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 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

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

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	22HE1071	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	Course Title	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	தமிழர்மரபு/ 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	Fluid Mechanics	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**

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OFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICALIII Geotechnical Engineering	VERTICAL IV Geo-Informatics	VERTICAL V Transportation Infrastructure	VERTICAL VI Environmental Engineering	VERTICAL VII Water Resources
22CE5307 Geo-Environmental Engineering	22CE5310 Total Station and GPS Surveying	22CE5313 Airports and Harbours	22CE5316 Climate Change Adaptation and Mitigation	22CE5319 Hydrology
22CE5308 Ground Improvement Techniques	22CE5311 Remote Sensing Concepts	22CE5314 Traffic Engineering and Management	22CE5317 Air and Noise Pollution Control Engineering	22CE5320 Ground water Engineering
22CE5309 Soil Dynamics and Machine Foundations	22CE5312 Satellite Image Processing	22CE5315 Urban Planning and Development	22CE5318 Environmental Impact Assessment	22CE5322 Water Resources Systems Engineering
22CE6305 Rock Mechanics	22CE6307 Cartography and GIS	22CE6309 Smart cities	22CE6311 Industrial Wastewater Management	22CE6313 Watershed Conservation and Management
22CE6306 Earthand Earth Retaining Structures	22CE6308 Photogrammetry	22CE6310 Intelligent Transport Systems	22CE6312 Solid and Hazardous Waste Management	22CE6314 Integrated Water Resources Management
22CE7305 Pile Foundation	22CE7307 Airborne and Terrestrial laser mapping	22CE7309 Pavement Engineering	22CE7311 Environmental Policy and Legislations	22CE7313 Urban Water Infrastructure
22CE7306 Tunneling Engineering	22CE7308 Hydrographic Surveying	22CE7310 Transportation planning Process	22CE7312 Environment, Health and Safety	22CE7314 Water Quality and Management

CIA	ESE	TOTAL
40	60	100
40	60	100
40	60	100
40	60	100
40	60	100
60	40	100
100	-	100
360	**340**	**700**

A	ESE	TOTAL
	100	200
	100	**200**

VIII	Total
10	165

VERTICALI

Structural Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5301	Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5302	Steel Structures	PEC	3	0	0	3	3	40	60	100
3	22CE5303	Pre-fabricated Structure	PEC	3	0	0	3	3	40	60	100
4	22CE6301	Pre stressed Concrete Structures	PEC	3	0	0	3	3	40	60	100
5	22CE6302	Rehabilitation / Heritage Restoration	PEC	3	0	0	3	3	40	60	100
6	22CE7301	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3	40	60	100
7	22CE7302	Introduction to Finite Element Method	PEC	3	0	0	3	3	40	60	100

VERTICALII

Construction Techniques and Practices

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5304	Formwork Engineering	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	22CE5306	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3	40	60	100
4	22CE6303	Construction Safety and Risk Management	PEC	3	0	0	3	3	40	60	100
5	22CE6304	Advanced Construction Techniques	PEC	3	0	0	3	3	40	60	100
6	22CE7303	Energy Efficient Buildings	PEC	3	0	0	3	3	40	60	100
7	22CE7304	Green Buildings	PEC	3	0	0	3	3	40	60	100

VERTICALIII

Geotechnical Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5307	Geo-Environmental Engineering	PEC	3	0	0	3	3	40	60	100
2	22CE5308	Ground Improvement Techniques	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	22CE6305	Rock Mechanics	PEC	3	0	0	3	3	40	60	100
5	22CE6306	Earth and Earth Retaining Structures	PEC	3	0	0	3	3	40	60	100
6	22CE7305	Pile Foundation	PEC	3	0	0	3	3	40	60	100
7	22CE7306	Tunneling Engineering	PEC	3	0	0	3	3	40	60	100

VERTICAL IV
Geo– Informatics

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5310	Total Station and GPS Surveying	PEC	3	0	0	3	3	40	60	100
2	22CE5311	Remote Sensing Concepts	PEC	3	0	0	3	3	40	60	100
3	22CE5312	Satellite Image Processing	PEC	3	0	0	3	3	40	60	100
4	22CE6307	Cartography and GIS	PEC	3	0	0	3	3	40	60	100
5	22CE6308	Photogrammetry	PEC	3	0	0	3	3	40	60	100
6	22CE7307	Airborne and Terrestrial laser Mapping	PEC	3	0	0	3	3	40	60	100
7	22CE7308	Hydrographic Surveying	PEC	3	0	0	3	3	40	60	100

VERTICAL V
Transportation Infrastructure

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5313	Airports and Harbours	PEC	3	0	0	3	3	40	60	100
2	22CE5314	Traffic Engineering and Management	PEC	3	0	0	3	3	40	60	100
3	22CE5315	Urban Planning and Development	PEC	3	0	0	3	3	40	60	100
4	22CE6309	Smart cities	PEC	3	0	0	3	3	40	60	100
5	22CE6310	Intelligent Transport Systems	PEC	3	0	0	3	3	40	60	100
6	22CE7309	Pavement Engineering	PEC	3	0	0	3	3	40	60	100
7	22CE7310	Transportation planning Process	PEC	3	0	0	3	3	40	60	100

VERTICAL VI
Environmental Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5316	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3	40	60	100
2	22CE5317	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5318	Environmental Impact Assessment	PEC	3	0	0	3	3	40	60	100
4	22CE6311	Industrial Wastewater Management	PEC	3	0	0	3	3	40	60	100
5	22CE6312	Solid and Hazardous Waste Management	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	22CE7312	Environment, Health and Safety	PEC	3	0	0	3	3	40	60	100

VERTICAL VII

Water Resources

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5319	Hydrology	PEC	3	0	0	3	3	40	60	100
2	22CE5320	Groundwater Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5322	Water Resources Systems Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE6313	Watershed Conservation and Management	PEC	3	0	0	3	3	40	60	100
5	22CE6314	Integrated Water Resources Management	PEC	3	0	0	3	3	40	60	100
6	22CE7313	Urban Water Infrastructure	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 Finite Element Analysis in Structural Engineering	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 Open Source GIS
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	Structural Analysis and Design	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 ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Signature of the Chairman (BoS)

Chairman - BoS
CIVIL - HiCET

Signature of the Dean Academics

Dean (Academics)
HiCET

Signature of the Principal

S.No	Course Code	CourseName	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	22MA1101	Matrices and Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
2.	22ME1201	Engineering Drawing	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
3.	22PH1151	Physics for non-circuit Engineering	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
4.	22HE1151	English for Engineers	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
5.	22IT1151	Python Programming and Practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
6.	22HE1071	Universal Human Values					2	2	2.4	2	-	2.2	-	2.4		
7.	22HE1072	Entrepreneurship & Innovation	2	1.6	2	2	1.8	-	-	2	-	2	-	2.2	1.4	1
8.	22MC1091	அறிவியல் தமிழ்	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	22MC1092	Indian Constitution					2	2	2.4	2	-	2.2	-	2.4		

Chairman - BoS
CIVIL - HiCET

Dean (Academics)
HiCET

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 sequences and series.
3. Analyseanddiscussthemaximaandminimaofthefunctionsofseveralvariables.
4. Evaluate the multiple integrals and apply in solving problems.
5. Apply vector differential operator for vector function and theorems to solve engineeringproblems.

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, Jacobian, Maxima, minima and saddle points; Method ofLagrange 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; 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: Compute partial derivatives of function of several variables and write Taylor's series for functionswith two variables.

CO4: Evaluate multiple integral and its applications in finding area, volume.

CO5: Apply the concept of vector calculus in two and three dimensional spaces.

TEXTBOOKS

T1: G.B.Thomasand 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.Umaand S.Padma, "Engineering Mathematics I (Matrices and Calculus)" Pearson Ltd, 2022.

REFERENCEBOOKS

R1- JerroldE.Marsden, AnthonyTromba, "VectorCalculus" , W.H.Freeman 2003
R2- Strauss M .J, G.L.Bradley and K.J.Smith, "Multivariablecalculus", PrenticeHall, 2002.
R3-VeerarajanT, "EngineeringMathematics", McGraw Hill Education (India) Pvt Ltd, NewDelhi, 2016.

HINDUSTHAN ACADEMIC CO... Chairman ... HINDUSTHAN COLLEGE OF ENGG & TECH...

Chairman - BoS
CIVIL - HiCET

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

The learner should be able :

Course Objective

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
	PLANE CURVES	
I	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, parabolaand hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
	PROJECTIONS OF POINTS, LINES AND PLANE SURFACES	
II	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
	PROJECTIONS OF SOLIDS	
III	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
	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	
IV	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
	ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	
V	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.

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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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO12
CO1	2	3	2	-	1	-	1	-	-	1	1	1	1	2
CO2	3	3	2	1	1	-	1	-	-	1	1	1	1	2
CO3	3	3	3	-	1	1	1	-	-	1	1	-	1	1
CO4	3	3	3	1	1	2	1	-	-	1	1	1	1	1
CO5	3	3	3	1	1	3	1	-	-	1	1	1	1	1
Average	2.8	3	2.6	1	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.	22PH1151	PHYSICS FOR NON- CIRCUIT ENGINEERING (AERO,AUTO,AGRI,CHEM,CIVIL,MECH,MCT &FT)	2	0	2	3

Course Objective

1.Gain knowledge about laser, their applications , become Conversant with principles of optical fiber, types and applications of optical fiber
2. Enhance his fundamental knowledge about properties of matter
3.Understand the concept of Wave optics
4. Gain knowledge about Quantum Physics.
5. Acquire fundamental knowledge of thermal physics which is related to the engineering program

Unit	Description	Instructional Hours
	LASER AND FIBRE OPTICS	
I	Spontaneous emission and stimulated emission –Type of lasers – Nd:YAG laser - Laser Applications – Holography – Construction and reconstruction of images. Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index and modes) – Fiber optical communication link. **Determination of Wavelength and particle size using Laser**	6+6
	PROPERTIES OF MATTER	
II	Elasticity – Hooke's law – Poisson's ratio – Bending moment – Depression of a cantilever – Deteremination 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**	6+6
	WAVE OPTICS	
III	Interference of light – air wedge –Thickness of thin paper -Testing of thickness of surface- Michelson interferometer. Diffraction of light –Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating** **Determination of thickness of a thin wire – Air wedge method**	6+6
	QUANTUM PHYSICS	
IV	Black body radiation –Compton effect: theory and experimental verification – wave particle duality –concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box .	6+6
	THERMAL PHYSICS	
V	Transfer of heat energy –thermal conduction, convection and radiation – thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – applications: solar water heaters.	6+6
	Total Instructional Hours	**60**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Understand the advanced technology of LASER and optical communication in the field of Engineering
CO2: Illustrate the fundamental properties of matter
CO3: Discuss the Oscillatory motions of particles
CO4: Understand the advanced technology of Quantum Physics in the field of Engineering
CO5: Develop the technology of thermal physics in engineering field

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering Physics" S. Chand and Company ltd., New Delhi 2016
R2 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt. Ltd., 2021

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO12
CO1	3	2	1	1	1	1	-	-	-	-	-	1	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	1	2	2
CO3	3	2	1	2	2	-	-	-	-	-	-	1	2	3
CO4	3	3	1	2	2	1	-	-	-	-	-	1	2	2
CO5	3	2	2	3	2	1	2	-	-	-	-	1	2	3
Average	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22HE1151	ENGLISH FOR ENGINEERS	2	0	2	3

Course Objective

The learner should be able :

1. To improve the communicative proficiency of learners
2. To help learners use language effectively in professional writing
3. To advance the skill of maintaining the suitable tone of communication.
4. To introduce the professional life skills.
5. To impart official communication etiquette.

Unit	Description	Instructional Hours
I	**Language Proficiency:** Types of Sentences, Functional Units, Framing question. **Writing:** process description, Writing Checklist. **Vocabulary** – words on environment. **Practical Component: Listening**- Watching short videos and answer the questions, **Speaking**- Self introduction, formal & semi-formal	7+2
II	**Language Proficiency:** Tenses, Adjectives and adverbs. **Writing:** Formal letters (letters conveying positive and negative news), Formal and informal email writing (using emoticons, abbreviations& acronyms), reading comprehension. **Vocabulary**– words on entertainment. **Practical Component: Listening**-Comprehensions based on TED talks **Speaking**- Narrating a short story or an event happened in their life	7+2
III	**Language Proficiency:** Prepositions, phrasal verbs. **Writing:** Formal thanks giving, Congratulating, warning and apologizing letters, cloze test. **Vocabulary** – words on tools.**PracticalComponent:Listening**-Listentosongsandanswerthequestions **Speaking**-Justaminute	5+4
IV	**Language Proficiency:** Subject verb concord, Prefixes & suffixes. **Writing:** Preparing agenda &minutes, writing an event report. **Vocabulary**– words on engineering process. **Practical Component: Listening**- Comprehensions based on Talk of orators or interview shows **Speaking**- Presentation on a general topic with ppt.	5+4
V	**Language Proficiency:** Modal Auxiliaries, Active & passive voice, **Writing:** Project report (proposal & progress), sequencing of sentences **Vocabulary** –words on engineering material **Practical Component: Listening**- Comprehensions based on Nat Geo/Discovery channel videos **Speaking**- Preparing posters and presenting a steam.	6+3
	Total Instructional Hours	**45**

Course Outcome

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

CO1:To communicate in a professional forum

CO2:To speak or write a content in the proficient language

CO3:To maintain and use appropriated one of the communication.

CO4:To read, write and present in a professional way.

CO5:To follow the etiquettes informal communication.

TEXTBOOKS:

T1- Norman Whit by, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press,2016.T2-Raymond Murphy, "Essential English Grammar", Cambridge UniversityPress,2019.

REFERENCEBOOKS:

R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press,

R2-RaymondMurphy, "English Grammar in Use"-4theditionCambridgeUniversityPress,2004.

R3-KamaleshSadanan"AFoundationCoursefortheSpeakersofTamil-Part-I&II",OrientBlackswan, 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO12
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
Average	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21CS1151	**PYTHON PROGRAMMING AND PRSCTICES**	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 a card 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: return values, 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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Average	2	3	3	-	2	-	-	-	2	-	-	2	2	2

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

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. To facilitate the development of a Holistic perspective among students towards life and profession 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. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, 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 ETHICS** 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.

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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'Manual for *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- 87034-53-2

R3.JeevanVidya: E K Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.

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

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

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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).

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

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Programme /Semester	Course Code	Name of the Course	L	T	P	C
B.E./ I	22MC1091	INDIANCONSTITUTION	2	0	0	0

Course Objective

The learner should be able to:

1. Sensitization of student towards self, family (relationship), society and nature
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals
3. Strengthening of self-reflection
4. Development of commitment and courage to act

Unit	Description	Instructional Hours
I	**BASICFEATURESANDFUNDAMENTALPRINCIPLES** Meaning of the constitution all and constitution alums –Historical perspective of the constitution of India– salient features and characteristics of the constitution of India.	6
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights – fundamental duties and its legislative status –The directive principles of state policy – its importance and implementation –Federal structure and distribution Of legislative and financial powers between the union and states.	6
III	**PARLIAMENTARYFORMOFGOVERNMENT** The constitution powers and the status of the president in India. – Amendment of the constitutional Powers and procedures – The historical perspective of the constitution a amendment of India – Emergency provisions : National emergency, President rule, Financial emergency.	6
IV	**LOCALGOVERNANCE** Local self – government – Rural Local Government – Panchayath Raj, Elections of Panchayat – State Election Commission – Urban Local Government – Amendment Act, Urban Local Government Structures in India	6
V	**INDIANSOCIETY** Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	**30**

Course Outcome

Upon completion of the course, students will be able to
CO1: Understand the functions of the Indian government.
CO2: Understand and a bide the rules of the Indian constitution

TEXTBOOKS:

T1-Durga Das Basu,"IntroductiontotheConstitutionofIndia",PrenticeHallofIndia,NewDelhi,1997.
T2-AgarwalRC., "Indian Political System", S.Chand and Company, NewDelhi,1997.
T3-Maciver and Page,"Society:AnIntroductionAnalysis",MacMilanIndiaLtd.,NewDelhi.
T4-SharmaKL., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, NewDelhi,1997.

REFERENCEBOOKS:

R1-Sharma, Brij Kishore,"IntroductiontotheConstitutionofIndia:,PrenticeHallofIndia,NewDelhi.R2-GahaiUR.
"Indian Political System", New Academic Publishing House, Jalaendhar.
R3-Sharma RN,"Indian Social Problems "Media Promoters and Publishers Pvt .Ltd.

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

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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

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

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	Course Title	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 for civil	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	தமிழரமரபு/ 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	Fluid Mechanics	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 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	19	22	24	24	24	23	19	10	165

SEMESTER WISE CREDIT DISTRIBUTION

B.E. CIVIL ENGINEERING PROGRAMME										
S.No.	Course Area	SEMESTER WISE CREDIT DISTRIBUTION								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	7	2	-	-	-	-	-	**15**
4	PCC	-	-	15	21	13	6	9	-	**64**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	6	6	-	**12**
7	EEC	3	3	3	1	2	2	1	10	**25**
8	MCC				-	-	-	-	-	-
Total		**19**	**22**	**24**	**24**	**24**	**23**	**19**	**10**	**165**

SEMESTER WISE COURSE DISTRIBUTION

B.E. CIVIL ENGINEERING PROGRAMME										
S.No.	Course Area	SEMESTER WISE COURSE DISTRIBUTION								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	1	1	-	1	-	1	-	-	**4**
2	BSC	2	4	1	-	-	-	-	-	**1**
3	ESC	2	2	1	-	-	-	-	-	**5**
4	PCC	-	-	5	7	4	2	3	-	**21**
5	PEC	-	-	-	-	3	2	1	-	**6**
6	OEC	-	-	-	-	-	2	2	-	**4**
7	EEC	2	2	2	1	2	1	1	1	**12**
8	MCC	1	2	-	-	-	-	-	-	3
Total		**8**	**11**	**9**	**9**	**9**	**8**	**7**	**1**	**62**

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Structural Engineering	VERTICAL II Construction Techniques and Practices	VERTICALI II Geotechnical Engineering	VERTICAL IV Geo-Informatics	VERTICAL V Transportation Infrastructure	VERTICAL VI Environmental Engineering	VERTICAL VII Water Resources
22CE5301 Concrete Structures	22CE5304 Formwork Engineering	22CE5307 Geo-Environmental Engineering	22CE5310 Total Station and GPS Surveying	22CE5313 Airports and Harbours	22CE5316 Climate Change Adaptation and Mitigation	22CE5319 Hydrology
22CE5302 Steel Structures	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 Pre fabricate Structure	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 Rehabilitation / Heritage Restoration	22CE6304 Advanced Construction Techniques	22CE6306 Earth and 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 Introduction to Finite Element Method	22CE7304 Green Buildings	22CE7306 Tunneling Engineering	22CE7308 Hydrographic Surveying	22CE7310 Transportation planning Process	22CE7312 Environment, Health and Safety	22CE7314 Water Quality and Management

VERTICAL I

Structural Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5301	Concrete Structures	PEC	3	0	0	3	3	40	60	100
2	22CE5302	Steel Structures	PEC	3	0	0	3	3	40	60	100
3	22CE5303	Pre-fabricated Structure	PEC	3	0	0	3	3	40	60	100
4	22CE6301	Pre stressed Concrete Structures	PEC	3	0	0	3	3	40	60	100
5	22CE6302	Rehabilitation / Heritage Restoration	PEC	3	0	0	3	3	40	60	100
6	22CE7301	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3	40	60	100
7	22CE7302	Introduction to Finite Element Method	PEC	3	0	0	3	3	40	60	100

VERTICAL II

Construction Techniques and Practices

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5304	Formwork Engineering	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	22CE5306	Sustainable Construction and Lean Construction	PEC	3	0	0	3	3	40	60	100
4	22CE6303	Construction Safety and Risk Management	PEC	3	0	0	3	3	40	60	100
5	22CE6304	Advanced Construction Techniques	PEC	3	0	0	3	3	40	60	100
6	22CE7303	Energy Efficient Buildings	PEC	3	0	0	3	3	40	60	100
7	22CE7304	Green Buildings	PEC	3	0	0	3	3	40	60	100

VERTICAL III

Geotechnical Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5307	Geo-Environmental Engineering	PEC	3	0	0	3	3	40	60	100
2	22CE5308	Ground Improvement Techniques	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	22CE6305	Rock Mechanics	PEC	3	0	0	3	3	40	60	100
5	22CE6306	Earth and Earth Retaining Structures	PEC	3	0	0	3	3	40	60	100
6	22CE7305	Pile Foundation	PEC	3	0	0	3	3	40	60	100
7	22CE7306	Tunneling Engineering	PEC	3	0	0	3	3	40	60	100

VERTICAL IV

Geo– Informatics

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5310	Total Station and GPS Surveying	PEC	3	0	0	3	3	40	60	100
2	22CE5311	Remote Sensing Concepts	PEC	3	0	0	3	3	40	60	100
3	22CE5312	Satellite Image Processing	PEC	3	0	0	3	3	40	60	100
4	22CE6307	Cartography and GIS	PEC	3	0	0	3	3	40	60	100
5	22CE6308	Photogrammetry	PEC	3	0	0	3	3	40	60	100
6	22CE7307	Airborne and Terrestrial laser mapping	PEC	3	0	0	3	3	40	60	100
7	22CE7308	Hydrographic Surveying	PEC	3	0	0	3	3	40	60	100

VERTICAL V

Transportation Infrastructure

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5313	Airports and Harbours	PEC	3	0	0	3	3	40	60	100
2	22CE5314	Traffic Engineering and Management	PEC	3	0	0	3	3	40	60	100
3	22CE5315	Urban Planning and Development	PEC	3	0	0	3	3	40	60	100
4	22CE6309	Smart cities	PEC	3	0	0	3	3	40	60	100
5	22CE6310	Intelligent Transport Systems	PEC	3	0	0	3	3	40	60	100
6	22CE7309	Pavement Engineering	PEC	3	0	0	3	3	40	60	100
7	22CE7310	Transportation planning Process	PEC	3	0	0	3	3	40	60	100

VERTICAL VI

Environmental Engineering

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5316	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3	40	60	100
2	22CE5317	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5318	Environmental Impact Assessment	PEC	3	0	0	3	3	40	60	100
4	22CE6311	Industrial Wastewater Management	PEC	3	0	0	3	3	40	60	100
5	22CE6312	Solid and Hazardous Waste Management	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	22CE7312	Environment, Health and Safety	PEC	3	0	0	3	3	40	60	100

VERTICAL VII

Water Resources

S.No.	Course Code	Course Title	Course Category	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1	22CE5319	Hydrology	PEC	3	0	0	3	3	40	60	100
2	22CE5320	Ground water Engineering	PEC	3	0	0	3	3	40	60	100
3	22CE5322	Water Resources Systems Engineering	PEC	3	0	0	3	3	40	60	100
4	22CE6313	Watershed Conservation and Management	PEC	3	0	0	3	3	40	60	100
5	22CE6314	Integrated Water Resources Management	PEC	3	0	0	3	3	40	60	100
6	22CE7313	Urban Water Infrastructure	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 Finite Element Analysis in Structural Engineering	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 Open Source GIS
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	Structural Analysis and Design	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

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

S.No.	Course Code	Vertical I	Vertical II
1	22CE5231	Principles of Surveying	Sustainable infrastructure Development
2	22CE6231	Construction Technology	Sustainable Agriculture and Environmental Management
3	22CE6232	Soil and Foundations	Sustainable Bio Materials
4	22CE7231	Structural Analysis and Design	Materials for Energy Sustainability
5	22CE7232	Water and Wastewater Treatment	Green Technology
6	22CE8231	Quantity Estimation and Valuation	Environmental Quality Monitoring and Analysis
7		Transportation Engineering	Integrated Energy Planning for Sustainable Development

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Signature of the Chairman (BoS)

Chairman - BoS
CIVIL - HiCET

Signature of the Dean Academics

Dean (Academics)
HiCET

Signature of the Principal

S.No	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	22MA1101	Matrices and Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
2.	22ME1201	Engineering Drawing	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
3.	22PH1151	Physics for non-circuit Engineering	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
4.	22HE1151	English for Engineers	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
5.	22IT1151	Python Programming and Practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
6.	22HE1071	Universal Human Values					2	2	2.4	2	-	2.2	-	2.4		
7.	22HE1072	Entrepreneurship & Innovation	2	1.6	2	2	1.8	-	-	2	-	2	-	2.2	1.4	1
8.	22MC1091	அறிவியல் தமிழ்	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	22MC1092	Indian Constitution					2	2	2.4	2	-	2.2	-	2.4		
10.	22MA2105	Partial Differential Equation , Fourier Series and Transforms	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
11.	22CY2101	Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
12.	22PH2101	Basics of Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
13.	22CE2101	Engineering Mechanics and Solid Mechanics	3	3	1.6	1		2	1			1	1	1	1	1.4
14.	22CY2152	Applied Chemistry	3	2	2	2	2	1	1	-	-	-	-	1	1	1
15.	22HE2151	Effective Technical Communication	3	2	2	2	2	1	1	-	-	-	-	1	1	1
16.	22HE2071	Design Thinking														

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17.	22HE2072	Soft Skills and Aptitude I	**2**	**2**	**3**	**1**	**1**	**1**	-	-	**2**	**2**	**1**	**2**	**1**	**1**
18.	22MC2091	தமிழர்மரபு	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19.	22MC2092	Heritage of Tamil	2	2	3	1	1	1	-	-	2	2	1	2	1	1
20.	22MA3108	Statistics & Numerical Methods	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2.2	2.2	2.2
21.	22CE3201	Basic Building Services	3	1.2	1	1.4	1	1.4	1.6	1.6	-	-	-	2.4	1.8	1.8
22.	22CE3202	Construction Materials and Techniques	3	3	1.6	2.4	1	1.75	3	1.6	1.8	2.2	1.4	1.5	3	3
23.	22CE3203	Water Supply and Wastewater Engineering	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6
24.	22CE3251	Strength of Materials	3	3	3	2	-	1.8	1.6	-	1.4	1.6	-	2.8	3	3
25.	22CE3252	Fluid Mechanics	3	3	3	2	-	2.4	1	-	2	1	-	2.6	3	3
26.	22HE3071	Soft Skills – II	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3
27.	22CE3072	Computer Aided Building Drawing	2	2	3	1	1	1	-	-	2	2	1	2	1	1
28.	22CE3073	Essence of Indian Traditional Knowledge	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	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	2	3	1	2	-	-	-	-	-	-	2	3	1
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	3
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	1	2	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	-	2	2	3
Average	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2.2	2.2	2.2

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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 – Planning electrical wiring for building – Main and Distribution boards – Transformers and switch gears - Layout of substations.	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 – Laws 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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	2	1				2	2	2
CO2	3	1	1	1	1	1	1					2	1	1
CO3	3	1	1	1	1	1	1					2	2	2
CO4	3	1	1	2	1	2	2	2				3	2	2
CO5	3	1	1	1	1	1	2	2				3	2	2
Average	3	1.2	1	1.4	1	1.4	1.6	1.6	-	-	-	2.4	1.8	1.8

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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 – cable anchoring and grouting - Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – 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 P C, 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, Schexnayder C J, 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, New Delhi, 2008.
R3 - Punmia, B C, Building construction , Laxmi Publications (p) Ltd., 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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.	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 materials - 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 - Plumbing systems for drainage.	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) - UASB - Waste Stabilization Ponds - Other treatment methods - 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 the water 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,201
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.	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 loading and 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

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

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

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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 parallel – 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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Chairman - BoS
CIVIL - HiCET

Dean (Academics)
HiCET

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		3	1			1		3	3	3
CO2	3	3	3	2		2				1		2	3	3
CO3	3	3	3	2		3	1		2	1		3	3	3
CO4	3	3	3	2		1			2	1		2	3	3
CO5	3	3	3	1		3	1		2	1		3	3	3
Average	3	3	3	2	-	2.4	1	-	2	1	-	2.6	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	4	2

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	PSO1	PSO2
CO1	3	3	3	1	3	2			2	2	2	2	3	3
CO2	3	3	3	1	3	2			2	2	2	2	3	3
CO3	3	3	3	1	3	2			1	2	2	2	3	3
CO4	3	3	3	1	3	2			2	2	2	2	3	3
CO5	3	3	3	1	3	2			2	2	2	2	3	3
Average	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	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
	GROUP DISCUSSION & PRESENTATION SKILLS	
I	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
	INTERVIEW SKILLS AND PERSONALITY SKILLS	
II	Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
	BUSINESS ETIQUETTE & ETHICS	
III	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
	QUANTITATIVE APTITUDE	
IV	Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration	3
	LOGICAL REASONING	
V	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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	1	1			2	2	1	2	1	1
CO2	2	2	3	1	1	1			2	2	1	2	1	1
CO3	2	2	3	1	1	1			2	2	1	2	1	1
CO4														
CO5														
Average	2	2	3	1	1	1	-	-	2	2	1	2	1	1

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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., Murugesan R .and PadminiS., "Civil Engineering Drawing-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	1	3	2			2	2	2	2	3	3
CO2	3	3	3	1	3	2			2	2	2	2	3	3
CO3	3	3	3	1	3	2			1	2	2	2	3	3
CO4	3	3	3	1	3	2			2	2	2	2	3	3
CO5	3	3	3	1	3	2			2	2	2	2	3	3
Average	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22MC3073	ESSENCEOF INDIAN TRADITIONAL KNOWLEDEGE	2	0	0	0

Course Objective

The learner should be able to

1. Comprehend the basic principles of Indian Tradition.
2. Understand that Sustainability is at the core of Indian Traditional Knowledge Systems connecting society andnature.
3. Realize the Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature is also important in modern society with rapid technological advancements and societal disruptions.
4. Apprehend the Indian linguistic tradition and Indian artistic tradition.

Unit	Description	Instructional Hours
I	Basic Structure of Indian Knowledge System	3
II	Modern Science and Indian Knowledge System	3
III	Yoga and Holistic Health care	3
IV	Philosophical tradition	3
V	Indian linguistic tradition (Phonology, Morphology, Syntax and semantics), Indian artistic tradition and Case Studies.	3
	Total Instructional Hours	**15**

Course Outcome

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

- Ability to understand the structure of Indian system of life.
- Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

REFERENCE BOOKS:

R1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan,Mumbai, 5th Edition, 2014
R2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
R3. Fritzof Capra, Tao of PhysicsR4. Fritzof Capra, The wave of Life.
R5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad,Amakuam
R6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.
R7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi,2016.
R8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi,2016.
R9. P R Sharma (English translation), Shodashang Hridayam.

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

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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	21EE2103	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

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CIVIL - HiCET

Signature of the Dean Academics

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HiCET

Signature of the Principal

SEMESTER WISE CREDIT DISTRIBUTION

B.E. CIVIL ENGINEERING PROGRAMME										
S.No.	Course Area	SEMESTER WISE CREDIT DISTRIBUTION								Total Credits
		HSC	BSC	ESC	PCC	PEC	OEC	EEC	NCM	
1	I	4	10	6	-	-	-	-	-	**20**
2	II	4	10	8	-	-	-	-	-	**22**
3	III	-	4	-	16	-	-	-	-	**20**
4	IV	-	4	-	17	-	-		-	**21**
5	V	-	-	-	19	3	-	2	-	**24**
6	VI	-	-	-	15	3	3	3	-	**24**
7	VII	-	-	-	12	3	3	2	-	**20**
8	VIII	-	-	-	-	6	-	8	-	**14**
	Total	**8**	**28**	**14**	**79**	**15**	**6**	**15**	-	**165**

SEMESTER WISE COURSE DISTRIBUTION

B.E. CIVIL ENGINEERING PROGRAMME										
S.No.	Course Area	SEMESTER WISE COURSE DISTRIBUTION								Total Credits
		HSC	BSC	ESC	PCC	PEC	OEC	EEC	NCM	
1	I	2	3	2	-	-	-	2		**9**
2	II	2	3	3	-	-	-	1	-	**9**
3	III	-	1	-	6	-	-	2	1	**10**
4	IV	-	1	-	6	-	-	2	1	**10**
5	V	-	-	-	7	1	-	2	-	**10**
6	VI	-	-	-	6	1	1	3	-	**11**
7	VII	-	-	-	4	1	1	1	-	**7**
8	VIII	-	-	-	-	2	-	1	-	**3**
	Total	**4**	**8**	**5**	**29**	**5**	**2**	**14**	**2**	**69**

Mapping of Course Outcome and Programme Outcome

S.No	Course Code	CourseName	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	21HE1101	Technical English	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
2.	21MA1102	Calculus and Linear Algebra	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
3.	21PH1151	Applied Physics	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4
4.	21CY1151	Chemistry for Engineers	3	2	2	2	2	1	1	-	-	-	-	1	1	1
5.	21CS1151	Problem Solving Python Programming	2	3	3	-	2	-	-	-	2	-	-	2	2	2
6.	21ME1152	Engineering Drawing	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
7.	21HE1071	Language Competency Enhancement Course - I	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
8.	21MC1191	Induction Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	21HE1072	Career Guidance Level - I Personality, Aptitude and Career Development	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
10.	21HE1073	Entrepreneurship and Innovation	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
11.	21HE2101	Business English for Engineers	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
12.	21MA2101	Differential Equations and Complex Variables	3	3	3	2.6	2	-	-	-	-	-	-	2	2	2.2

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13.	21EE2103	Basics of Electrical and Electronics Engineering	3	2.5	2.0	2	1	3	2	1	-	-	-	1.4	2.6	1.8
14.	21ME2101	Engineering Mechanics	3	3	1.6	1		2	1			1	1	1	1	1.4
15.	21PH2151	Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
16.	21CY2151	Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
17.	21ME2001	Engineering Practices	3		3		3				1				1	2
18.	21HE2071	Language Competency Enhancement Course -II	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
19.	21HE2072	Career Guidance Level - II Personality, Aptitude and Career Development	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
20.	21MA3103	Fourier Analysis and Numerical Methods	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2
21.	21CE3201	Mechanics of Fluids	3	3	3	2	-	2.4	1	-	2	1	-	2.6	3	3
22.	21CE3202	Geology and Construction Materials	3	1.2	1	1.4	1	1.4	1.6	1.6	-	-	-	2.4	1.8	1.8
23.	21CE3203	Surveying	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
24.	21CE3251	Mechanics of Solids	3	3	3	2	-	2.4	1	-	2	1	-	2.6	3	3
25.	21CE3001	Survey Lab	3	3	3	2	2.8	3	-	-	3	2.8	-	3	3	3
26.	21CE3002	Computer Aided Building Drawing	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3

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27.	21MC3191	Indian Constitution					2	2	2.4	2	-	2.2	-	2.4		
28.	21HE3072	Career Guidance Level - III Personality Aptitude and Career Development	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
29.	21HE3073	Leadership Management Skills	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
30.	21MA4103	Probability and Statistics	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2.2	2.2	2.2
31.	21CE4201	Strength of Materials	3	3	3	2	-	1.8	1.6	-	1.4	1.6	-	2.8	3	3
32.	21CE4202	Applied Hydraulics and Hydraulic Machinery	3	2.6	1.6	1.4	2	2	2.8	1	1.6	2	2.2	2.8	3	2.6
33.	21CE4203	Soil Mechanics	3	3	2.8	2.6	-	2.2	1	1.6	2	1.4	1.8	3	3	3
34.	21CE4251	Concrete Technology	3	3	1.6	2.4	1	1.75	3	1.6	1.8	2.2	1.4	1.5	3	3
35.	21CE4001	Soil Mechanics Lab	2.8	3	1	2.3	2.25	1.6	1.5	2.6	1.5	1.8	1.6	2	2.4	2
36.	21CE4002	Fluid Mechanics and Hydraulic Machinery Lab	3	1.4	1.4	2	1	2	1	1.8	3	3	-	1.6	3	2.8
37.	21MC4191	Essence of Indian Traditional Knowledge					2	2	2.4	2	-	2.2	-	2.4		
38.	21HE4072	Career Guidance Level – IV Personality, Aptitude and Career Development	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
39.	21CE5201	Structural Analysis - I	3	3	3	3	1	3	1	1	3	2	1	1	3	3
40.	21CE5202	Design of RC Elements	3	3	3	2	1	3	1	3	2	2	-	3	3	3

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41.	21CE5203	Water Supply Engineering	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6
42.	21CE5204	Foundation Engineering	3	2.8	2.6	1.4	-	2.6	1.6	-	2	2.2	-	3	2.6	3
43.	21CE5205	Highway and Railway Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1	-	1.4	2.2
44.	21CE5001	Concrete and Highway Engineering Lab	3	1	1	2	1	2	1	1.8	3	3		2	3	3
45.	21CE5002	Survey Camp	3	3	3	2	2.8	3	-	-	3	2.8		3	3	3
46.	21HE5071	Soft Skills - I	2	2	3	1	1	1	-	-	2	2	1	2	1	1
47.	21HE5072	Design Thinking	2	2	3	1	1	1	-	-	2	2	1	2	1	1
48.	21CE5301	Advanced Surveying Techniques	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
49.	21CE5302	Traffic Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1		1.4	2.2
50.	21CE5303	Housing Planning and Management	3	3	2.2	2.3	-	2	2.2	2.5	2	3	2.3	2	1.8	2
51.	21CE5304	Construction Techniques, Equipment and Safety	3	1.4	1.4	1.6	1.6	1.4	1.6	1.6	-	-	-	2.8	2.2	1.8
52.	21CE5305	Hydrology	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6
53.	21CE5306	Professional Ethics and Laws for Civil Engineers	1	2	3	1	1	1	3	2	2	2	1	2	1	1
54.	21CE5206	Advanced Concrete Technology	3	3	1.6	2.4	1	1.75	3	1.6	1.8	2.2	1.4	1.5	3	3
55.	21CE5207	Transport of Water and Wastewater	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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56.	21CE5208	Soil Properties and Behaviour	3	3	2.8	2.6	-	2.2	1	1.6	2	1.4	1.8	3	3	3
57.	21CE55209	Fundamentals of Remote Sensing	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
58.	21CE5601	Principles of Surveying	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
59.	21CE5602	Sustainable Infrastructure Development	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.	21CE5201	STRUCTURAL ANALYSIS I	3	0	0	3

Course Objective

1. To Analyze the Beams and Frames by energy Method, unit load method and Theorem of three moments.
2. To analyze arched structures
3. To analyze the determinate structures for internal forces by slope deflection method.
4. To calculate the internal forces on determinate structures by moment distribution method.
5. To learn about basic concepts in influence lines for statically determinate structures

Unit	Description	Instructional Hours
	ANALYSIS OF BEAMS AND FRAMES	
I	Determination of Static and Kinematic Indeterminacies - Degree of Freedom - Analysis of beams, frames by energy method (up to redundancy two)-Principle of Virtual Work - unit load method-Maxwell reciprocal theorem-Analysis Of Continuous Beams by Theorem of three moments.	9
	ARCHES	
II	Arches as structural forms–Types of arches (definitions based on shape and number of centers)– Analysis of three hinged and two hinged parabolic and circular arches- Settlement and temperature effects.	9
	SLOPE DEFLECTION METHOD	
III	Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements- Symmetric frames with symmetric and skew-symmetric loadings	9
	MOMENT DISTRIBUTION METHOD	
IV	Stiffness and carry over factors–Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway– Support settlement - Symmetric frames with symmetric and skew-symmetric loadings	9
	MOVING LOADS AND INFLUENCE LINES	
V	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
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students will have ability to
CO1:Determine the deflection of beams, trusses and frames by energy and unit load method
CO2: Analyse three hinged and two hinged parabolic arches
CO3: Analyse the continuous beams and rigid frames by slope defection method
CO4: Apply the concept of moment distribution and analyse the continuous beams and rigid frames with and without sway
CO5: Draw the influence lines for statically determinate structures

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 - Ramamrutham S., "Theory of Structures", Dhanpat Rai Publishing Company (P) Ltd., 9th Edition, 2019
R2 - Negi L.S. &Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2016
R3 - Hibbeler R.C., "Structural Analysis", Pearson Education, 10th Edition, 2018
R4 - Devadas Menon, "Structural Analysis", Narosa Publishing House, 2nd Edition 2018

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5202	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.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5203	WATER SUPPLY ENGINEERING	3	0	0	3

Course Objective

1. Gain knowledge on the characteristics of water, water quality standards and plan water supply system based on demand and rate of consumption
2. Acquire adequate knowledge on the conveyance system and its components
3. Learn the unit operations and understand the design of various components of water treatment plants.
4. Understand the various advanced water treatment methods.
5. Get conversant with the methods of water distribution, systems of plumbing and house service connections.

Unit	Description	Instructional Hours
	PLANNING OF WATER SUPPLY SYSTEM	
I	Public water supply system – Objectives – Planning – Design period – Physical, chemical and biological characteristics of water – IS and WHO standards – Water demand - Types of demand – Variations in demand – Population forecasting.	9
	CONVEYANCE OF WATER	
II	Sources of water – Surface and groundwater sources- Well hydraulics - Intakes – Pipes and conduits for conveying water – Pipe hydraulics – Pipe materials – Laying, joining and testing of pipes – Pipe appurtenances – Pumps and pumping stations.	9
	WATER TREATMENT	
III	Objectives – Unit operation and processes – Screens - Plain sedimentation tanks - Principles & functions of chemical feeding, flash mixers, flocculators - Sand filters – Disinfection – Residue management – Construction, operation and maintenance of water treatment plants.	9
	ADVANCED WATER TREATMENT	
IV	Principles and functions of aeration – Iron and manganese removal – Defluoridation and Demineralisation – Water softening – Desalination - Membrane systems – Recent advances.	9
	WATER DISTRIBUTION AND SUPPLY TO BUILDINGS	
V	Requirements of water distribution - Distribution systems – Analysis of distribution networks – Computer applications – Leak detection methods - Principles of design of water supply to buildings – House service connections – Fixtures and fittings – Systems of plumbing - Types of plumbing – Rural water supply.	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Recognize the importance of water quality standards and forecast population to determine the rate of consumption

CO2: Interpret the various conveyance systems and its components

CO3: Classify and design the various components of the water treatment plant

CO4: Compare various advanced water treatment methods

CO5: Analyze distribution networks and assess the various systems of plumbing

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, 2010.

REFERENCE BOOKS:

R1 - Birdie, G.S, and Birdie, J. S , "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 2012.

R2 - Modi, P. N, "Water Supply Engineering" Vol. I, Standard Book House, 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	PSO11	PSO12
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.	21CE5204	**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 and in-situ tests (SPT & SCPT) -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 – Types and proportioning of Isolated footing, Combined 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

Upon successful completion of the course, students will have ability 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: Interpret 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.

REFERENCE BOOKS:

R1 – Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
R2 - Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", Pearson Education, 2nd Edition, 2013.
R3 - Gopal Ranjan and Rao A.S.R. "Basic and Applied Soil Mechanics", New Age International (P) Ltd, New Delhi, 2006.
R4 - 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	PSO11	PSO12
CO1	3	2	2	2		2	3		3	2		3	3	3
CO2	3	3	2	1		2	1		1	1		3	2	3
CO3	3	3	3	1		3	1		2	3		3	3	3
CO4	3	3	3	2		3	2		3	3		3	3	3
CO5	3	3	3	1		3	1		1	2		3	2	3
Average	3	2.8	2.6	1.4	-	2.6	1.6	-	2	2.2	-	3	2.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5205	**HIGHWAY AND RAILWAY ENGINEERING**	3	0	0	3

Course Objective

1. To familiarize the concepts of highway planning and geometric design of highway
2. To learn the design of pavements
3. To get exposed to various highway materials and testing, maintenance and pavement evaluation
4. To know the importance of proper planning, designing and signaling of railways
5. To understand the necessity of railway maintenance and modernization of tracks

Unit	Description	Instructional Hours
	HIGHWAY PLANNING AND ALIGNMENT	
I	Historical Development of Road Construction – Highway Development in India – Institutions for Highway Development at National Level – Requirements of and Factors Affecting the Ideal Road Alignment – Engineering Survey for Alignment (Conventional & Modern Methods) – Classification of Roads – Highway cross sectional elements – Sight Distance – Design of Horizontal Alignments – Super elevation, Widening of pavements on horizontal curves – Transition Curves – Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves.	9
	PAVEMENT DESIGN	
II	Rigid and Flexible Pavements – Components and their functions – Design principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements – ESWL, Climate, Sub-grade soil and Traffic – Design Practice for Flexible and Rigid Pavements (CBR Method, IRC Method and Recommendations – Problems) – Joints.	9
	HIGHWAY MATERIALS, MAINTENANCE AND REHABILITATION	
III	Desirable Properties and Testing of Highway Materials – CBR Test, Field Density Test – Aggregate – Crushing, Abrasion, Impact Tests, Water Absorption, Flakiness and Elongation Indices – Bitumen – Penetration, Ductility, Viscosity, Binder Content and Softening Point Test – Construction Practices – Water Bound Macadam Road, Wet mix macadam road, Bituminous Road and Cement Concrete Road – Pavement distress in Flexible and Rigid Pavements – Symptoms, Causes and Treatments – Special Repairs – Highway Drainage – Pavement Evaluation – Pavement Strengthening	9
	RAILWAY PLANNING, DESIGN AND SIGNALLING	
IV	Role of Indian Railways in Development of Nation – Engineering Surveys for track alignment – Conventional and modern methods (Remote Sensing, GIS & GPS, etc.) – Elements of permanent way – Rails, Sleepers, Ballast, Rail fixtures and Fastenings – Track Stress, Coning of wheels, Creep in rails, Defects in rails – Route alignment surveys, Conventional and modern methods – Geometric design of railways, Gradient, Super elevation, Widening of gauge on curves – Points and Crossings-Signaling.	9
	RAILWAY MAINTENANCE AND MODERNIZATION	
V	Earth work – Stabilization of track on poor soil – Tunneling methods, drainage and ventilation – Calculation of materials required for track laying – Construction and maintenance of tracks – Re-laying of tracks - Modern methods of construction & maintenance – Railway stations and yards – layouts - passenger amenities – Urban rail – Infrastructure for Metro, Mono and Underground railways – Introduction of hyper loop.	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Understand different highway development programs, sight distance and IRC recommendations.
CO2: Design the flexible and rigid pavements by IRC method.
CO3: Identify and explain the various highway materials and pavement evaluation methods.
CO4: Plan and design the railway tracks.
CO5: Appreciate the need for modernization of tracks for speed trains.

TEXT BOOKS:

T1- Khanna, S. K. and Justo, C.E.G., "Highway Engineering", Nem Chand and Brothers, Roorkee, 2015.
T2- Saxena Subhash, C. and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2003.

REFERENCE BOOKS:

R1- Bindra, S.P. "Highway Engineering", Dhanpat Rai and Sons, New Delhi, 2014.
R2- Kadiyali, L.R. "Principles and Practice of Highway Engineering", 8th edition, Khanna Technical Publications, New Delhi, 2013.
R3- Rao, G.V., "Principles of Transportation Engineering", Tata McGraw Hill Publication, New Delhi, 2017.
R4- Subramanian, K.P., "Highways, Railways, Airport and Harbour Engineering", V Scitech Publications (India), Chennai, 2010.

CODE BOOKS:

C1 - IRC 58 - 2015: Guidelines for Design of Plain Jointed Rigid Pavement
C2 - IRC 37 - 2018: Guidelines for Design of Flexible Pavements

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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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5001	CONCRETE AND HIGHWAY ENGINEERING LAB	0	0	4	2

Course Objective

1. To study the properties of constituent materials of concrete
2. To gain knowledge on the tests on fresh concrete
3. To learn the tests on hardened concrete and how the different materials shall modify the performance of concrete
4. To know the properties of bitumen and to study the various tests carried out on aggregates
5. To understand the techniques to characterize the materials in concrete and highway

Expt . No.	Description of the Experiment
1.	**TESTS ON AGGREGATES**
	Determination of Specific Gravity of Aggregates
	Determination of Fineness Modulus of Aggregates
	Determination of Water Absorption of Aggregates
	Determination of Flakiness and Elongation Indices of Coarse Aggregates
	Determination of Crushing strength, Impact Strength and Abrasion of Coarse Aggregates
2.	**TESTS ON FRESH CONCRETE**
	Determination of workability by Slump and Compaction Factor Test
	Determination of workability by using Flow Table and Vee Bee Consistometer
3.	**TESTS ON HARDENED CONCRETE**
	Determination of Compressive Strength and Split Tensile Strength of Concrete Specimens
	Determination of Flexural Strength and Modulus of Elasticity of Concrete Specimens
4.	**TESTS ON BITUMEN**
	Determination of Softening Point and Penetration Index of Bitumen
	Determination of Density and Specific Gravity of Bituminous Mixture
	Determination of Ductility of Bitumen
	Determination of Marshall Stability and Flow Value of Bituminous Mixture
	Total Practical Hours 45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Interpret the properties of aggregates
CO2: Carry out various tests to determine flow properties of fresh concrete
CO2: Conduct tests to demonstrate and determine the strength of hardened concrete
CO4: Diagnose the properties of aggregates and bitumen using different testing methods
CO5: Assess the quality of the various constituents of concrete and draw inferences from the test results

REFERENCE BOOKS:

R1 - Gambhir, M.L., NehaJamwal, "Building and Construction Materials – Testing and Quality Control (LabManual)", McGraw Hill Education (India) Private Limited, New Delhi, 2014.
R2 - Shetty, M. S., "Concrete Technology, Theory & Practice", S.Chand and Co, New Delhi, 2008.
R3 - Khanna,S.K, Justo,C.E.G."Highway material testing (LaboratoryManual)", NemChand& Bros, Roorkee (U.P), Revised Edition, 2009.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5002	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. **Setting out work**

Setting out simple road curve by linear method

Setting out simple railway curve by Instrument method

Setting out work using Total Station (Spread footing marking for residential building)

2. **Preparation of topographic map**

Measurement of Area using Total Station

Establishment of Horizontal Control Network (Grid Contouring) using Total Station

Establishment of Vertical Control Network (Radial Contouring) using Total Station

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	PSO11	PSO12
CO1	3	3	3	2	2	3	-	-	3	2		3	3	3
CO2	3	3	3	2	3	3	-	-	3	3		3	3	3
CO3	3	3	3	2	3	3	-	-	3	3		3	3	3
CO4	3	3	3	2	3	3	-	-	3	3		3	3	3
CO5	3	3	3	2	3	3	-	-	3	3		3	3	3
Average	3	3	3	2	2.8				3	2.8		3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	21HE5071	**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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	21HE5072	**DESIGN THINKING**	1	0	0	1

Course Objective

1. To expose students to the design process
2. To develop and test innovative ideas through a rapid iteration cycle.
3. To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
	DESIGN ABILITY	
I	Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	4
	DESIGNING TO WIN	
II	Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	4
	DESIGN TO PLEASE AND DESIGNING TOGETHER	
III	Background – Product Innovations Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
	DESIGN EXPERTISE	
IV	Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert	3
	Total Instructional Hours	**15**

Course Outcome

Upon completion of the course, students will be able to
CO1: Develop a strong understanding of the Design Process
CO2: Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 - I. Nigel Cross, "Design Thinking", Kindle Edition

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.
R2 - Tim Brown, "Change by Design", 2009

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

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PROFESSIONAL ELECTIVE – I

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5301	ADVANCED SURVEYING TECHNIQUES	3	0	0	3

Course Objective

1. To understand the fundamentals of Astronomical Surveying
2. To learn the basics principles of Aerial Surveying
3. To study the various Total Station Surveying
4. To gain knowledge on GPS Surveying
5. To enhance the knowledge on route surveys, hydrographic survey and tunnel alignments

Unit	Description	Instructional Hours
I	**ASTRONOMICAL SURVEYING** Astronomical terms and definition – Motion of sun and stars – Celestial co-ordinate System - Time system - Nautical Alamance – Apparent attitude and corrections – Field observations and determinations of time, longitude, latitude and azimuth by attitude and Hour angle method.	9
II	**AERIAL SURVEYING** Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry – overlaps – Scale of photographs – Vertical and titled photographs distortion in aerial photographs – Stereostopic vision - Photo interpretation – Applications.	9
III	**TOTAL STATION SURVEYING** Methods of Measuring Distance - Basic Principles of Total Station - Historical Development, Classifications - Applications and comparison with conventional surveying - Classification - Applications of Electromagnetic waves - Propagation properties - Wave propagation at lower andhigher frequencies.	9
IV	**GPS SURVEYING** Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler's Law - Perturbing forces – Geodeticsatellite - Doppler effect - Positioning concept –GNSS, IRNSS and GAGAN - 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
V	**MISCELLANEOUS SURVEYING** Reconnaissance – Route surveys for highways, railways and waterways – Simple, compound, reverse, transition and vertical curve – Setting out methods - Hydrographic surveying – Tides – MSL – Sounding methods – Measurement of current and discharge – Tunnel alignment and setting out – Settlement and Deformation studies – Remote sensing.	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Interpret the concepts of astronomical surveying
CO2: Recognize the importance of photogrammetric surveying
CO3: Comprehend and apply the principles of Total Station Surveying
CO4: Interpretthe principles of GPS surveying and data processing
CO5: Compare the conceptsof route survey, hydrographic survey and tunnel alignments

TEXT BOOKS:

T1 - Lillesand,T.M., Kiefer, R.W. and Chipman, J. W., "Remote Sensing and Image Interpretation", John Willey and Sons Asia Pvt. Ltd., New Delhi, 7th Edition, 2015.
T2 - Anji Reddy, M., "Textbook of Remote Sensing and Geographical Information System", BS Publications, Hyderabad, 4th Edition, 2019.

REFERENCE BOOKS:

R1 - Lo. C.P.andA.K.W.Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
R2 -Arora. K. R., "Surveying Vol. I & II", Standard Book House, 10th Edition, 2008.
R3 - Peter A. Burrough, Rachael A. McDonnell. "Principles of GIS", Oxford University Press, 2015.
R4 - Ian Heywood, "An Introduction to GIS", Pearson Education, New Delhi, 2007.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	21CE5302	TRAFFIC ENGINEERING	3	0	0	3

Course Objective

1. To provide an insight on traffic, its components and factors affecting road traffic
2. To familiarize with various traffic surveys, interpretation and analysis
3. To acquire knowledge on traffic intersection design
4. To gain an insight on different traffic control systems
5. To study the IRC traffic techniques

Unit	Description	Instructional Hours
	TRAFFIC CHARACTERISTICS	
I	Road Characteristics – Classification – Functions and standards – Road user characteristics -- PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India.	9
	TRAFFIC SURVEYS AND ANALYSIS	
II	Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Basic principles of Traffic Flow.	9
	GEOMETRIC DESIGN OF INTERSECTIONS	
III	Conflicts at Intersections - Classification of Grade Intersections - Channelized Intersections - Principles of Intersection Design - Elements of Intersection Design - Rotary design, Grade Separation and interchanges - Design principles	9
	TRAFFIC SAFETY AND ENVIRONMENT	
IV	Road accidents – Causes, effect, prevention, and cost – - Street lighting – Road safety – Objectives, Demographics - Traffic regulations - Basic Principles - Road Safety Policy - Motor vehicle act 1988 – Intersection safety - Traffic and environmental hazards – Air and Noise Pollution, causes, health effects and abatement measures.	9
	TRAFFIC TECHNIQUES	
V	IRC guidelines - Traffic Forecasting techniques - Restrictions on turning movements – One way Streets - Traffic Segregation - Traffic Calming - Tidal flow operations - Exclusive Bus Lanes - Introduction to Intelligent Transportation System (ITS) - Roles of ITS- Methods for traffic Management.	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Apply knowledge of traffic, its components and factors affecting road traffic in intersection design
CO2: Apply the knowledge of sampling data in conducting various surveys and analysis
CO3: Identify traffic movements and design islands, intersections and road lightings
CO4: Interpret the causes, effects and prevention of road accidents
CO5: Comprehendthe traffic regulations and techniques

TEXT BOOKS:

T1- Kadiyali. L.R. 'Traffic Engineering and Transport Planning', Khanna Publishers,2016.
T2 - Srinivasa Kumar, "Introduction to Traffic Engineering", Universities Press, 2018.

REFERENCE BOOKS:

R1 – SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques for Urban Areas", 1994
R2 - JotinKhisty C., Kent Lall, "Transportation Engineering-An Introduction" , Prentice-Hall of India, New Delhi, 1998.
R3 – Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.
R4 - Papacostas,C.A., "Fundamentals of Transportation Engineering", Prentice-Hall of India Private Limited, New Delhi.2000.

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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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5303	**HOUSING PLANNING AND MANAGEMENT**	3	0	0	3

Course Objective

1. To provide an exposure on basic housing related terms
2. To acquire knowledge on housing programs
3. To gain knowledge on planning and design of housing projects
4. To get exposed to cost effective techniques and materials
5. To get familiar with housing finance and project appraisal

Unit	Description	Instructional Hours
	INTRODUCTION TO HOUSING	
I	Introduction to Basic Terms – House, Home, Household, Apartments, Multi-storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing – DC regulations - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels	9
	HOUSING PROGRAMMES	
II	Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and relocation – Role of Public housing agencies and Private sector in supply – Role of Non-Government Organizations in slum housing	9
	PLANNING AND DESIGN OF HOUSING PROJECTS	
III	Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation	9
	CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS	
IV	New Constructions Techniques – Cost Effective Modern materials and methods of construction- Green building concept- Benefits - Building Centers – Concept, Functions, Cost Effective Technologies and Performance Evaluation	9
	HOUSING FINANCE AND PROJECT APPRAISAL	
V	Appraisal of housing projects – Housing Finance, Cost Recovery – Cost Recovery Policy - Cash Flow Analysis, Subsidy and Cross Subsidy, Viability Gap Funding - Public Private Partnership Projects – Pricing of Housing Units (Problems)	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Interpret the technical terms in relation with housing policy and project
CO2: Comprehend and understand the specifications and plan of various housing programmes
CO3: Handle the planning and design of various housing projects
CO4: Use the cost effective techniques and materials to reduce the project cost
CO5: Perform financial appraisal of housing projects

TEXT BOOKS:

T1- Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 2007.
T2- Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 2010.

REFERENCE BOOKS:

R1 - Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2020.
R2 - Dhanalakshmi G ,Anbarasan . S, " Housing Planning And Management", KKS Publishers, 2012.
R3 - Chandra Sekar, K.,and Karthikeyan, N., "Housing Planning & Management", CGS Publications.2016.
R4 - "Development Control Rules for Chennai Metropolitan Area", CMA, Chennai, 2019.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3		2			2	3						1	
CO2	3		2			2	2		2	3	2		2	2
CO3	3	3	3	3		2	2	2	2	3	2	2	2	2
CO4	3		2	2		2	2					2	2	2
CO5	3	3	2	2		2		3	2	3	3		2	
Average	3	3	2.2	2.3	-	2	2.2	2.5	2	3	2.3	2	1.8	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5304	CONSTRUCTION TECHNIQUES, EQUIPMENT AND SAFETY	3	0	0	3

Course Objective

1. To understand the techniques used in the construction industry
2. To recognize the application of various construction equipment
3. To learn the construction practices in construction industry
4. To familiarize with safety measures available in the construction practices
5. To gain knowledge of super and sub structure construction methods and techniques

Unit	Description	Instructional Hours
I	**CONSTRUCTION TECHNIQUES** Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism - floor system - Development of construction techniques - High rise Building Technology - Seismic effect-Environmental impact of materials – responsible sourcing - Eco Building (Green Building) -Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Building automation - Energy efficient buildings for various zones - Case studies of residential, office buildings and other buildings in each zones.	9
II	**CONSTRUCTION EQUIPMENTS** Selection of Equipment for Earthwork – Earth Moving Operations – Types of Earthwork equipment – Tractors, Motor Graders, Scrapers, Front End Waders, Earth Movers – Equipment for Foundation and Pile Driving – Equipment for Compaction, Batching, Mixing and Concreting – Equipment for Material Handling and Erection of Structures – Equipment for Dredging, Trenching and Tunneling - Ownership cost-Depreciation-Operating cost-Construction equipment maintenance.	9
III	**CONSTRUCTION PRACTICES** Specifications, details and sequence of activities and construction co-ordination –Site Clearance –Marking – Earthwork – Brick masonry – Stone masonry – Bond in masonry - Concrete hollow block masonry – Flooring –Damp proof courses – Construction joints – Movement and expansion joints —Building foundations – Basements – Temporary shed – Centering and shuttering – Slip forms – Scaffoldings – De-shuttering forms – Frames – Braced domes – Laying brick – Weather and water proof – Roof finishes – Acoustic and fire protection.	9
IV	**CONSTRUCTION SAFETY** Construction Safety - Safety hazards, risks and accidents - Legal requirements – OSHA - Personal Protective Equipment (PPE) – Electrical Safety – Prevention - Fire Prevention and Control – Safety Signs and Signals – Safety training-Integration of safety and quality management –Impact of BIM-Mobile devices- - Types of safety practices -Excavations and Confined Spaces-scaffolding- Movement of materials.	9
V	**SUB STRUCTURE AND SUPER STRUCTURE CONSTRUCTION** Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation - Launching girders, bridge decks, off shore platforms – special forms for shells - in-situ pre-stressing in high rise structures - Materials handling .	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Interpret the techniques used in construction industry.
CO2: Enumerate the various equipments used in construction.
CO3: Recognize the construction practices in construction industry.
CO4: Identify and incorporate the safety practices in construction.
CO5: Comprehend the techniques of sub-structure and super-structure construction

TEXT BOOKS:

T1 - Arora S.P. and Brindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
T2 - Varghese, P.C. "Building Construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2015

REFERENCE BOOKS:

R1 - Sharma, S.C., "Construction Equipment and Management", Khanna Publishers, New Delhi, 2008.
R2 - Rethaliya, R. P., "Advanced construction and equipments", Atul Prakashan Publishing, 2019.
R3 - Mishra, R. K., "Construction safety", Aitbs Publishers, India, 2013.
R4 - Peurifoy, R.L., Aviadshapira and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 2010.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5305	**HYDROLOGY**	3	0	0	3

Course Objective

1. To study the concept of hydrometeorology.
2. To have an idea about the types, forms and measurement of precipitation.
3. To understand the components of hydrograph and applications of hydrograph.
4. To learn about the ground water hydrology.
5. To gain knowledge on the importance of flood and flood routing.

Unit	Description	Instructional Hours
	INTRODUCTION AND HYDRO METEOROLOGY	
I	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
	PRECIPITATION	
II	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
	HYDROGRAPH ANALYSIS	
III	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
	GROUND WATER HYDROLOGY	
IV	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
	FLOODS AND FLOOD ROUTING	
V	Flood frequency studies – Recurrence interval - Gumbel's method- Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control.	9
	Total Instructional Hours	**45**

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Emphasize the importance of hydrometerology.
CO2:Evaluate the precipitation potential and analyse precipitation data.
CO3: Plot and analyse flood hydrographs
CO4:Estimate the yield and losses in aquifers.
CO5:Comprehend the methods of flood routing based on flood frequency studies.

TEXT BOOKS:

T1 - Jayarami Reddy, P., "Hydrology", Tata McGraw Hill Publishing Company, New Delhi, 2008.
T2 - Santosh Kumar Garg, "Hydrology and Water Resources Engineering", Khanna Publications Pvt.Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - Subramanya,"Engineering Hydrology", Tata McGraw Hill Publishing Company, New Delhi, 2013.
R2 – Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice-Hall of India, 2009.
R3 - Mutreja, K.N. , "Applied Hydrology", Tata McGraw Hill Publishing Company, New Delhi, 1992.
R4 - Raghunath,H.M., "Hydrology- Principles, Analysis and Design", New Age International Pvt. Ltd., New Delhi, 2nd Edition, 2006.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	21CE5306	PROFESSIONALETHICS AND LAWS FOR CIVIL ENGINEERS	3	0	0	3

Course Objective

1. To raise awareness on human values and engineering ethics
2. To gain knowledge on social experimentation techniques and contract laws
3. To understand the professional rights and responsibilities of engineers in the society
4. To emphasize the significance and necessity of safety and risk assessment in engineering
5. To gain an insight on the global issues in engineering and technology

Unit	Description	Instructional Hours
I	**HUMAN VALUES AND ENGINEERING ETHICS** Morals, Values and Ethics - Work Ethic - Team work - Service Learning - Respect for Others - Living Peacefully – Honesty - Courage – Time management – Team work – Commitment - Self-Confidence - Customs and religion - Senses of Engineering Ethics - Variety of moral issues - Types of inquiry, Moral dilemmas and Moral Autonomy - Kohlberg's Theory - Gilligan's Theory - Case studies and moral stories.	09
II	**SOCIAL EXPERIMENTATION AND CONTRACT LAWS** Engineering as experimentation - Engineers as responsible experimenters - Codes of ethics - Sample code of conduct - A balanced outlook on Law - Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law,Building & Other Construction Workers Act (1996) and Rules (1998).	09
III	**RESPONSIBILITIES AND RIGHTS** Collegiality and loyalty - Respect for Authority -Collective Bargaining – Confidentiality - Conflicts of Interest - Whistle Blowing – Occupational Crime - Professional Rights- Employee Rights - Intellectual Property Rights (IPR) - Case studies.	09
IV	**SAFETY AND RISK ASSESSMENT** Safety and risk - Assessment of safety and risk - Risk Benefit Analysis - Reducing risk – 9/11 Attacks - Chernobyl disaster - Bhopal gas tragedy – Chennai building collapse (2014) - Case studies – Introduction to Environmental Impact Assessment.	09
V	**GLOBAL ISSUES IN ENGINEERING** Multinational Corporations – Environmental Ethics – Conflict Management – Economic recession - Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility	09
	Total Instructional Hours	45

Course Outcome

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

1. Integrate professional ethics and human values in their work environment
2. Interpret the social experimentation techniques and contract laws in engineering
3. Recognize and enforce their professional rights and responsibilities in the field of engineering
4. Assess the risks in an engineering project and propose suitable safety measures
5. Identify the global issues in engineering and the need for corporate social responsibilities

Text Books

T1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 4th Edition, 2014.
T2. Nikita Agarawal, Rishi Kumar, "Laws for Engineers", Genius Publications, 2016.

Reference Books

R1. Jayshree suresh, B.S.Raghavan,"Human Values and Professional Ethics," S.Chand&company Ltd, New Delhi, 2th Edition, 2007.
R2. Edmund G See Bauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
R3.Abrahamson M.V, "Engineering Law and the ICE Contracts, 4th Edition, 2016.

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

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B.E. / B. Tech. (HONOURS)

UNDERGRADUATEPROGRAMMES

CIVIL ENGINEERING

REGULATION-2019

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5206	ADVANCED CONCRETE TECHNOLOGY	3	0	0	3

Course Objective

1. To understand the properties of ingredients of concrete
2. To gain knowledge on concrete design mix
3. To understand the manufacturing process of concrete
4. Tounderstand special concrete and their use
5. study the behaviour of concrete at its fresh and hardened state

Unit	Description	Instructional Hours
	CONCRETE MAKING MATERIALS	
I	Aggregates classification IS Specifications, Properties, Grading, Methods of combining aggregates, specified gradings, Testing of aggregates - Cement, Grade of cement, Chemical composition, Testing of concrete, Hydration of cement, Structure of hydrated cement, special cements - Water - Chemical admixtures, Mineral admixture.	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- changes in Mix design for special materials	9
	CONCRETING METHODS	
III	Process of manufacturing of concrete, methods of transportation, placing and curing, cracking, plastic shrinkage, Extreme weather concreting, special concreting methods. Vacuum dewatering – Underwater Concrete	9
	SPECIAL CONCRETES	
IV	Light weight concrete Fly ash concrete, Fiber reinforced concrete, Sulphur impregnated concrete, Polymer Concrete – High performance concrete. High performance fiber reinforced concrete, Self- Compacting Concrete, Geo Polymer Concrete, Waste material-based concrete – Ready mixed concrete.	9
	TESTS ON CONCRETE	
V	Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage – Durability of concrete. Non-destructive Testing Techniques - microstructure of concrete	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: Develop the knowledge on various materials needed for concrete manufacture
CO2: Apply the rules to do mix designs for concrete by various methods
CO3: Develop the methods of manufacturing of concrete.
CO4: Understand the various special concrete
CO5: Explain the various tests on fresh and hardened concrete

TEXT BOOKS:

T1 - Shetty, M.S., "Concrete Technology (Theory & Practice)", S.Chand and Co, Revised edition, 2015.
T2 - Gambhir. M.L., "Concrete Technology", Tata McGraw Hill, fifth edition, 2013.

REFERENCE BOOKS:

R1 - Gupta.B.L., Amit Gupta, "Concrete Technology, Jain Book Agency, 2017.
R2 - Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2019.
R3 - Gambhir.M.L., Concrete Technology, McGraw Hill Education, 2006.
R4 - Neville, A.M., Properties of Concrete, Prentice Hall, 1995, London.
R5 - Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015.

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

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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.	21CE5207	TRANSPORT OF WATER AND WASTEWATER	3	0	0	3

Course Objective

1. Impart knowledge on fluid properties and principles governing the flow and its measurement.
2. Educate the students on the components of water transmission and distribution systems.
3. Learn the various components, functions and working of wastewater collection and conveyance systems.
4. Study the necessities of storm water drainage and its application.
5. 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

The students will be able to:
CO1: Understand 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: Adopt 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.

Chairman - BoS
CIVIL - HiCET

Dean (Academics)
HiCET

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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Chairman - BoS
CIVIL - HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5208	SOIL PROPERTIES AND BEHAVIOUR	3	0	0	3

Course Objective

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

Unit	Description	Instructional Hours
	ORIGIN OF SOIL AND CLAY MINERALS	
I	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
	PHYSICAL &CHEMICAL BEHAVIOUR	
II	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
	SWELLING AND SHRINKAGE CHARACTERISTICS OF CLAY	
III	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
	COMPRESSIBILITY, PERMEABILITY BEHAVIOUR OF SOIL	
IV	Compressibility, permeability behaviour of fine and coarse grained soils – mechanisms and factors influencing engineering properties – liquefaction potential – causes and consequences.	9
	CONDUCTION PHENOMENA & PREDICTION OF SOIL BEHAVIOUR	
V	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: To identify and classify soil deposits.
CO2: To comprehend the principle of the physio-chemical behaviour of soil.
CO3:To reason the causes for the problems associated with the behaviour of soils.
CO4: To derive the various engineering properties of soil.
CO5:To 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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CIVIL - HiCET

Chairman

Dean (Academics)
HiCET

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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CIVIL - HiCET

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5209	FUNDAMENTALS OF REMOTE SENSING	3	0	2	3

Course Objective

1. To introduce the student to the physical principles of Remote Sensing as a tool for mapping.
2. To inform him of the data products, their properties and methods of preparing thematic information.
3. To understand the various classification of Remote Sensing images.
4. To impart the knowledge of Microwave Remote Sensing and its application
5. To Gain knowledge in the principles of thermal Remote Sensing.

Unit	Description	Instructional Hours
	INTRODUCTION TO REMOTE SENSING	
I	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
	DATA ACQUISITION IN DIFFERENT PLATFORMS	
II	Historical development – Opto mechanical electro optical sensors – across track and Along track scanners – multi spectral scanners – characteristics of different types of platforms – medium and high resolution mission – future missionData products and characteristics – formats.	9
	DATA ANALYSIS	
III	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
	PASSIVE SURVEY SYSTEM	
IV	Introduction - plane waves, antenna systems, Resolution Concepts, Radiometry - Passive microwave sensing components – Emission laws - Roughness and Dielectric Constant – Radiometers – Components - Brightness temperature.	9
	THERMAL REMOTE SENSING	
V	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 Acquire knowledge about concepts of Remote sensing, sensors and their Characteristics.

CO2 Acquire knowledge in data products, their properties and methods of preparing thematic information.

CO3 Gain skills in various classifications of Remote sensing images.

CO4 Impart the knowledge of Microwave Remote sensing and its application.

CO5 Gain knowledge in the principles of thermal remote sensing.

TEXT BOOKS:

T1 – W.G.Rees, Physical principles of Remote Sensing, second edition, Cambridge University Press, 2001.

T2 - Emilio Chuvieco; Alfredo Huete; Fundamental of Satellite Remote Sensing, December, CRC Press 2009.

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Chairman - BoS
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Dean (Academics)
HiCET

REFERENCE BOOKS:

R1 - Ulaby,F.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	PSO11	PSO12
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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HINDUSTHAN ACADEMIC COUNCIL

Dean (Academics)
HiCET

B.E. / B. Tech. (MINOR DEGREE)

UNDERGRADUATEPROGRAMMES

CIVIL ENGINEERING

REGULATION-2019

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE5601	**PRINCIPLES OF SURVEYING**	3	0	0	3

Course Objective

1. To gain knowledge on basic principle and concepts of different surveying methods.
2. To learn how to use compass to carry out land surveying.
3. To learn the basics of leveling and its applications.
4. To understand the concepts of Theodolite survey in linear and angular measurements.
5. To acquire knowledge on working principle of Total Station

Unit	Description	Instructional Hours
	INTRODUCTION AND CHAIN SURVEYING	
I	**INTRODUCTION:** Definition, objectives, principles and classification of surveying –Plan and map. **CHAIN SURVEYING:** Linear measurements - Direct measurement – Ranging – offsets -errors in chaining-cross staff and optical square - obstacles in chaining – Demonstration of chain surveying	9
	COMPASS SURVEYING	
II	Introduction, Meridians and bearings, Principle, working and use of Prismatic compass,Surveyor's compass. Dip and Declination, Traverse surveying, Computation of bearingsand included angles given the bearings of legs of a closed traverse. Local attraction,determination andcorrections – Demonstration of compass surveying	9
	LEVELLING	
III	Levelling Instruments – Bench Marks – Temporary andPermanent Adjustments – Differential, Fly, Check, Profile – Booking -Rise and fall method and Height of Instrument method, comparison of Arithmetic checks -Reduction- Demonstration with leveling instrument CONTOURING: Definition of contour – Contour interval – Characteristics ofcontours– Directandindirectmethodsofcontouring	9
	THEODOLITE SURVEYING	
IV	Theodolite - temporary and permanentadjustments - horizontal - vertical angles - heights and distances - traversing-closingerroranddistribution-Gale'stable-omittedmeasurements – Demonstration with theodolite.	9
	TOTAL STATION	
V	Total station – Introduction – Advantages – Types of total stations – Applications of total station - Sources of Error - Care and maintenance of Total Station – Demonstration with Total Station	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1:Carry out preliminary surveying to prepare a layout of a given area.
CO2:Apply compass surveying and compute bearings.
CO3:Plot LS,CS and Contouring using leveling applications.
CO4:Intepret the methods of measurement by heights and distances using theodolite surveying.
CO5:Comprehend the principles and use total station in surveying

TEXT BOOKS:

T1 - Punmia, B. C., "Surveying", Vol.1, Laxmi Publications, New Delhi. 2015
T2 - Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.

REFERENCE BOOKS:

R1 -Alak De, "Plane Surveying", S. Chand & Company Ltd., 2000.
R2 - Bannister and S. Raymond, R. Baker "Surveying", 7th Edition, Pearson Education Ltd.,2009.
R3 - Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22CE5602	SUSTAINABLE INFRASTRUCTURE DEVELOPMENT	3	0	0	3

Course Objective

1. To gain knowledge on concepts and socio-economic policies of sustainable development.
2. To examine the strategies for implementing sustainable development programmes.
3. To learn the various sustainability and performance indicators, their assessment techniques and constraints
4. To explore the different approaches for resource management for a sustainable urban planning.
5. To understand the principles of urban planning and built-in environment.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SUSTAINABLE DEVELOPMENT** Definitions and principles of Sustainable Development - History and emergence of the conceptof Sustainable Development - Environment and Development linkages- Globalization andenvironment – Millennium Development Goals: Status (global and Indian) Impacts on approachto development policy and practice in India, future directions.	9
II	**ENVIRONMENTAL SUSTAINABILITY** Land, Water and Food production - Moving towards sustainability: Energy powering SustainableDevelopment - Financing the environment and Sustainable Development.	9
III	**SUSTAINABILITY INDICATORS** Sustainability indicators – Hurdlesto Sustainability-Operational Guidelines-Interconnected prerequisites for sustainabledevelopment - Science and Technology for sustainable development – Performanceindicators of sustainability and Assessment mechanism – Constraints and barriers forsustainable development.	9
IV	**URBAN PLANNING AND ENVIRONMENT** Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development.	9
V	**THE BUILT-IN ENVIRONMENT** Urban Form, Land Use, Compact Development, Principles of street design- complete streets,Transport Integrated Urban land use Planning, Guidelines for Environmentally Sound Transportation.	9
	Total Instructional Hours	45

Course Outcome

The students will be able to:
CO1: Describe the concepts and socio-economic policies of sustainable development.
CO2: Recognize and identify the strategies for implementing sustainable development programmes.
CO3: Comprehend the various sustainability and performance indicators, their assessment techniques and constraints
CO4: Identify the different approaches for resource management for a sustainable urban planning
CO5: Illustrate the principles of urban planning and built-in environment.

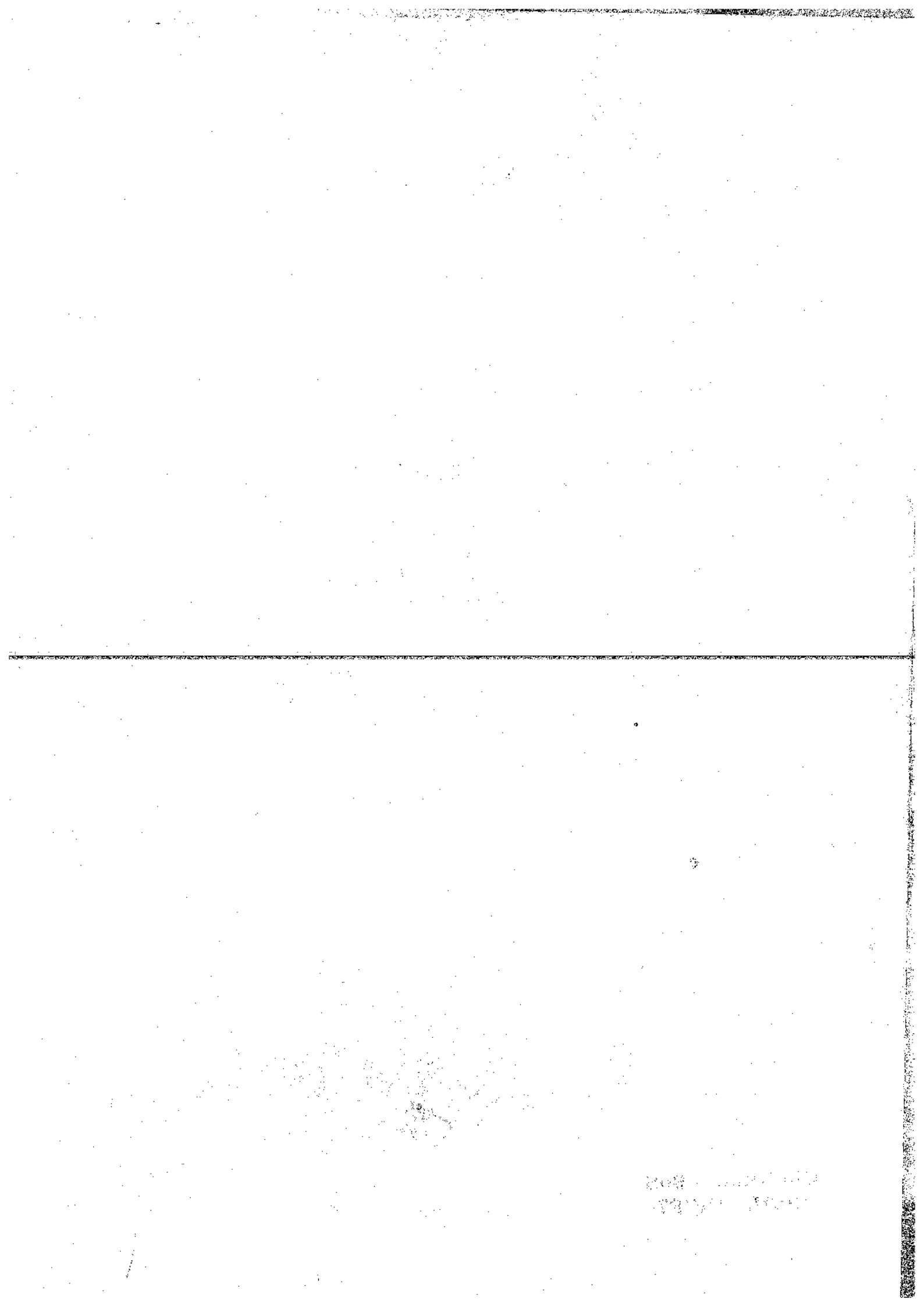
REFERENCE BOOKS:

R1. GilgAW and YarwoodR," Rural Change and Sustainability-Agriculture, the Environment andCommunities",CABI Edited by SJEssex,September2005.
R2. Ganesha Somayaji and Sakarama Somayaji, "Environmental Concerns and Sustainabledevelopment: Some perspectives from India", Editors: publisher TERI Press, ISBN 8179932249.
R3. James H. Weaver, Michael T. Rock, Kenneth Kustere, "Achieving Broad-Based Sustainable Development: Governance, Environment, and Growth with Equity", Kumarian Press, West Hartford, CT. Publication Year,1997.
R4. Kirkby. J, O'Keefe P. and Timberlake, "Sustainable development" Earth Scan Publication,London,1996.
R5. Kerry Turner. R, "Sustainable Environmental Management", Principles and Practice Publisher:Belhaven Press,ISBN:1852930039.
R6. Munier N, "Introduction to Sustainability", Springer2005

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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

Chairman - BoS
CIVIL - HiCET

Dean (Academics)
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

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SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION - 2019

(For the students admitted during the academic year 2020 - 2021 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	19HE1101	Technical English	HS	2	1	0	3	25	75	100
2	19MA1102	Calculus and Linear Algebra	BS	3	1	0	4	25	75	100
THEORY WITH PRACTICAL COMPONENT										
3	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	19CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	19ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	19HE1071	Language Competency Enhancement Course - I	HS	1	0	0	1	100	-	100
MANDATORY COURSE										
8	19MC1191	Induction Programme	EEC	-	-	-	-	-	-	-
9	19HE1072	Career Guidance Level - I Personality, Aptitude and Career Development	EEC	2	0	0	0	100		100
10	19HE1073	Entrepreneurship and Innovation	EEC	1	0	0	0	100		100
			Total	**16**	**2**	**10**	**20**	**550**	**350**	**900**

SEMESTER II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	2	1	0	3	25	75	100
2	19MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	19EE2103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
4	19ME2101	Engineering Mechanics	ES	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19PH2151	Material Science	BS	2	0	2	3	50	50	100
6	19CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICAL										
8	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
9	19HE2071	Language Competency Enhancement Course -II	HS	1	0	0	1	100	-	100
MANDATORY COURSE										
10	19HE2072	Career Guidance Level – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100		100
			Total	**18**	**2**	**8**	**22**	**350**	**450**	**900**

SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3103	Fourier Analysis and Numerical Methods	BS	3	1	0	4	25	75	100
2	19CE3201	Mechanics of Fluids	PC	3	0	0	3	25	75	100
3	19CE3202	Geology and Construction Materials	PC	3	0	0	3	25	75	100
4	19CE3203	Surveying	PC	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19CE3251	Mechanics of Solids	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19CE3001	Survey Lab	PC	0	0	4	2	50	50	100
7	19CE3002	Computer Aided Building Drawing	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	19MC3191	Indian Constitution	EEC	2	0	0	0	-	-	-
9	19HE3072	Career Guidance Level - III Personality Aptitude and Career Development	EEC	2	0	0	0	100		100
10	19HE3073	Leadership Management Skills	EEC	1	0	0	0	100		100
			Total	**19**	**1**	**10**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA4103	Probability and Statistics	BS	3	1	0	4	25	75	100
2	19CE4201	Strength of Materials	PC	3	1	0	4	25	75	100
3	19CE4202	Applied Hydraulics and Hydraulic Machinery	PC	3	0	0	3	25	75	100
4	19CE4203	Soil Mechanics	PC	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19CE4251	Concrete Technology	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19CE4001	Soil Mechanics Lab	PC	0	0	4	2	50	50	100
7	19CE4002	Fluid Mechanics and Hydraulic Machinery Lab	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	19MC4191	Essence of Indian Traditional Knowledge	EEC	2	0	0	0	-	-	-
9	19HE4072	Career Guidance Level – IV Personality, Aptitude and Career Development	EEC	2	0	0	0	100		100
10	19HE4073	IdeationSkill	EEC	1	0	0	0	100		100
			Total	**19**	**2**	**10**	**21**	**450**	**450**	**700**

SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE5201	Structural Analysis - I	PC	3	0	0	3	25	75	100
2	19CE5202	Design of RC Elements	PC	3	1	0	4	25	75	100
3	19CE5203	Water Supply Engineering	PC	3	0	0	3	25	75	100
4	19CE5204	Foundation Engineering	PC	3	0	0	3	25	75	100
5	19CE5205	Highway and Railway Engineering	PC	3	0	0	3	25	75	100
6	19CE53XX	Professional Elective - I	PE	3	0	0	3	25	75	100
PRACTICAL										
7	19CE5001	Concrete and Highway Engineering Lab	PC	0	0	4	2	50	50	100
8	19CE5002	Survey Camp*	PC	0	0	0	1	50	50	100
MANDATORY COURSE										
9	19HE5071	Soft Skills - I	EEC	1	0	0	1	100		100
10	19HE5072	Design Thinking	EEC	1	0	0	1	100		100
			Total	**20**	**1**	**4**	**24**	**450**	**550**	**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	19CE6201	Structural Analysis - II	PC	3	0	0	3	25	75	100
2	19CE6202	Design of Steel Structural Elements	PC	3	0	0	3	25	75	100
3	19CE6203	Wastewater Engineering	PC	3	0	0	3	25	75	100
4	19CE6204	Construction Management	PC	3	0	0	3	25	75	100
5	19CE63XX	Professional Elective - II	PE	3	0	0	3	25	75	100
6	19XX64XX	Open Elective - I	OE	3	0	0	3	25	75	100
PRACTICAL										
7	19CE6001	Water and Wastewater Testing Lab	PC	0	0	3	1.5	50	50	100
8	19CE6002	Design and Drawing of RC Structures	PC	0	0	3	1.5	50	50	100
9	19CE6701	Internship / Industrial Training*	EEC	0	0	0	1	0	100	100
MANDATORY COURSE										
10	19HE6071	Soft Skills – II	EEC	1	0	0	1	100		100
11	19HE6072	Intellectual Property Rights	EEC	1	0	0	1	100		100
			Total	**20**	**0**	**6**	**24**	**450**	**650**	**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	19CE7201	Water Resources and Irrigation Engineering	PC	3	0	0	3	25	75	100
2	19CE7202	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	25	75	100
3	19CE7203	Estimation, Costing and Valuation	PC	3	1	0	4	25	75	100
4	19CE73XX	Professional Elective - III	PE	3	0	0	3	25	75	100
5	19XX74XX	Open Elective - II	OE	3	0	0	3	25	75	100
PRACTICAL										
6	19CE7001	Design and Drawing of Steel Structures	PC	0	0	4	2	50	50	100
7	19CE7901	Project I - Design Project	EEC	0	0	4	2	100	100	200
			Total	**15**	**1**	**8**	**20**	**275**	**525**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE83XX	Professional Elective - IV	PE	3	0	0	3	25	75	100
2	19CE83XX	Professional Elective - V	PE	3	0	0	3	25	75	100
PRACTICAL										
3	19CE8901	Project II – Main Project	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

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	19CE5301	Advanced Surveying Techniques	PE	3	0	0	3	25	75	100
2	19CE5302	Traffic Engineering	PE	3	0	0	3	25	75	100
3	19CE5303	Housing Planning and Management	PE	3	0	0	3	25	75	100
4	19CE5304	Construction Techniques, Equipment and Safety	PE	3	0	0	3	25	75	100
5	19CE5305	Hydrology	PE	3	0	0	3	25	75	100
6	19CE5306	Professional Ethics and Laws for Civil Engineers	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE - II										
1	19CE6301	Building Services	PE	3	0	0	3	25	75	100
2	19CE6302	Airports, Docks and Harbour Engineering	PE	3	0	0	3	25	75	100
3	19CE6303	Subsurface Investigation and Field Testing	PE	3	0	0	3	25	75	100
4	19CE6304	Groundwater Engineering	PE	3	0	0	3	25	75	100
5	19CE6305	Architecture and Town Planning	PE	3	0	0	3	25	75	100
6	19CE6306	Disaster Preparedness and Planning	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE - III										
1	19CE7301	Prestressed Concrete Structures	PE	3	0	0	3	25	75	100
2	19CE7302	Air Pollution Management	PE	3	0	0	3	25	75	100
3	19CE7303	Industrial Wastewater Treatment	PE	3	0	0	3	25	75	100
4	19CE7304	Composite Structures	PE	3	0	0	3	25	75	100
5	19CE7305	Finite ElementAnalysis	PE	3	0	0	3	25	75	100
6	19CE7306	Computer Aided Analysis and Design of Structures	PE	2	0	2	3	25	75	100
PROFESSIONAL ELECTIVE - IV										
1	19CE8301	Ground Improvement Techniques	PE	3	0	0	3	25	75	100
2	19CE8302	Prefabricated Structures	PE	3	0	0	3	25	75	100
3	19CE8303	Valuation of Land and Buildings	PE	3	0	0	3	25	75	100
4	19CE8304	Municipal Solid Waste Management	PE	3	0	0	3	25	75	100
5	19CE8305	Design of Formwork	PE	3	0	0	3	25	75	100
6	19CE8306	Non Destructive Testing of Structures	PE	3	0	0	3	25	75	100

PROFESSIONAL ELECTIVE - V										
1	19CE8307	Construction Economics and Finance	PE	3	0	0	3	25	75	100
2	19CE8308	Repair and Rehabilitation of Structures	PE	3	0	0	3	25	75	100
3	19CE8309	Disaster Resistant Structures	PE	3	0	0	3	25	75	100
4	19CE8310	Environmental Impact Assessment	PE	3	0	0	3	25	75	100
5	19CE8311	Construction Safety Practices	PE	3	0	0	3	25	75	100
6	19CE8312	IoT for Smart City Planning	PE	3	0	0	3	25	75	100

OPEN ELECTIVES

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
1	19CE6401	Remote Sensing and GIS	OE	3	0	0	3	25	75	100
2	19CE7401	Interior Design	OE	3	0	0	3	25	75	100

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SEMESTER WISE CREDIT DISTRIBUTION

S.No.	Course Area	SEMESTER WISE CREDIT DISTRIBUTION							Total Credits
		HSC	BSC	ESC	PCC	PEC	OEC	EEC	
1	I	4	10	6	-	-	-	-	**20**
2	II	4	10	8	-	-	-	-	**22**
3	III	-	4	-	16	-	-	-	**20**
4	IV	-	4	-	17	-	-	-	**21**
5	V	-	-	-	19	3	-	2	**24**
6	VI	-	-	-	15	3	3	3	**24**
7	VII	-	-	-	12	3	3	2	**20**
8	VIII	-	-	-	-	6	-	8	**14**
	Total	**8**	**28**	**14**	**79**	**15**	**6**	**15**	**165**

SEMESTER WISE COURSE DISTRIBUTION

S.No.	Course Area	SEMESTER WISE COURSE DISTRIBUTION							Total Credits
		HSC	BSC	ESC	PCC	PEC	OEC	EEC	
1	I	2	3	2	-	-	-	1	**8**
2	II	2	3	3	-	-	-	-	**8**
3	III	-	1	-	6	-	-	1	**8**
4	IV	-	1	-	6	-	-	1	**8**
5	V	-	-	-	7	1	-	2	**10**
6	VI	-	-	-	6	1	1	3	**11**
7	VII	-	-	-	4	1	1	1	**7**
8	VIII	-	-	-	-	2	-	1	**3**
	Total	**4**	**8**	**5**	**29**	**5**	**2**	**10**	**63**

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S.No	Course Code	CourseName	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	19HE1101	Technical English	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
2.	19MA1102	Calculus and Linear Algebra	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
3.	19PH1151	Applied Physics	3	2.2	2	1.6	2	1.33	-	-	-	-	-	1	2.4	2.4
4.	19CY1151	Chemistry for Engineers	3	2	2	2	2	1	1	-	-	-	-	1	1	1
5.	19CS1151	Python Programming and Practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
6.	19ME1152	Engineering Drawing	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
7.	19HE1071	Language Competency Enhancement Course - I	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
8.	19MC1191	Induction Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	19HE2101	Business English for Engineers	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
10.	19MA2101	Differential Equations and Complex Variables	3	3	3	2.6	2	-	-	-	-	-	-	2	2	2.2
11.	19EE2103	Basics of Electrical and Electronics Engineering	2.4	2.5	2.0	2	1	3	2	1	-	-	-	1.4	2.6	1.8
12.	19ME2101	Engineering Mechanics	3	3	1.6	1		2	1			1	1	1	1	1.4
13.	19PH2151	Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2
14.	19CY2151	Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-

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15.	19ME2001	Engineering Practices	3	-	3	-	3	-	-	-	1	-	-	-	1	2
16.	19HE2071	Language Competency Enhancement Course -II	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
17.	19MA3103	Fourier Analysis and Numerical Methods	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2
18.	19CE3201	Mechanics of Fluids	3	3	3	2	-	2.4	1	-	2	1	-	2.6	3	3
19.	19CE3202	Geology and Construction Materials	3	1.2	1	1.4	1	1.4	1.6	1.6	-	-	-	2.4	1.8	1.8
20.	19CE3203	Surveying	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
21.	19CE3251	Mechanics of Solids	3	3	3	2	-	2.4	1	-	2	1	-	2.6	3	3
22.	19CE3001	Survey Lab	3	3	3	2	2.8	3	-	-	3	2.8	-	3	3	3
23.	19CE3002	Computer Aided Building Drawing	3	3	3	1	3	2	-	-	1.8	2	2	2	3	3
24.	19MC3191	Indian Constitution	-	-	-	-	2	2	2.4	2	-	2.2	-	2.4	-	-
25.	19MA4103	Probability and Statistics	3	2.8	3	1.4	1.4	2	-	-	-	-	-	2.2	2.2	2.2
26.	19CE4201	Strength of Materials	3	3	3	2	-	1.8	1.6	-	1.4	1.6	-	2.8	3	3
27.	19CE4202	Applied Hydraulics and Hydraulic Machinery	3	2.6	1.6	1.4	2	2	2.8	1	1.6	2	2.2	2.8	3	2.6
28.	19CE4203	Soil Mechanics	3	3	2.8	2.6	-	2.2	1	1.6	2	1.4	1.8	3	3	3
29.	19CE4251	Concrete Technology	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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30.	19CE4001	Soil Mechanics Lab	2.8	3	1	2.3	2.25	1.6	1.5	2.6	1.5	1.8	1.6	2	2.4	2
31.	19CE4002	Fluid Mechanics and Hydraulic Machinery Lab	3	1.4	1.4	2	1	2	1	1.8	3	3	-	1.6	3	2.8
32.	19MC4191	Essence of Indian Traditional Knowledge	2	1.6	2	2	1.8	-	-	2	-	2	-	2.2	1.4	1
33.	19CE5201	Structural Analysis - I	3	3	3	3	1	3	1	1	3	2	1	1	3	3
34.	19CE5202	Design of RC Elements	3	3	3	2	1	3	1	3	2	2	-	3	3	3
35.	19CE5203	Water Supply Engineering	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.6
36.	19CE5204	Foundation Engineering	3	2.8	2.6	1.4	-	2.6	1.6	-	2	2.2	-	3	2.6	3
37.	19CE5205	Highway and Railway Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1	-	1.4	2.2
38.	19CE5001	Concrete and Highway Engineering Lab	3	1	1	2	1	2	1	1.8	3	3	-	2	3	3
39.	19CE5002	Survey Camp	3	3	3	2	2.8	3	-	-	3	2.8	-	3	3	3
40.	19HE5071	Soft Skills - I	-	-	-	-	2	2	2.4	2	-	2.2	-	2.4	-	-
41.	19HE5072	Design Thinking	2	2	3	1	1	1	-	-	2	2	1	2	1	1
42.	19CE6201	Structural Analysis - II	3	3	3	3	1	3	1	1	3	2	1	1	3	3
43.	19CE6202	Design of Steel Structural Elements	3	3	3	2	-	3	1	3	2	2	-	2	3	3
44.	19CE6203	Wastewater Engineering	3	2.6	2	1	3	2.6	2.6	1.3	2	2.6	2.4	2.8	3	3

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45.	19CE6204	Construction Management	3	2	2.6	2	2.5	2	-	1.7	2	2	3	2	2	1.8
46.	19CE6001	Water and Wastewater Testing Lab	3	2	3	2.4	2	2.6	2.4	1.5	1.6	1.25	1.4	2.4	1.6	3
47.	19CE6002	Design and Drawing of RC Structures	3	3	3	3	2	2	2	2	2	2	1	2	3	3
48.	19HE6071	Soft Skills – II	-	-		-	2	2	2.4	2	-	2.2	-	2.4	-	-
49.	19HE6072	Intellectual Property Rights	1	1		1	2	2	2.4	2	-	2.2	-	2.4	-	-
50.	19CE7201	Water Resources and Irrigation Engineering	2.6	2.6	1.6	1	-	1	1.6	1	-	-	1.3	2	2	2
51.	19CE7202	Structural Dynamics and Earthquake Engineering	3	2.8	2.8	2.4	1.2	1.8	1.6	1	1	1	1	2.2	3	3
52.	19CE7203	Estimation, Costing and Valuation	3	2.6	2.2	2.4	2	2	2.4	1.8	2.2	2.4	2.2	2.2	2.4	1.8
53.	19CE7001	Design and Drawing of Steel Structures	3	3	3	3	2	2	2	2	2	2	1	2	3	3
54.	19CE7901	Project I - Design Project	3	3	3	3	3	3	3	3	3	3	3	3	3	3
55.	19CE5301	Advanced Surveying Techniques	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
56.	19CE5302	Traffic Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1		1.4	2.2
57.	19CE5303	Housing Planning and Management	3	3	2.2	2.3	-	2	2.2	2.5	2	3	2.3	2	1.8	2
58.	19CE5304	Construction Techniques, Equipment and Safety	3	1.4	1.4	1.6	1.6	1.4	1.6	1.6	-	-	-	2.8	2.2	1.8
59.	19CE5305	Hydrology	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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60.	19CE5306	Professional Ethics and Laws for Civil Engineers	1	2	3	1	1	1	3	2	2	2	1	2	1	1
61.	19CE6301	Building Services	2	2	1	1	-	2	-	1.5	2	2	-	2	2	1
62.	19CE6302	Airports, Docks and Harbour Engineering	3	2.5	1.5	1.5	2	2	2	1.5	1	-	1	1	3	3
63.	19CE6303	Subsurface Investigation and Field Testing	3	3	1.5	1	-	2	2	3	2.5	2	2.5	3	3	3
64.	19CE6304	Groundwater Engineering	3	2.5	3	2.75	-	1.5	2	-	2.25	1.75	-	2.25	3	3
65.	19CE6305	Architecture and Town Planning	3	1.8	2	1	-	2.8	2.8	2.8	-	2	2	2.4	3	2.8
66.	19CE6306	Disaster Preparedness and Planning	3	-	-	2	1	-	-	3	-	-	2	2	2	1
67.	19CE7301	Prestressed Concrete Structures	3	3	3	1	-	-	-	2	2	-	-	2	3	2
68.	19CE7302	Air Pollution Management	3	1	2	1	2.5	-	-	2	2	1.5	1	1	2	2
69.	19CE7303	Industrial Wastewater Treatment	3	2.6	2	1	3	2.6	2.6	1.3	2	2.6	2.4	2.8	3	3
70.	19CE7304	Composite Structures	3	2.5	3	2	-	2	1	2	2.5	2	1	2	3	3
71.	19CE7305	Finite Element Analysis	3	3	2	-	-	-	-	-	-	-	-	1	3	2
72.	19CE7306	Computer Aided Analysis and Design of Structures	3	3	3	-	3	3	-	2	3	3	-	2	3	1
73.	19CE6401	Remote Sensing and GIS	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
74.	19CE7402	Interior Design	2	-	1.6	2	-	-	1.6	2.3	2	-	-	-	2	1.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7201	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 TamilNadu – 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	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: Interpret 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	1	1	1	1	1	1	1	2	3	3
CO2	3	3	3	2	1	1	1	1	1	1	1	2	3	3
CO3	3	2	2	2	1	1	1	1	1	1	1	2	3	3
CO4	3	3	3	3	1	3	2	1	1	1	1	2	3	3
CO5	3	3	3	3	2	3	3	1	1	1	1	3	3	3
Average	3	2.8	2.8	2.4	1.2	1.8	1.6	1	1	1	1	2.2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7202	**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
	SINGLE DEGREE OF FREEDOM SYSTEM	
I	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
	MULTIPLE DEGREE OF FREEDOM SYSTEM	
II	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
	ELEMENTS OF SEISMOLOGY	
III	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
	EARTHQUAKE EFFECTS ON STRUCTURES	
IV	Effect of earthquake on different types of structures – Behaviour of RCC, Steel and Prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Liquefaction of soil – Response Spectra – Causes of damage – Lessons learnt from past earthquakes.	9
	CONCEPTS OF EARTHQUAKE RESISTANT DESIGN	
V	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 detailing.	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: Identify the various causes and effects of earthquakes on structures due to past earthquakes

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

TEXT BOOKS:

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	2	1	1	1	1	1	1	1	2	3	3
CO2	3	3	3	2	1	1	1	1	1	1	1	2	3	3
CO3	3	2	2	2	1	1	1	1	1	1	1	2	3	3
CO4	3	3	3	3	1	3	2	1	1	1	1	2	3	3
CO5	3	3	3	3	2	3	3	1	1	1	1	3	3	3
Average	3	2.8	2.8	2.4	1.2	1.8	1.6	1	1	1	1	2.2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7203	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	10+3
	RATE ANALYSIS	
II	Analysis of rates – Concepts and Terminologies - Factors affecting the cost of materials and Labour – 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 AND TENDERS	
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	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	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 analysis based 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	3	2	3	3	2	3	2	2	2	3	3
CO2	3	3	2	3	2	2	3	1	1	2	2	2	0	0
CO3	3	2	2	2	3	2	1	3	2	3	3	1	3	3
CO4	3	3	2	2	2	3	2	2	2	3	2	3	3	0
CO5	3	2	2	2	1	0	3	1	3	2	2	3	3	3
Average	3	2.6	2.2	2.4	2	2	2.4	1.8	2.2	2.4	2.2	2.2	2.4	1.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7001	**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.

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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	2	2	2	2	1	2	3	3
CO2	3	3	3	3	2	2	2	2	2	2	1	2	3	3
CO3	3	3	3	3	2	2	2	2	2	2	1	2	3	3
CO4	3	3	3	3	2	2	2	2	2	2	1	2	3	3
CO5	3	3	3	3	2	2	2	2	2	2	1	2	3	3
Average	3	3	3	3	2	2	2	2	2	2	1	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7901	**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 and has to be completed. 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 Design various structures / components / processes related to Civil Engineering.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7301	**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 miscellaneous prestressed 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 Prestressed Concrete 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 I 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	3	3	1				2	2			2	3	2
CO2	3	3	3	1				2	2			2	3	2
CO3	3	3	3	1				2	2			2	3	2
CO4	3	3	3	1				2	2			2	3	2
CO5	3	3	3	1				2	2			2	3	2
Average	3	3	3	1				2	2			2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7302	**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 POLLUTANTS	
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	2	2	1	1		2	2					1	2	2
CO2	2	2	1			1	2						2	2
CO3	2	2	2		1	1	2						2	2
CO4	2	2	2			1	2	1					2	2
CO5	2	2	2			1	2	1					2	2
Average	2	2	1.6	1	1	1.2	2	1				1	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7303	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	Pre and 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		1		3	2		2	3	3	3	3	3
CO2	3	3	2		3	2	3	2	2		2	3	3	3
CO3	3	2		1		2	3	1		3	3	2	3	3
CO4	3	3	2			3	2	1			2	3	3	3
CO5	3	2				3	3		2	2	2	3	3	3
Average	3	2.6	2	1	3	2.6	2.6	1.3	2	2.6	2.4	2.8	3	3

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2			1	2	3	2		2	3	3
CO2	3	3	3	2	2		1	2	2	2	1	2	3	3
CO3	3	3	3	2	2		1	2	2	2	1	2	3	3
CO4	3	3	3	2	2		1	2	2	2	1	2	3	3
CO5		2		2		2	1	2	2	2	1	2	3	3
Average	**3**	**2.5**	**3**	**2**		**2**	**1**	**2**	**2.5**	**2**	**1**	**2**	**3**	**3**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7304	**COMPOSITE STRUCTURES**	3	0	0	3

Course Objective

1. To study the code provisions 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
	INTRODUCTION	
I	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
	DESIGN OF COMPOSITE MEMBERS	
II	Design of composite beams, slabs, floor slabs, columns - beam to column joints- Design of non-sway composite frames	9
	DESIGN OF CONNECTIONS	
III	Shear connectors – Types and Properties – Methods of shear connection - Design of shear connectors – Degree of shear connection - Partial shear interaction	9
	COMPOSITE BOX GIRDER BRIDGES	
IV	Introduction - behavior of box girder bridges - design concepts	9
	CASE STUDIES	
V	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. Recognize 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. Interpret 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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7305	**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 McGraw Hill 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, 6th Edition, 2018.
R4- Bhatti Asghar, M., "Fundamental Finite Element Analysis and Applications", John Wiley & Sons, 2005 (Indian Reprint 2013).

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O4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	3	3		1				2	3	1
	3	2		1				2	3	1
	3	3		3		3		3	3	1
	3	3		3	3	3		2	3	1
	3	3		3	3	3		2	3	1
	3	**3**		**2**	**3**	**3**		**2**	**3**	**1**

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PO11	PO12	PSO1	PSO2
	1	3	2
	1	3	2
	1	3	2
	1	3	2
	1	3	2
	1	**3**	**2**

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