLANNING AND DESIGN OF SEWERAGE SYSTEM** Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Sewage pumping-drainage in buildings	9
V	**SEWAGE TREATMENT AND DISPOSAL** Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - Waste Stabilization Ponds - Recent Advances in Sewage Treatment - Discharge standards - Disposal of sludge.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Understand the importance of water quality standards and demand of water
CO2: Interpret the unit operations and maintenance of water treatment plants
CO3: Comprehend thewater storage and distribution systems
CO4: Design the sewers and sewerage systems
CO5: Recognize the various sewage treatment and sludge disposal methods

TEXT BOOKS:

T1 - Punmia, B. C. , Ashok K. Jain, and Arun K. Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
T2 - Garg, S. K, "Environmental Engineering" Vol. I, Khanna Publishers, New Delhi, 2015.
T3 - Garg, S.K., "Environmental Engineering" Vol.II, Khanna Publishers, New Delhi, 2015.

REFERENCE BOOKS:

R1 - Birdie, G.S, and Birdie. J. S., "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 2012.
R2 - Metcalf and Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill Company, New Delhi, 2010.
R3 - Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
R4 - Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning, Design and Operation", Prentice Hall of India Learning Private Limited, New Delhi, 2009.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7603	MATERIALS FOR ENERGY SUSTAINABILITY	3	0	0	3

Course Objective

1. To introduce the fundamental concepts of energy sustainability in civil engineering.
2. To explore the integration and impact of renewable energy systems in construction.
3. To understand the importance and technologies of energy storage solutions.
4. To examine sustainable materials and techniques used in green buildings.
5. To investigate emerging trends and innovations in sustainable construction materials.

Unit	Description	Instructional Hours
	INTRODUCTION TO ENERGY SUSTAINABILITY IN CIVIL ENGINEERING	
I	Overview of energy sustainability concepts - Role of civil engineering in promoting energy sustainability - Current energy consumption trends and challenges in the built environment - Environmental impact of traditional construction practices - Introduction to life cycle assessment of materials	9
	RENEWABLE ENERGY SYSTEMS IN CIVIL ENGINEERING	
II	Principles of solar energy and photovoltaic materials - Solar panel integration in buildings and infrastructure - Wind energy materials and structural design considerations - Geothermal energy systems and materials for construction - Case studies of renewable energy projects in civil engineering	9
	ENERGY STORAGE SOLUTIONS	
III	Importance of energy storage in sustainable infrastructure - Battery technologies and materials (e.g., lithium-ion, solid-state) - Supercapacitors and their applications in civil engineering - Integration of energy storage systems in buildings and grids - Advances in materials for high-capacity and durable energy storage	9
	GREEN BUILDING MATERIALS AND TECHNIQUES	
IV	Sustainable construction materials (e.g., recycled, reclaimed, bio-based) - Properties and performance of green building materials - Energy-efficient insulation materials and techniques - Smart materials for energy management in buildings - Certification systems for sustainable building materials	9
	FUTURE TRENDS AND INNOVATIONS IN SUSTAINABLE MATERIALS	
V	Emerging materials for energy-efficient infrastructure - aerogels, phase change materials - Nanomaterials and their applications in sustainable construction - Advances in sustainable pavement and road materials - The role of 3D printing and prefabrication in sustainable construction - Challenges and opportunities in adopting innovative sustainable materials	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Understand the role and importance of energy sustainability in civil engineering.
CO2: Analyze and apply renewable energy systems in civil engineering projects.
CO3: Gain knowledge of various energy storage technologies and their applications.
CO4: Learn about green building materials and techniques to enhance energy efficiency.
CO5: Aware of emerging trends and innovative materials in sustainable construction

TEXT BOOKS:

T1 - Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery"5th Edition, Wiley, 2022.
T2 –Ross Spiegel and Dru Meadows "Green Building Materials: A Guide to Product Selection and Specification"3rd Edition, Wiley, 2010
T3 - Abdul Ghani Olabi"Energy Storage for Sustainable Microgrid" 1st Edition, Academic Press, 2021
T4 - Frank Kreith and D. Yogi Goswami"Principles of Sustainable Energy Systems" 3rd Edition, CRC Press, 2020

REFERENCE BOOKS:

R1 –Meg Calkins, "Materials for Sustainable Sites: A Complete Guide to the Evaluation, Selection, and Use of Sustainable Construction Materials" 1st Edition, Wiley (2008)
R2 –Dr. SudhirBaijnathOjha, Mr. GajanaCharpe, Aparna Srivastava, "Sustainable Green Energy for Sustainable Development", Scientific International Publishing House.
R3 -Francesco Colangelo and Rabin Tuladhar"Handbook of Sustainable Concrete and Industrial Waste Management" 1st Edition, Woodhead Publishing Co. Inc., (2021)
R4 – Alfred Rufer, "Energy Storage: Systems and Components", 2nd Edition (2017), CRC Press

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7604	**GREEN TECHNOLOGY**	3	0	0	3

Course Objective

1. To understand the sources of energy and present scenario in India
2. To comprehend the energy system of the present and future in order to promote sustainable development.
3. To familiarize oneself with the distinct requirements for green building and green roads.
4. To grasp the fundamentals of green chemistry.
5. To gain the knowledge on the green nano-materials used in construction.

Unit	Description	Instructional Hours
I	**ENERGY SOURCES** Introduction to nexus between Energy, Environment and Sustainable Development;Energy transformation from source to services; Energy sources, sun as the source of energy; biologicalprocesses; photosynthesis; food chains, classification of energy sources, quality and concentration ofenergy sources; fossil fuel reserves - estimates, duration; theory of renewability, renewable resources;overview of global/ India's energy scenario.	9
II	**GREEN ENERGY AND SUSTAINABLE DEVELOPMENT** The inseparable linkages of life supporting systems,biodiversity and ecosystem services and their implications for sustainable development; global warming;greenhouse gas emissions, impacts, mitigation and adaptation ; future energy Systems- clean/green energytechnologies; International agreements/conventions on energy and sustainability - United NationsFramework Convention on Climate Change (UNFCC); sustainable development	9
III	**GREEN BUILDING AND ROADS** Utility of Solar energy in buildings concepts of Solar Passive Cooling andHeating of Buildings. Green Composites for buildings: Concepts of Green Composites. Water Utilizationin Buildings, Low Energy Approaches to Water Management.Management of Solid Wastes.Managementof Sullage Water and Sewage.Urban Environment and Green Buildings. Green Cover and BuiltEnvironment. Green roads and its construction procedure	9
IV	**GREEN CHEMISTRY** Introduction to Green Chemistry: Principles of Green Chemistry, Reasons for GreenChemistry (resource minimisation, waste minimisation, concepts), Green reactions solvent free reactions,Catalyzed (heterogeneous/homogeneous) reactions, MW/ Ultrasound mediated reactions, Bio catalysts etc	9
V	**GREEN NANOTECHNOLOGY** Introduction to nanomaterials: Nanoparticles preparation techniques, Nanomaterials for Green Systems: Green materials, including biomaterials, biopolymers, bioplastics, and composites Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, andLighting. Paints, Roofs, Walls, and Cooling.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Analyze the diverse sources of energy and evaluate the current energy landscape in India.

CO2: Develop the ability to analyze and compare existing energy systems while proposing strategies for future sustainable development.

CO3: Equipped to identify and apply the specific criteria necessary for the implementation of green building practices and eco-friendly road construction.

CO4: Know the basics of green chemistry and how it helps the environment.

CO5: Familiar with using eco-friendly materials in construction for a greener future.

TEXT BOOKS:

T1 - Khan B.H, Non conventional energy resources, Tata McGraw-Hill, New Delhi 2006.

T2 –Suresh V., "Introduction to Green Buildings & Built Environment", Indian Green Building Council, BSP Books, 2023.

T3 - Paul T.Anastas and John C. Warner, "Green Chemistry: Theory and Practice", Oxford, University Press, 2000

T4 - Dr. Adv. HarshulSalva., "Green Building : Principles & Practices", Notion Press, 2021

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REFERENCE BOOKS:

R1 –Hariharalyer., "Green Building Fundamentals", Notion Press, 2022.
R2 –Dr. SudhirBaijnathOjha, Mr. GajanaCharpe, Aparna Srivastava, "Sustainable Green Energy for Sustainable Development", Scientific International Publishing House.
R3 - Glen E. Fryxell, Guozhong Cao, "Environmental applications of nanomaterials: synthesis,sorbents and sensors", World Scientific Pub. Co. Inc., 2007
R4 – Michael F, Ashby, Daniel L, Schodek, Paulo J, Ferreira, "Nanomaterials, nanotechnologiesand design: an introduction for engineers", Elsevier, 2009

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7301	PRESTRESSED CONCRETE STRUCTURES	3	0	0	3

Course Objective

1. To introduce the need for prestressing as well as the methods, types and advantages of prestressed concrete
2. To gain knowledge on the design of prestressed concrete beams subjected to flexure and shear
3. To calculate deflection and acquire knowledge on design of anchorage zone
4. To learn how to analyze the composite beams and continuous beams
5. To gain knowledge on miscellaneousprestressed concrete structures

Unit	Description	Instructional Hours
	INTRODUCTION – THEORY AND BEHAVIOUR	
I	Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections –Losses of prestress – Estimation of crack width.	9
	DESIGN FOR FLEXURE AND SHEAR	
II	Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S.1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.	9
	DEFLECTION AND DESIGN OF ANCHORAGE ZONE	
III	Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – Design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.	9
	COMPOSITE BEAMS AND CONTINUOUS BEAMS	
IV	Types and analysis of composite beams – Deflection of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.	9
	MISCELLANEOUS STRUCTURES	
V	Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Describe the basic fundamentals of prestressed concrete in civil engineering
CO2: Design prestressed concrete beams
CO3: Calculate deflection and anchorage zone stresses
CO4: Evaluate the performance of composite beams and continuous beams
CO5: Design miscellaneous prestressed concrete structures

TEXT BOOKS:

T1- Krishna Raju, N., "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 2018.
T2- Pandit, G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2019.

REFERENCE BOOKS:

R1- Rajagopalan, N., "Prestressed Concrete", Narosa Publishing House, 2017.
R2- Dayaratnam, P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
R3- Lin, T.Y. and Ned H.Burns, "Design of PrestressedConcrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
R4- Ramaswamy, G.S., "Modern Prestressed Concrete Design", Arnold Heinimen, New Delhi, 1990.

CODE BOOKS:

C1- IS1343:2012, "Code of Practice for Prestressed Concrete", Bureau of Indian Standards, New Delhi, 2012.
C2- IS3370: 1967(R2008) (Part 1 to 4), "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7302	**AIR POLLUTION MANAGEMENT**	3	0	0	3

Course Objective

1. To classify the sources and understand the effects of air pollution.
2. To study the dispersion of pollutants.
3. To know the various techniques and equipment for control of air pollution.
4. To learn about the air quality standards and legislation.
5. To gain knowledge on indoor air pollution and noise pollution.

Unit	Description	Instructional Hours
	SOURCES AND EFFECTS OF AIR POLLUTION	
I	Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings, vegetation, animals and property – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles	9
	DISPERSION OF AIR POLLUTANTS	
II	Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric Stability and turbulence – Plume rise – Wind profiles and plume patterns - Dispersion of pollutants – Dispersion models – Applications	9
	AIR POLLUTION CONTROL	
III	Concepts of control – Principles and design of control measures – Particulates control by Gravity separators, Centrifugal separators, Fabric filters, Scrubbers,Electrostatic precipitators – Selection criteria for equipment – Gaseous pollutant control by Adsorption, Absorption, Condensation, Combustion, Bio-scrubbers, Biofilters - CO_2 capturing	9
	AIR QUALITY MANAGEMENT	
IV	Ambient air quality and Emission standards– Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality–– Air Pollution Climatology	9
	INDOOR AIR QUALITY AND NOISE POLLUTION	
V	Sources, types and control of indoor air pollutants - sick building syndrome types – Sources and effects of noise pollution – Assessment - Standards – Control methods –Prevention	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Recognize the different sources of air pollution and predict the impacts
CO2: Interpret the dispersion of pollutants based on meteorological conditions
CO3: Propose suitable control equipment for various air pollutants
CO4: Comprehend the regulatory requirements for air quality monitoring
CO5: Categorize the sources and suggest control measures for indoor air pollution and noise pollution

TEXT BOOKS:

T1-Rao.C.S, "Environmental Pollution Control Engineering", Wiley Eastern Ltd., New Delhi, 2006.
T2 - Rao, M.N, and Rao, H. V. N, "Air Pollution Control", Tata-McGraw-Hill, New Delhi, 2007.

REFERENCE BOOKS:

R1 - Noel de Nevers, "Air pollution Control Engineering", Waveland Press Inc., 2017.
R2 - Lawrence K. Wang, Norman C. Pereira, Yung-Tse Hung, Air Pollution Control Engineering, Humana Press, 2004.
R3 - Heumann, W.L., "Industrial Air Pollution Control Systems", McGraw-Hill, New York, 2007.
R4 -Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw-Hill Publishing Company, New Delhi, 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7303	**INDUSTRIAL WASTEWATER TREATMENT**	3	0	0	3

Course Objective

1. To study characteristics of industrial wastewater and its effects on water bodies
2. To explore the primary treatment methods and waste reduction techniques
3. To learn the various advanced wastewater treatment and disposal methods
4. To understand the characteristics and composition of wastewater from various industrial sources
5. To give exposure on common effluent treatment plants and disposal techniques

Unit	Description	Instructional Hours
	INTRODUCTION AND SOURCES OF POLLUTION	
I	Sources of pollution – Physical, Chemical and Biological properties of Industrial Wastes – Difference between industrial and municipal wastewaters – Effects of industrial effluents on sewers and natural water bodies.	9
	PRIMARY TREATMENT METHODS	
II	Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by floatation – Waste reduction – Volume reduction – Strength reduction	9
	ADVANCED TREATMENT METHODS	
III	Waste treatment methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane separation process – Air stripping and absorption processes – Special treatment methods – Disposal of treated wastewater	9
	CHARACTERISTICS OF INDUSTRIAL WASTEWATER	
IV	Sources, Characteristics, Waste treatment flow sheets for selected industries such as textiles, tanneries, dairy, sugar & distilleries, paper, steel plants, refineries, fertilizers, thermal power plants – Wastewater reclamation concepts	9
	TREATMENT PLANTS AND PROBLEMS	
V	Joint treatment of raw industrial wastewater and domestic sewage – Common Effluent Treatment Plants (CETP) – Location, design, operation and maintenance problems - Residue management – Dewatering – Source reduction techniques – Quality requirements for wastewater reuse – Industrial reuse – Discharge into water bodies – Disposal on land – Zero Effluent Discharge (ZED) – Zero Liquid Discharge (ZLD)	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1: Identify the sources of pollution and interpret the effects of industrial effluents on environment
CO2: Classify the various primary treatment methods and waste reduction techniques
CO3: Illustrate the different advanced wastewater treatment and disposal methods
CO4: Compare the characteristics and composition of wastewater from various industrial sources
CO5: Understand the operational and maintenance problems related to treatment plants.

TEXT BOOKS:

T1 –Metcalf & Eddy, "Wastewater Engineering Treatment and Reuse", McGraw-Hill Inc., New York, 2017.
T2 - Patwardhan A.D., "Industrial Wastewater Treatment" PHI Learning Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1 - Rao M. N. & Dutta A. K. , "Wastewater Treatment". Oxford and IBH Publishers, New Delhi, 2018.
R2 - Freeman H.M., "Industrial Pollution Prevention Hand Book", McGraw Hill Inc., New York, 2017.
R2 - Mark J. Hammer, Mark J. Hammer, Jr., "Water & Wastewater Technology", PHI Learning Pvt. Ltd,New Delhi, 2017.
R3 - Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw Hill Inc., New York, 2017.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	2	-	1	-	2	3	3	3
CO2	3	2	2	-	1	2	3	2	2	1	2	2	3	2
CO3	3	3	3	-	2	3	2	-	1	1	3	2	3	2
CO4	3	3	2	2	2	3	2	2	1	-	2	3	2	3
CO5	3	3	2	-	2	3	3	-	-	-	-	2	3	3
Average	**3**	**2.8**	**2.4**	**2**	**1.8**	**2.75**	**2.4**	**2**	**1.25**	**1**	**2.25**	**2.4**	**2.8**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7304	**COMPOSITE STRUCTURES**	3	0	0	3

Course Objective

1. To study the codeprovisions and design of steel-concrete composite construction
2. To understand the design of composite members
3. To learn the design of connections in composite structures
4. To understand the behavior of box girder bridges
5. To gain knowledge on seismic behavior of composite structures.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to steel-concrete composite construction -Design Philosophy -Eurocodes - Properties of the materials - Direct actions (loading) - Application - Codes - Serviceability and construction issues in design	9
II	**DESIGN OF COMPOSITE MEMBERS** Design of composite beams, slabs, floor slabs, columns - beam to columnjoints- Design of non-sway composite frames	9
III	**DESIGN OF CONNECTIONS** Shear connectors – Types and Properties – Methods of shear connection - Design of shearconnectors – Degree of shear connection - Partial shear interaction	9
IV	**COMPOSITE BOX GIRDER BRIDGES** Introduction - behavior of box girder bridges - design concepts	9
V	**CASE STUDIES** Case studies on steel-concrete composite construction in buildings - seismic behavior of composite structures	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to

CO1. Understand the codal provisions and the design of steel-concrete composite construction
CO2. Design composite members
CO3. Design connections in composite structures
CO4. Design composite box girder bridges
CO5. Understand the seismic behavior of composite structures

TEXT BOOKS:

T1 - Johnson R.P., "Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings". Vol.I, Blackwell Scientific Publications, 2004.
T2 - Oehlers D.J. and Bradford M.A., "Elementary Behaviour of Composite Steel and Concrete Structural Members ", Butterworth Heinemann, Oxford, 2002.

REFERENCES:

R1 - Owens, G.W. and Knowles, P. "Steel Designers Manual", Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.
R2 – Narayanan, R., "Composite Steel Structures – Advances, Design and Construction", Elsevier, Applied Science, UK, 1987.
R3 - "Teaching Resources for Structural Steel Design", Vol. 2 & 3, Institute of Steel Development and Growth (INSDAG), 2000.
R4 - Johnson R.P., "Composite Structures of Steel and Concrete- Beams, Slabs, Columns and Frames for Buildings", Wiley Blackwell Publishing, 2004.

CODE BOOK:

C1 - IS: 11384-1985, Code of Practice for Composite Construction in Structural Steel and Concrete, 1985

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7305	**FINITE ELEMENT ANALYSIS**	3	0	0	3

Course Objective

1. To understand the finite element analysis, modeling and various principles
2. To gain knowledge on element properties
3. To understand the concepts of Finite element analysis for one and two dimensional problems
4. To study about isoparametric elements and its formulation
5. To learn the applications of finite element method

Unit	Description	Instructional Hours
	INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FORMULATION	
I	Basic Concepts of Finite Element Analysis (FEA) and initial value problems – Modeling – Elasticity – Steps in Finite Element Analysis (FEA) – Virtual Work and Variational Calculus Principle – Finite Element Method – Formulation of Stiffness matrix and Boundary Conditions.	9
	ELEMENT PROPERTIES	
II	Member Approach for Truss and Beam Element - Member Approach for Portal Frame and Grid Element – Solid Elements – Stiffness Matrix of Isoparametric Elements – Numerical Integration: One, Two and Three Dimensional.	9
	FINITE ELEMENT ANALYSIS OF ONE AND TWO DIMENSIONAL PROBLEMS	
III	Second order equations – Discretization of domain into elements – Generalized coordinates approach – Triangular and Quadrilateral Elements – Extension of Fourth order equation – Derivation of element equations and matrices – Assembly of element equation and matrices – Imposition of Boundary Conditions – Solution Techniques.	9
	ISOPARAMETRIC ELEMENTS AND FORMULATION	
IV	Natural Coordinates in 1, 2 and 3 Dimensions – Isoparametric elements in 1, 2 and 3 Dimension – Lagrangean and Serendipity Elements – Numerical Elements.	9
	APPLICATIONS OF FINITE ELEMENT METHOD	
V	Finite Elements for Elastic Stability – Finite Elements in Fluid Mechanics – Dynamic Analysis – Bending of Elastic Plates – Time Dependent Problems in Elasticity.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1:Comprehend the concepts and methods of finite element analysis
CO2: Formulate the stiffness matrix of the elements
CO3: Be conversant with the concepts of finite element analysis for one and two dimensional problems
CO4: Relate the isoparametric elements with its formulation
CO5: Select finite element methods for various applications

TEXT BOOKS:

T1- Chandrupatla, T. R., and Belegundu, A. D., "Introduction to Finite Element in Engineering", Pearson Education Limited, 2015.
T2- Reddy,J.N. "Introduction to the Finite Element Method", Tata McGrawHill Education, 4th Edition, 2018.

REFERENCE BOOKS:

R1- Dhanaraj, R. and Prabhakaran Nair, K, "Finite Element Analysis", Oxford Publications, 2015.
R2- Krishnamoorthy C.S., "Finite Element Analysis – Theory & Programming", Tata McGraw Hill Publishing Company Ltd., 2007.
R3- Rao, S.S., "The Finite Element Method in Engineering", Butterworth-Heinemann, 6thEdition, 2018.
R4- Bhatti Asghar, M., "Fundamental Finite Element Analysis and Applications", John Wiley & Sons, 2005 (Indian Reprint 2013).

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE7306	COMPUTER AIDED ANALYSIS AND DESIGN OF STRUCTURES	2	0	2	3

Course Objective

1.To study the basic concepts of Computer Aided Design
2.To understand the concepts of Analyzing the beams for stiffness method using Microsoft Excel
3. To gain the knowledge on Analysis and design of Cantilever and simply supported beams by C++.
4. To learn about the Modelling, Analysis and Design of framed structure using ETABS.
5. To study the concepts of Modelling, Analysis and Design of framed structure using STAAD Pro.

Unit	Description	Instructional Hours
I	**Introduction to Computer Aided Design** Introduction to computer aided design – Reasons for implementing CAD – Design process – Applications of computers to design – Benefits of computer Aided design.	9
II	**Stiffness Method using Microsoft Excel** Stiffness method of analysis- step by step procedure – Analysis of Single Span Beams and continuous beams using Excel	9
III	**Analysis of beams using C++** Analysis of cantilever and simply supported beam using C++	9
IV	**Modelling, Analysis and Design using ETABS** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using ETABS	9
V	**Modelling, Analysis and Design using STAAD Pro.** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using STAAD Pro.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: understand the concepts of computer Aided Design
CO2:Analyse the structure for Stiffness method using Microsoft Excel.
CO3: Analyse the beams using C++
CO4:Analyse the multistorey building using ETABS
CO5:Analyse the multistorey building using STAAD Pro.

TEXT BOOKS:

T1-Krishna Murthy C.S and Rajiv S. – Computer Aided Design, Software & Analytical tools –Alpha Science International Ltd,2005.
T2-DrShah V. L -Computer Aided design in reinforcedconcrete, Structures Publications, Pune, 2015.

REFERENCE BOOKS:

R1-Weaver W. and Gere J. M - Matrix Analysis of Framed Structure, CBS Publishers and Distributors Pvt Ltd, Delhi, 2018
R2- Meek J. L - Computer Methods in StructuralAnalysis, CRC Press, 1991
R3-YashavantKanetkar -Let Us C++, BPB Publications, 2020
R4- Prof. Sham Tickoo - Learning Bentley Staad.Pro V8i for Structural Analysis, Dreamtech Press,2015
R5 – Engr. Yousuf Dinar and Engr. Nurullah Siddique - Book for Beginners RCC Design by ETABS, University campus Publisher and seller, Dhaka, 2014

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	1	2	2	2	2	1	2	3	2
CO2	3	2	3	2	2	1	2	2	2	3	2	2	3	2
CO3	3	3	3	3	2	1	3	2	2	2	2	3	3	3
CO4	3	2	3	3	1	2	2	2	2	2	2	2	3	2
CO5	3	2	3	2	1	1	2	2	2	2	1	2	3	2

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