HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
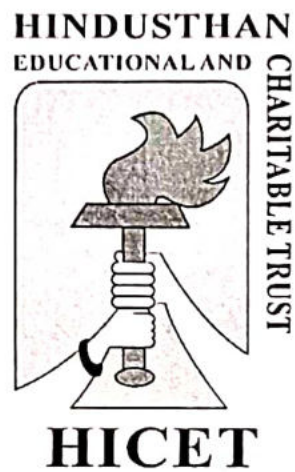
(An Autonomous Institution, Affiliated to Anna University, Chennai)

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 2022 - 2023 and onwards)

REGULATION – 2022

CIVIL ENGINEERING

CURRICULUM

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

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

SEMESTER II

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

SEMESTER III

S.No.	Course Code	CourseTitle	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	FluidMechanics	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	SoftSkills–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	CourseTitle	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	ConcreteTechnology	PCC	3	0	0	3	3	40	60	100
4	22CE4203	Highway and Railway Engineering	PCC	3	0	0	3	4	40	60	100
			THEORY WITHPRACTICAL COMPONENT								
5	22CE4251	Surveying 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

S.No.	Course Area	\multicolumn{8}{c}{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	\multicolumn{8}{c}{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	VERTICAL 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	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

Signature of the Chairman (BoS)

Signature of the Dean Academics

Signature of the Principal

Chairman - BoS
CIVIL - HiCET

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	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. Analyse and discuss the maxima and minima of the functions of several variables.
4. Evaluate the multiple integrals and apply in solving problems.
5. Apply vector differential operator for vector function and theorems to solve engineering problems.

Unit	Description	Instructional Hours
I	**MATREICES** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) -Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**SINGLE VARIATE CALCULUS** Rolle's Theorem–Lagrange's Mean Value Theorem-Maxima and Minima–Taylor's and Maclaurin's Series.	12
III	**FUNCTIONS OF SEVERAL VARIABLES** Partial derivatives-Total derivative, Jacobian, Maxima, minima and saddle points; Method of Lagrange 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 functions with 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.Thomas and R.L.Finney, "Calculus and Analytical Geometry", 9th Edition Addison Wesley Publishing Company, 2016.
T2: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2019.
T3: K.P.Umaand S.Padma, "Engineering Mathematics I (Matrices and Calculus)" Pearson Ltd, 2022.

REFERENCEBOOKS

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

Chairman - BoS
CIVIL - HiCET

Chairman

Dean (Academics)
HiCET

	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

Chairman - BoS
CIVIL - HiCET

Chairman

Dean (Academics)
HiCET

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

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

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

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

TEXT BOOK:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5thedition New Age International Publishers, New Delhi 2016.

T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai 2016.

REFERENCES:

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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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 EGINEERING** (Common to Non Circuit branches)	2	0	2	3

The student should be able to

Course Objective	1. Gain knowledge about laser, their applications and Conversant with principles of optical fiber, types and applications of optical fiber 2. Enhance the fundamental knowledge in properties of matter 3. Extend the knowledge about wave optics 4. Gain knowledge about magnetic materials. 5. Acquire fundamental knowledge of nano materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**LASER AND FIBRE OPTICS** 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+3
II	**PROPERTIES OF MATTER** Elasticity – Hooke's law –Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending theory and experiment. Twisting couple - torsion pendulum: theory and experiment **Determination of Young's modulus by uniform bending method Determination of Rigidity modulus – Torsion pendulum**	6+3+3
III	**WAVE OPTICS** Interference of light – air wedge –Thickness of thin paper - 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+3+3
IV	**QUANTUM PHYSICS** 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
V	**THERMAL PHYSICS** 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
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able 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 magnetic materials in the field of EngineeringCO5: Develop the technology of smart materials and Nano materials 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., NewDelhi2016
R2 -Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2022

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	-	-	-	-	-	1	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	CourseCode	Name of the Course	L	T	P	C
B.E	2211E1151	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.**Practical Component: 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-** 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"-4th editionCambridgeUniversityPress,2004.
R3-KamaleshSadanan"AFoundationCoursefortheSpeakersofTamil-Part-I&II",OrientBlackswan, 2010.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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.	2211E1095	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. Inter connectedness, 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.

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*, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

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

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

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

Course Objective

The learner should be able :

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

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

Total Instructional Hours   15

Course Outcome

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

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

TEXTBOOKS

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

REFERENCEBOOKS

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

WEBRESOURCES

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

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	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	Course Code	Name of the Course	L	T	P	C
B.E	22MA2205	PARTIAL DIFFERENTIAL EQUATIONS, FOURIER SERIES AND TRANSFORMS (BME, CIVIL & FT)	3	1	0	4

The learner should be able to

Course Objective	
1.	Compute the solution of first order partial differential equations.
2.	Analyze Fourier series which is central to many applications in engineering.
3.	Apply the effective tools for the solutions of one dimensional boundary value problems.
4.	Apply Fourier transform techniques in various situations.
5.	Analyze Z transform techniques for discrete time systems.

Unit	Description	Instructional Hours
I	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form $f(p,q)=0$, Clairaut's equation – Lagrange's equation.	12
II	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions –Change of Interval - Parseval's Identity - Harmonic analysis.	12
III	**BOUNDARY VALUE PROBLEMS** Classification of PDE - Solutions of one dimensional wave equation-One dimensional equation of heat conduction (excluding insulated edges).	12
IV	**FOURIER TRANSFORMS** Fourier Transform Pair - Fourier sine and cosine transforms Pair – Properties-Transforms of Simple functions – Convolution Theorem (Statement only).	12
V	**Z - TRANSFORMS** Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction only) – Solution of difference equations using Z – transform.	12
	Total Instructional Hours	60

Course Outcome	
CO1:	Compute the solution of first order partial differential equations.
CO2:	Understand the principles of Fourier series which helps them to solve physical problems of engineering.
CO3:	Employ Fourier series in solving the boundary value problems
CO4:	Apply Fourier transform techniques which extend its applications
CO5:	Compute the solution of difference equations using Z – transform.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018
T2 - Bali. N.P and Manish Goyal & Watkins, "Advanced Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007

REFERENCE BOOKS :

R1 - Veerarajan. T.,"Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
R2 - Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi,2018.
R3 - Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, NewDelhi, 2018.

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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	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	2	3	-	-	-	-	-	-	2	2	1
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.	22CY2201	ENVIRONMENTAL STUDIES (common to all branches except CSE,IT & AIML)	3	0	0	2

Course Objective

The learner should be able to
1. Grasp the importance and issues related to ecosystem and biodiversity and their protection.
2. Acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. Identify the various natural resources, exploitation and its conservation
4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems.
5. Become aware on the national and international concern for environment and its protection

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**NATURAL RESOURCES** Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources.	9
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	9
V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health.	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Discuss the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2: Identify the causes of environmental pollution and hazards due to manmade activities.
CO3: Develop an understanding of different natural resources including renewable resources.
CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5: Describe about the importance of women and child education, existing technology to protect environment.

TEXT BOOKS:

T1 – S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2020
T2 - Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers, New Delhi, 2019.

REFERENCE BOOKS:

R1 - Erach Bharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015
R2 - G.Tyler Miller, Jr and Scott E. Spoolman "Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
R3 – Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO2	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO3	2	1	1	-	-	2	3	3	2	-	-	2	-	-
CO4	2	1	2	-	-	2	3	3	2	-	-	2	-	-
CO5	2	1	2	-	-	2	3	3	2	-	-	2	-	-
Average	2	1	1.7	-	-	1	2	3	2	-	-	2	-	

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22PII2201	BASICS OF MATERIALS SCIENCE	2	0	0	2

Course Objective

The student should be able to
1. Gain knowledge about Crystal systems and crystal structures
2. Understand the knowledge about electrical properties of materials
3. Enhance the fundamental knowledge in semiconducting materials.
4. Gain knowledge about magnetic materials
5. Acquire fundamental knowledge new engineering materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**CRYSTAL PHYSICS** Crystal systems - Bravais lattice - Lattice planes - Miller indices – Inter planar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures — Fermi-Diracstatistics – Density of energy states .	6
III	**SEMICONDUCTING MATERIALS** Introduction – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Intrinsic semiconductor—electrical conductivity – band gap determination. Extrinsic semiconductor – n type and p type semiconductor – Light Emitting Diode.	6
IV	**MAGNETIC MATERIALS** Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications.	6
V	**NEW ENGINEERING MATERIALS** Metallic glasses: melt spinning process, Preparation and applications - shape memory alloys: phases, shape memory effect - Characteristics of SMA : Pseudoelastic effect, Super elasticity and Hystersis. Applications of SMA. Nanomaterials preparation (bottom up and top down approaches) – various techniques - pulsed laser deposition - Chemical vapor deposition	6
	Total Instructional Hours	30

Course Outcome

After completion of the course the learner will be able to
CO1: Understand the Crystal systems and crystal structures in the field of Engineering
CO2: Illustrate the fundamental of electrical properties of materials
CO3: Discuss concept of acceptor or donor levels and the band gap of a semiconducting materials
CO4: Develop the technology of the magnetic materials and its applications in engineering field
CO5: Understand the advanced technology of new engineering materials in the field of Engineering

TEXT BOOKS:

T1 - Rajendran V, "Materials Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2022

REFERENCE BOOKS:

R1 – Charles Kittel "Introduction to Solid State Physics". Wiley., New Delhi 2017
R2 - Dr. M.Arumugam "Materials Science " Anuradha publications., 2019

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	-	-	-	-	-	1	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.	22CE2101	ENGINEERING MECHANICS AND SOLID MECHANICS	3	0	0	3

Course Objective

1. To understand basic concepts and force systems in a real world environment.
2. To understand the static equilibrium of particles and rigid bodies both in two dimensions.
3. To understand the moment of surfaces and solids.
4. To understand the effect of static friction on equilibrium and the dynamic equilibrium equation.
5. To study the state of stresses and strains in structural components subjected to different loading conditions

Unit	Description	Instructional Hours
I	**STATICS OF PARTICLES** Introduction to engineering mechanics - Classifications, force vector, Law of mechanics, System of forces, transmissibility, Force on a particle – resultant of two forces and several concurrent forces – resolution of a force – equilibrium of a particle — forces in space – equilibrium of a particle in space.	9
II	**EQUILIBRIUM OF RIGID BODIES** Free body diagram, moment of a force – varignon's theorem – moment of a couple – resolution of a force and a couple. Support reactions of the beam.	9
III	**CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA** Centroids of simple plane areas, composite areas, determination of moment of inertia of composite plane figures, polar moment of inertia-radius of gyration – mass moment of inertia of simple solids.	9
IV	**FRICTION & DYNAMICS OF PARTICLES** Laws of dry friction – angles of friction- angle of repose-coefficient of static and kinetic friction – – Friction in inclined plane, Ladder friction, Screw friction– rolling resistance – belt friction - Rectilinear and Curvilinear motion, -Newton's II law – D'Alembert's principle- Energy - potential energy kinetic energy-conservation of energy-work done by a force - work energy method, Impulse momentum method, Impact of bodies, Translation and rotation of the particles	9
V	**TENSION, COMPRESSION AND SHEAR** Introduction - Stress and strain - Hooke's law - Poisson's ratio - Elastic constants – Relationship between elastic constants - Thermal stresses in compound bars	9
	Total Instructional Hours	45

Course Outcome

Upon completion of the course, students will be able to
CO1: Define and illustrate the basic concepts of force system
CO2: Identify the resultant force and couple, support reactions of the beam
CO3: Calculate the Centre of gravity and moment of inertia of an object
CO4: Examine the friction force of particles and objects for Impending Motion and Determine the displacement, velocity and acceleration of particles and objects
CO5: Realize the state of stresses and strains in structural components under tension, compression and shear.

TEXT BOOKS:

T1. F.P.Beer, and Jr. E.R.Johnston., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 11th Edition, Tata McGraw-Hill Publishing company, New Delhi (2018).
T2. Bansal R.K. "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, 2018

REFERENCE BOOKS:

1. NH.Dubey, "Engineering Mechanics", Tata Mcraw Hill, New Delhi, 2016.
2. R.C.Hibbeller, and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. S.S.Bhavikatti, and K.G.Rajashekarappa, "Engineering Mechanics", New Age International (P) Limited Publishers, 2015.
4. P. Jaget Babu, "Engineering Mechanics", Pearson Education, India Ltd, 2016.
5. Rajput RK.," A Textbook of Strength of Materials", S.Chand Publishing, New Delhi, 2018

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

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22CY2252	**APPLIED CHEMISTRY** (MECH,AERO,CIVIL,AUTO,MCT)	2	0	2	3

Course Objective	The learner should be able to
	1. Acquire knowledge on the concepts of chemistry involved in day today life.
	2. Identify the water related problems and water treatment techniques.
	3. Enhance the fundamental knowledge on electrochemistry and the mechanism of corrosion and its control.
	4. Acquire knowledge on various thermo dynamical laws and its importance in engineering applications.
	5. Acquire knowledge on the types of fuels, calorific value calculations, and manufacture of various types of fuels.

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE** Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics-Preparation, properties and uses of PVC, Teflon and Thermosetting plastics - Preparation, properties and uses of Polyester and Polyurethane.	6
II	**WATER TECHNOLOGY** Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary hardness of water by EDTA Determination of Dissolved Oxygen in sewage water by Winkler's method. Estimation of alkalinity of water sample by indicator method.**	6
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HCl vs NaOH). Estimation of Ferrous iron by Potentiometry.**	6
IV	**CHEMICAL THERMODYNAMICS** Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs Helmholtz equation- Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore..	6
V	**FUELS AND COMBUSTION** Fuels : Classification of fuels - coal varieties - analysis of coal (proximate and ultimate analysis) - coke manufacture (Otto-Hoffman byproduct coke oven method) - characteristics of metallurgical coke - cracking (thermal and catalytic cracking definition only) – manufacturing of synthetic petrol (Fischer Tropsch method, Bergius process) – knocking (octane number, cetane number) - gaseous fuels (production, composition and uses of producer gas and water gas).Combustion : gross and net calorific value - explosive range - spontaneous ignition temperature - flue gas analysis (Orsat apparatus).	6
	Total Instructional Hours	30
	Total Lab Instructional Hours	30

Course Outcome	At the end of the course, the learner will be able to
	CO1: List out the chemicals used in food, soaps and detergents, drugs, cosmetics and plastics
	CO2: Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries anddaily life
	CO3:Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences tominimize corrosion to improve industrial design
	CO4: Develop sound knowledge on second law of thermodynamics and second law based derivations and its importance inengineering applications in all disciplines.
	CO5: Classify the various types of fuel and their analysis and other techniques.

TEXT BOOKS

T1 - P. C. Jain & Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2018).
T2 - O .G. Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 – Shikha Agarwal "Engineering Chemistry - Fundamentals and Applications, Cambridge University Press, Delhi, 2019
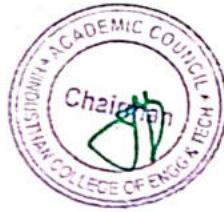R2 - S. S. Dara "A Text book of Engineering Chemistry" S. Chand & Co. Ltd., New Delhi (2018).

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	2211E2251	EFFECTIVE TECHNICAL COMMUNICATION	2	0	2	3

Course Objective

The learner should be able to
1. To improve essential business communication skills.
2. To enrich employability knowledge.
3. To acquire the crucial organizing ability in official forum.
4. To impart important business writings.
5. To make effective presentation with essential etiquette.

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure. Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature. *Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech*	9
II	Language Proficiency: Direct and Indirect speech. Writing: Formal memos, Job application and resume preparation Vocabulary - words on offense and ethics. *Practical Component: Listening- Comprehensions based on telephonic conversation Speaking- Vote of thanks& welcome address*	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension, Vocabulary– words on society. *Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation*	9
IV	Language Proficiency: Idioms Writing: Report writing (marketing, investigating) Vocabulary-words involved in business. *Practical Component: Listening- Watching technical discussions andpreparing MoM Speaking- On the spot Group Discussion*	9
V	Language Proficiency: spotting errors Writing: making /interpreting chart, sequencing of sentences Vocabulary- words involved in finance. *Practical Component: Listening- Comprehensions based on announcements Speaking- Presentation on a technical topic with ppt.*	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, learners will be able
CO1: To the business procedure and promotion skills.
CO2: To make oral and written presentation in corporate forum.
CO3: To schedule official events and participate in official discussions without reluctance.CO4: To take an effective role and manage in an organizational sector.
CO5:To prepare and demonstrate a professional presentation

TEXT BOOKS:

T1 - Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge UniversityPress, 2016.
T2- Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.

REFERENCE BOOKS :

R1 -Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009.
R2- Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009.
R3-Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	21HB5072	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
I	**DESIGN ABILITY** 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
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** 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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B E	22HE2072	SOFT SKILLS AND APTITUDE I	0	0	0	1

Course Objective

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

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	04
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	04
	Total Instructional Hours	30

Course Outcome

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

REFERENCE BOOKS:
R1 - Quantitative Aptitude – Dr. R S Agarwal
R2 - Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3 - Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4 - Objective General English – S.P.Bakshi

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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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GE3152   தமிழர் மரபு   **L T P C**
                                                               1 0 0 1

அலகு I   மொழி மற்றும் இலக்கியம்:   3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II   மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை –
               சிற்பக் கலை:   3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:   3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV   தமிழர்களின் திணைக் கோட்பாடுகள்:   3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V   இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:   3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TEXT-CUM-REFERENCE BOOKS   **TOTAL : 15 PERIODS**

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

Chairman - BoS
CIVIL - HiCET

Dean (Academics)
HiCET

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

Course Objective

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

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

Course Outcome

At the end of the course, the learner will be able to
CO1: Learn about the works pertaining to Sangam age
CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
CO3 Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture.
CO4: Appreciate the intricacies of Tamil literature that had existed in the past.
CO5: Understand the contribution of Tamil Literature to Indian Culture

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

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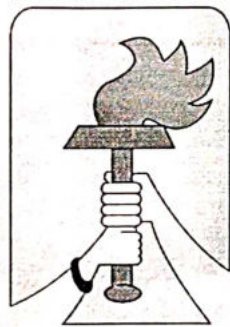
Chairman - BoS
CIVIL - HiCET

Chairman
ACADEMIC COUNCIL
HINDUSTHAN COLLEGE

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

&

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

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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 Element Analysis	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
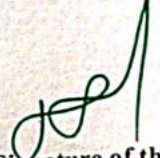
				L	T	P	C			
1	21CE8307	Construction Economics and Finance	PE	3	0	0	3	40	60	100
2	21CE8308	Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100
3	21CE8309	Disaster Resistant Structures	PE	3	0	0	3	40	60	100
4	21CE8310	Environmental Impact Assessment	PE	3	0	0	3	40	60	100
5	21CE8311	Construction Safety Practices	PE	3	0	0	3	40	60	100
6	21CE8312	IoT for Smart City Planning	PE	3	0	0	3	40	60	100

OPEN ELECTIVES

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

Signature of the Chairman (BoS)

Signature of the Dean Academics

Signature of the Principal

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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	!	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

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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	1.4
7.	21HE1071	Language Competency Enhancement Course - 1	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	-	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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S.No	Course Code	Course Name															
13.	21EE2103	Basics of Electrical and Electronics Engineering	3	2.5	2.0	2	1	3	2	1	-	-	1	-	1.4	2.6	1.8
14.	21ME2101	Engineering Mechanics	3	3	1.6	1	1	2	1			1	1	1	1	1	1.4
15.	21PH2151	Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	1.8	-	-	1	2	2.2
16.	21CY2151	Environmental Studies	2	1	1.7	-	-	1.	2	3	2	-	-	2	2	-	-
17.	21ME2001	Engineering Practices	3	3	3		3			1		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	1	3	-	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	1	3	1	2.8	1	1
20.	21MA3103	Fourier Analysis and Numerical Methods	3	3	3	3	2.6	-	3	-	-	-	-	-	2	2	1.2
21.	21CE3201	Mechanics of Fluids	3	3	3	2	-	2.4	1	2	2	1	1	-	2.6	3	3
22.	21CE3202	Geology and Construction Materials	3	1.2	1	1.4	1	1.4	1.6	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	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	-	-	2	1.8	2	2	2	3	3

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S.No	Course Code	Course Name															
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	1.6	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	1.6	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	2.2
31.	21CE4201	Strength of Materials	3	3	3	2	-	1.8	1.6	-	1.4	2.8	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	1.4	2.8	3	2.6
33.	21CE4203	Soil Mechanics	3	3	2.8	2.6	-	2.2	1	1.6	2	1.4	2	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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21MA3103	FOURIER ANALYSIS AND NUMERICAL METHODS	3	1	0	4

Course Objective

1. Introduce Fourier series analysis which is central to many applications in Engineering
2. Solve boundary value problems by applying Fourier series
3. Apply Fourier transform techniques used in wide variety of situations
4. Apply various methods to solve numerical differentiation and numerical integration
5. Explain the numerical solution of ordinary differential equations as most of the engineering problems are expressed in the form of differential equations

Unit	Description	Instructional Hours
I	**FOURIER SERIES** Introduction - Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis.	12
II	**BOUNDARY VALUE PROBLEMS** Classification – solution of one dimensional wave equation – one dimensional heat equation – Fourier series solution in Cartesian coordinates.	12
III	**FOURIER TRANSFORMS** Fourier Transform Pair - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem – Parseval's identity.	12
IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION** Interpolation: Newton's forward and backward difference formulae – Newton's divided difference formula and Lagrangian interpolation for unequal intervals. Differentiation: Newton's forward and backward interpolation formulae for equal intervals – Newton's divided difference formula for unequal intervals. Numerical integration: Trapezoidal and Simpson's 1/3 and 3/8 rules.	12
V	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods: Taylor's series method – Modified Euler's method for first order equation – Fourth order Runge- kutta method for solving first order equations – Multi step method: Milne's predictor and corrector method.	12
	Total Instructional Hours	60

Course Outcome

CO1: Understand the function in terms of sine and cosine terms in fourier series and also to get knowledge in fourier transforms

CO2: Demonstrate the application of Fourier series in solving the heat and wave equations

CO3: Understand the mathematical principles on Fourier transforms and able to solve some of the physical problems of engineering

CO4: Understand and apply the concepts of interpolation, numerical differentiation and integration

CO5:Understand the concept of solving ordinary differential equations using single and multi stepmethods

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 - Veerarajan. T.,"Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
R3- GuptaS.K.,"Numerical Methods for Engineers", New Age International Pvt.Ltd Publishers,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
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Average	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE3201	MECHANICS OF FLUIDS	3	0	0	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
I	**FLUID PROPERTIES** 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
II	**FLUID STATICS** 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
III	**FLUID KINEMATICS & FLUID DYNAMICS** 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 – Orificemeter, Venturimeter. Measurement of Discharge – Momentum principle	9
IV	**FLOW THROUGH PIPES** Flow through pipes – Laminar flow through pipes and between plates – Hagen-Poiseuille equation – Turbulent flow- Major and minor losses of flow in pipes - Darcy Weisbach's equation - Moody's diagram –Pipes in series and parallel – Equivalent pipe - Pipe network	9
V	**DIMENSIONAL ANALYSIS** 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: Interpret 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. UniversityPress (India) Pvt. Ltd. 2009.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	21CE3202	GEOLOGY AND CONSTRUCTION MATERIALS	3	0	0	3

Course Objective	
1.	To describe the geological processes, structures and their importance in construction projects
2.	To discuss the fundamental properties of minerals and their application in Civil Engineering
3.	To classify and characterize the various types of rocks, its engineering properties and uses
4.	To introduce students to materials commonly used in civil engineering and their properties
5.	To illustrate the properties and applications of other miscellaneous materials and finishes

Unit	Description	Instructional Hours
I	**PHYSICAL AND STRUCTURAL GEOLOGY** Geology in civil engineering – Branches of geology – Structure of Earth and its composition Weathering of rocks – Soils - Landforms and processes associated with river, wind and sea – Study of structures – Folds, Faults and Joints – Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings.	9
II	**MINEROLOGY** Physical properties of minerals – Quartz group - Feldspar group - Pyroxene (Hypersthene and Augite) – Amphibole (Hornblende) – Mica (Muscovite and Biotite)– Calcite – Gypsum - Clay minerals (Kaolin) - Ore minerals (Iron ores, Chromite, Bauxite, Chalcopyrite) – Coal and Petroleum.	9
III	**PETROLOGY** Classification of rocks - Distinction between Igneous, Sedimentary and Metamorphic rocks - Engineering properties of rocks - Description, occurrence, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.	9
IV	**BUILDING MATERIALS** Bricks –manufacture, types, properties, uses, Building Stones – types & uses, , Cement – manufacture, types, properties, Mortar – types&properties, Concrete – ingredients, properties, types, uses, Concrete Mixes, Grades, Steel – plain and deformed bars, relative merits – RCC – uses, merits and demerits.	9
V	**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
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students shall have ability to
	CO1: Recognize the importance of geological knowledge in Civil Engineering
	CO2: Identify the minerals present in the building materials
	CO3: Characterize the engineering properties of rocks and soils
	CO4: Distinguish and select the various construction materials used in concrete
	CO5: Compare the typical and potential applications of other miscellaneous materials and finishes

TEXT BOOKS:
T1 - Venkat Reddy, D. "Engineering Geology", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.
T2 - Parbin Singh, "Engineering and General Geology", S.K.Kataria and Sons, New Delhi, 2014.
T3 - Duggal, S.K., "Building Materials", New Age International, New Delhi, 2009.

REFERENCE BOOKS:
R1 - Dimitri P Krynine and William R Judd, "Principles of Engineering Geology and Geotechnics", CBS Publishers and Distributors, New Delhi.
R2 - Varghese, P.C., "Engineering Geology for Civil Engineering", Prentice Hall of India Learning Private Limited, New Delhi, 2012.
R3 - Shetty, M.S., "Concrete Technology", S.Chand and Company, 2011.
R4 – Rangwala, "Engineering Materials", Charotar Publishing House Pvt. Ltd., Anand, Gujarat, 2019.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	21CE3203	SURVEYING	3	0	0	3

Course Objective

1. To introduce the principles of surveying and levelling
2. To learn the various methods of Theodolite surveying and Contouring
3. To introduce the concepts of Control Surveying
4. To acquire knowledge on working principle of EDM and Total Station
5. To study the principles of map projections and GIS

Unit	Description	Instructional Hours
I	**INTRODUCTION OF SURVEYING AND LEVELLING** Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Basic Principles- Bearing Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling - Datum- Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking Reduction - Sources of errors in Levelling	9
II	**THEODOLITE SURVEYING AND COUNTOURS** Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Characteristics of contours – Methods of contouring – Contour gradient – Uses of contour plan and map	9
III	**CONTROL SURVEYING AND ADJUSTMENT** Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations –trigonometrical levelling – traversing – Errors Sources- precautions and corrections – classification of errors –true and most probable values - weighed observations – principle of least squares - normal equation – level nets.	9
IV	**ELECTRONIC DISTANCE MEASUREMENTS AND TOTAL STATION** Measurement principle of EDM instrument – EDM instrument characteristics – Accuracy in EDM – Field procedure of EDM – Total station – Introduction – Advantages – Types of total stations – Applications of total station - Sources of Error - Care and maintenance of Total Station	9
V	**CURVES AND GEOGRAPHICAL INFORMATION SYSTEM** Introduction – Curves – Types of Curves – Long Chord, Rankine's Method – Maps – Map projections – Map analysis – GIS – Definition – Basic components of GIS - Standard GIS software – Data types – Spatial and non-spatial (attributed) data – Measurement scales – Data Base Management Systems (DBMS)	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Apply the basic principles of surveying and levelling
CO2: Measure horizontal angle and vertical angle using theodolite
CO3: Take suitable precautions and apply necessary corrections in surveying
CO4: Apply principles of EDM and use total station in surveying
CO5: Interpret topographic maps and applications of GIS

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, A., Raymond, S., Baker, R., "Surveying", Pearson Education Ltd., 7th Edition, 2009.
R3 - Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.
R4 - Arora, K. R., "Surveying Vol I & II", Standard Book House, Twelfth Edition, 2013.

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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.	21CE3251	MECHANICS OF SOLIDS	2	0	2	3

Course Objective

1. To study the state of stresses and strains in structural components subjected to different loading conditions
2. To gain knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and loading
3. To learn the concepts of internal stress in beams of various cross sections
4. To analyze the members under complex state of stress by means of analytical and graphical methods
5. To understand the behaviour of members subjected to pure torsion and shear

Unit	Description	Instructional Hours
I	**TENSION, COMPRESSION AND SHEAR** Introduction - Stress and strain - Hooke's law - Poisson's ratio - Elastic constants – Relationship between elastic constants - Thermal stresses in compound bars. *Tension Test, Compression Test*	6+4(P)
II	**SHEAR FORCE AND BENDING MOMENT** 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. cantilever and overhanging beams	6
III	**STRESSES IN BEAMS** Introduction - Pure bending and non-uniform bending - Curvature of a beam –Bending stresses in beams – Shear stresses in beams of rectangular, circular, T and I sections. *Deflection Test, Shear Test*	6+4(P)
IV	**PRINCIPAL STRESS AND STRAIN** Plane stress - Principal stresses and maximum shear stress - Determination of principal stresses and principal planes - plane strain - Applications of plane stress.	6
V	**TORSION OF SHAFTS AND SPRING** Torsional deformations of a circular bar – Non uniform torsion - Stresses and strains in pure shear - transmission of power by circular shafts - Strain energy in torsion and pure shear - Springs – Types - Stresses and deflection of springs *Torsion Test, Impact Test, Test on Springs*	6+6(P)
	Total Instructional Hours	45

Course Outcome

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

CO1: Realize the state of stresses and strains in structural components under tension, compression and shear

CO2: Plot the Shear force and bending moment diagrams for all the statically determinate beams

CO3: Analyse the beam for bending and shear stresses

CO4: Evaluate the elements subjected to complex state of stress by means of analytical and graphical methods.

CO5: Comprehend the behaviour of members under pure torsion and shear

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.ChandPublishing, 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	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.	21CE301	SURVEY LAB	0	0	4	2

Course Objective
1. To gain knowledge on the principles and usage of chains and its accessories
2. To learn how to use compass, levels and theodolites
3. To study the methods and operational techniques of total station and GPS

Expt . No.   **Description of the Experiment**

1. Aligning. Ranging and Chaining

2. Chain Traversing

3. Compass Traversing

4. Fly Levelling using Dumpy Level (Height of Instrument and Rise & Fall Method)

5. Study of Theodolite

6. Horizontal Angles using Theodolite (Method of Repetition and Reiteration)

7. Vertical Angles using Theodolite

8. Stadia and Tangential Tacheometry

9. Setting Out of Structures using Total Station

10. Area of the Plot using Total Station

11. Introduction to GPS (Demonstration Only)

                                        Total Practical Hours   45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Handle and operate the conventional surveying instruments such as chain. tape and compass to measure distances, angles and areas.
CO2: To carry out leveling operations and prepare a contour map of a given area.
CO3: Conduct experiment using compass, and total station to calculate the given area.
CO4: Use the theodolite to determine the horizontal and vertical angles.
CO5: Take measurements, adjust the errors and prepare a layout of a given area

REFERENCE BOOKS:
R1 –Punmia B. C., "Surveying Vol. I & II", Standard Publishers, 2015.
R2 - Arora K.R., "Surveying Vol I & II", Standard Book House, 10th Edition, 2010.
R3 – Satheesh Gopi, Sathikumar R.,MadhuN.,"Advanced Surveying: Total Station, GIS and Remote Sensing", Pearson Education India, 2006.
R4 - Bannister and Raymond,S.,"Surveying", Longman, Seventh Edition, 2004.

	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	-	-	3	2.8	-	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE3002	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
2.	Orientation of buildings – Lighting and Ventilation - Building bye-laws - FSI, Open spaces
3.	Introduction to AutoCAD
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 and 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 –Marimuthu V.M.,Murugesan R.and Padmini S., "CivilEngineeringDrawing-I",Pratheeba Publishers, 2008

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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./B.Tech.	21MC3191	INDIAN CONSTITUTION	2	0	0	0

Course Objective

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	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India.	4
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.	4
III	**PARLIAMENTARY FORM OF GOVERNMENT** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – The historical perspective of the constitutional amendment of India – Emergency provisions: National emergency, President rule, Financial emergency.	4
IV	**LOCAL GOVERNANCE** Local self-government - constitutional scheme of India – Scheme of fundamental right to equality – scheme of fundamental right to certain freedom under article19 – scope of the right to life and personal liberty under article 21	4
V	**INDIAN SOCIETY** Constitutional Remedies for citizens – Political Parties and Pressure Groups: Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	4
	Total Instructional Hours	20

Course Outcome

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

TEXT BOOKS:

T1 -Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi, 1997.
T2 - Agarwal R C., "Indian Political System",S.Chand and Company, New Delhi, 1997.
T3 - Maciver and Page, " Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
T4 - Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997.

REFERENCE BOOKS:

R1 - Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2 - Gahai U R., "Indian Political System ", New Academic Publishing House, Jalaendhar.
R3 - Sharma R N., "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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Course code	Course title	L T P C
21HE3072	Career Guidance – Level III	2 0 0 0
Pre-requisite	Personality, Aptitude and Career Development	Syllabus version
	None	1

Course Objectives:
- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Display good writing skills while dealing with essays [SLO 12]

Expected Course Outcome:
Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO):   6, 7, 8, 12

Module:1   Logical Reasoning   **6 hours**   **SLO:6**
Clocks, calendars, Direction sense and Cubes
- Clocks
- Calendars
- Direction Sense
- Cubes

Data interpretation and Data sufficiency
- Data Interpretation – Tables
- Data Interpretation - Pie Chart
- Data Interpretation - Bar Graph
- Data Sufficiency

Module:2   Quantitative Aptitude   **7 hours**   **SLO: 7**
Time and work
- Work with different efficiencies
- Pipes and cisterns
- Work equivalence
- Division of wages

Time, Speed and Distance
- Basics of time, speed and distance
- Relative speed
- Problems based on trains
- Problems based on boats and streams
- Problems based on races

Profit and loss, Partnerships and averages
- Basic terminologies in profit and loss
- Partnership
- Averages
- Weighted average

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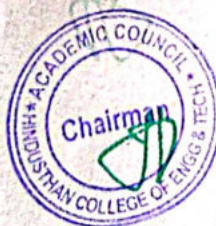
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Module:3 Verbal Ability   5 hours   SLO: 8
Sentence Correction
- Subject-Verb Agreement
- Modifiers
- Parallelism
- Pronoun-Antecedent Agreement
- Verb Time Sequences
- Comparisons
- Prepositions
- Determiners

Sentence Completion and Para-jumbles
- Pro-active thinking
- Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues)
- Fixed jumbles
- Anchored jumbles

Module:4   Writing skills for placements   2 hours   SLO: 12
Essay writing
- Idea generation for topics
- Best practices
- Practice and feedback

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, 3 Assessments with End Semester (Computer Based Test)

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	21HE3073	LEADERSHIP MANAGEMENT SKILLS	1	0	0	0

Course Objective	
	1. To know about the leadership skills that is to be acquired for success
	2. To become a teamwork expert, real world problem solver, your views will be challenged
	3. To gain global perspective and becoming an effective communicator
	4. To understand about learning, negotiation and decision making
	5. To get first hand information about the skills we possess and to work on improvement

Module	Description	Instructional Hours
1	Strategic thinking skills	
2	Planning and Delivery skills	
3	People management skills (Delegation)	
4	Change management and Innovation skills	
5	Communication skills	
6	Persuasion and influencing skills	
7	Learning Agility	
8	Motivation	
9	Personality	
10	Emotions	
11	Perception	
12	Negotiation	
13	Decision making	
14	Problem solving	
15	Building trust	
	Total Instructional Hours	**15**

Course Outcome	
	CO1: To practice essential leadership skills in day to day operations
	CO2: To work on leadership skills in the study environment
	CO3: To understand and develop the skills consciously
	CO4: To know about the real worth of all the skills for success
	CO5: To Analyze the real worth of the person and suggestion for improvement

TEXT BOOKS:
T1- A REVIEW OF LEADERSHIP THEORY AND COMPETENCY FRAMEWORKS, Bolden, R., Gosling, J., Marturano, A. and Dennison, P.June 2003
T2- LEADING FROM WITHIN: Building Organizational Leadership Capacity-David R. Kolzow, PhD, 2014

REFERENCE BOOKS:
R1- Seven habits of highly effective people – Stephen R.Covey
R2-The Art of Business Leadership: Indian Experiences – G.Balasubramaniam
R3 - DEVELOPING the LEADER WITHIN YOU-JOHN C. MAXWELL

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21MA4103	PROBABILITY AND STATISTICS	3	1	0	4

Course Objective

1. Construct a well defined knowledge of random variables
2. Explain the concept of two dimensional random variables and determine covariance
3. Introduce Correlation concepts to understand the relation between two random variables
4. Describesome basic concepts of statistical methods for testing the hypothesis
5. Analyze the design of experiment techniques to solve various engineering problems

Unit	Description	Instructional Hours
I	**PROBABILITY AND RANDOM VARIABLE** Axiomsofprobability - Conditional probability - Total probability - Baye'stheorem.Random variable -Discrete and continuous random variables- Probabilitymassfunction-Probabilitydensityfunction- Cumulativedistribution Functions-Momentgeneratingfunctions.	12
II	**TWO DIMENSIONAL RANDOM VARIABLES** Joint probability mass function - Joint probability density function – Marginal Probability mass function – Marginal probability density function - Conditional Probability mass function - Conditional Probability density function – Independent random variables.	12
III	**CORRELATION AND REGRESSION** Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines (problems based on Raw data only).	12
IV	**HYPOTHESIS TESTING** Large sample test based on Normal distribution - test of significance for single mean and difference of means - Small sample test – t test for single mean and difference of mean - F distribution for variance, Chi – Square test for independence of attributes – Goodness of fit.	12
V	**ANALYSIS OF VARIANCE** Introduction, assumptions of analysis of variance, completely randomized design, randomized block design, Latin square design.	12
	Total Instructional Hours	60

Course Outcome

CO1: Understand the concepts of random variables
CO2: Express the phenomenon of two dimensional random variables
CO3: Compute correlation and predict unknown values using regression
CO4: Understand the concepts of statistical methods for testing the hypothesis
CO5:Apply Design of Experiment techniques to solve various engineering problems

TEXT BOOKS:

T1 - Saeed Ghahramani, "Fundamentals of probability with stochastic processes", Prentice Hall New Jersy, 2016.
T2 - Medhi J," stochastic Processes", New Age International Publishers,New Delhi,2014.

REFERENCE BOOKS :

R1- IbeO.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, First Indian Reprint, 2010.
R2 - Mont Gomery C. "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	PSO11	PSO12
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 B.E.	Course Code 21CE4201	Name of the Course STRENGTH OF MATERIALS	L 3	T 1	P 0	C 4

Course Objective

1. To know the concepts of truss analysis.
2. To gain knowledge on the analysis of thin and thick cylinders subjected to fluid pressure and various failure theories.
3. To study the behaviour of short and long column under axial and eccentric loads.
4. To understand the deflection of beams by various methods.
5. To get exposed to the principles of unsymmetrical bending and shear.

Unit	Description	Instructional Hours
I	**ANALYSIS OF TRUSSES** 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.	12
II	**THIN AND THICK CYLINDERS AND THEORIES OF ELASTIC FAILURE** Thin cylinders – Circumferential stress – Longitudinal stress – Volumetric strain - Stresses in thick cylindrical shell– Lame's equation – Stresses in compound cylinders – Shrink fit - Failure theories - Maximum principal stress theory- Maximum shear stress theory- Maximum principal strain theory- Strain energy theory- maximum shear strain energy theory.	12
III	**COLUMNS AND STRUTS** Short and slender columns- Axial and bending stress – Kern of a section - buckling and stability – Columns with pinned ends - Columns with other support conditions - Columns with eccentric loads - Euler theory and Rankine's formula .	12
IV	**DEFLECTION OF BEAMS** Deflection of beams - Castigliano's theorem.- Geometric methods - Double integration method – Macaulay's method – Moment-Area method - Conjugate beam method.	12
V	**UNSYMMETRICAL BENDING** Unsymmetrical bending- Symmetrical and unsymmetrical sections - Bending stresses in beams - Shear centre - Symmetric and unsymmetrical sections.	12
	Total Instructional Hours	60

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Analyse the determinate trusses.
CO2: Determine the stresses developed in thin and thick cylinders subjected to fluid pressure.
CO3: Interpret the behaviour of short and long column under axial and eccentric loads.
CO4: Determine slope and deflection in beams using various methods.
CO5: Comprehend stresses in beams subjected to unsymmetrical bending.

TEXT BOOKS:

T1 - Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& Company Ltd., New Delhi, 2015.
T2 - Egor P Popov, "Engineering Mechanics of Solids", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

R1 - Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
R2 - Punmia B.C. "Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt. Ltd., New Delhi 2018.
R3 - Srinath, L.S, "Advanced Mechanics and solids", Tata-McGraw Hill Publishing Co. Ltd., 2005.
R4 - Beer, F.P. and Johnston, E.R., "Mechanics of Materials", Tata McGraw Hill, Sixth Edition, NewDelhi 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2		1	1		1	2				
CO2	3	3	3	2		2	2		2	1		3	3	3
CO3	3	3	3	2		2	1		2	2		2	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
Average	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.	21CE4202	APPLIED HYDRAULICS AND HYDRAULIC MACHINERY	3	0	0	3

Course Objective

1. To understand the types and flow regimes of open channel flows.
2. To get acquainted with velocity measurements and determine the most economical channel sections.
3. To acquire knowledge on the concepts of varied flow and learn the characteristics of hydraulic jump.
4. To learn the various types of turbines and calculate the work done by each.
5. To study the different types of pumps and their performance.

Unit	Description	Instructional Hours
	OPEN CHANNEL FLOW	
I	Open channel flow - Types and regimes of flow - Velocity distribution in open channel -Steady uniform flow: Chezy equation, Manning equation -Wide open channel -Specific energy -Critical flow and its computation - channel transition.	9
	UNIFORM FLOW	
II	Uniform flow -Velocity measurement -Manning's and Chezy's formuia - Determination of roughness coefficients - Determination of normal depth and velocity - Most economical sections - Non-erodible channels.	9
	VARIED FLOW	
III	Dynamic equations of gradually varied. flow - Assumptions - Characteristics of flow profiles - Draw down and back water curves - Profile determination - Graphical integration, direct step and standard step method - Flow through transitions – Hydraulic jump – Types - Energy dissipation – Surges.	9
	TURBINES	
IV	Impact of Jet on vanes - Turbines - Classification – Velocity triangle - Governing and selection of turbine - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine .	9
	PUMPS	
V	Centrifugal pumps - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps- Gear pump.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Classify open channel flows and plot the flow regimes.
CO2: Design the most economical sections for open channel flows
CO3: Analyse varied flows and interpret hydraulic jump phenomenon
CO4: Assess the performance of various types of turbines
CO5: Assess the performance of different pumps

TEXT BOOKS:

T1 - Chandramouli 'Applied Hydraulics' YesDee Publishers, 2017
T2 – Rajput R.K., "A text Book of Fluid Mechanics", S.Chand and Company,New Delhi,2009.

REFERENCE BOOKS:

R1 - Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2011.
R2 - Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2010.
R3 -Bansal R.K., "Fluid Mechanics & Hydraulic Machines", Laxmi Publications, 2015.
R4 - Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	2		2	3	1	2		2	3	3	3
CO2	3	3	1	2			2		2		2	3	3	3
CO3	3	3		1	2		3	1	2	2	2	3	3	2
CO4	3	2	1	1		2	3		1		3	2	3	2
CO5	3	2		1			3		1		2	3	3	3
Average	3	2.6	1.6	1.4	2	2	2.8	1	1.6	2	2.2	2.8	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE4203	SOIL MECHANICS	3	0	0	3

| Course Objective | 1. Learn the soil classification and compaction behavior of soil
2. Study the concepts behind the effective stress, permeability and seepage of soil.
3. Understand the concepts of stress distribution and settlement.
4. Explore the principles of shear test and liquefaction.
5. Gain knowledge on slope stability analysis, failure mechanism and protection measures |

Unit	Description	Instructional Hours
I	**SOIL CLASSIFICATION AND COMPACTION** Nature of soil - Soil formation - Soil water – phase relationship - Volume-weight relationships - BIS Classification of soil – Tests for specific gravity -Grain size distribution – Sieve analysis - Atterberg limits - Soil compaction – Theory, Field compaction methods – Standard proctor Compaction test - Factors influencing compaction behaviour of soils.	9
II	**EFFECTIVE STRESS CONCEPTS AND PERMEABILITY** Effective stress concepts in soils – quick sand condition - Critical hydraulic gradient - Permeability measurement in the laboratory – Constant head and Variable head method - factors influencing permeability of soils - Seepage – introduction to flow nets – properties and uses of flow nets - Equipotential and flow lines - Simple problems.	9
III	**STRESS DISTRIBUTION AND SETTLEMENT** Vertical Stress distribution in soil – Boussinesq equation – point load and line load - Westergaard's equation – Newmark's influence chart – principle, construction and use- Terzaghi's one dimensional consolidation theory — Components of settlement – immediate and consolidation settlement.	9
IV	**SHEAR STRENGTH** Shear strength properties of cohesive and cohesion less soils – Mohr-Coulomb failure criterion – Use of Mohr's circle – relationship between principle stresses and shear parameters – shear strength tests - Direct shear, Unconfined Compression and Vane shear– Liquefaction of soil.	9
V	**SLOPE STABILITY** Slope failure mechanisms – Types of slope failure – stability analysis of an infinite slope for cohesion less and cohesive soil - Friction circle method – Method of slices - Use of stability number - slope protection measures.	9
	Total Instructional Hours	45

| Course Outcome | Upon successful completion of the course, students shall have ability to
CO1: Classify the soil based on index properties of soil
CO2: Assess the permeability characteristics of soil and calculate stress at any point in soil media due to load applied at a ground surface
CO3 Identify the stress distribution in soil, settlement problems occur in construction site
CO4: Apply the knowledge in carrying out soil testing
CO5:Analyze the stability of slope in cohesive and cohesion less soil by using different methods |

TEXT BOOKS:

T1 -Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd.,New Delhi. 2011.

T2 - Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2015.

REFERENCE BOOKS:

R1 - Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

R2 - Gopal Ranjan and Rao. P. "Basic and Applied Soil Mechanics", New Age International Pvt, Ltd, New Delhi, 2014.

R3 - Braja M. Das, "Fundamentals of Geotechnical Engineering", Thomson Asia Pvt. Ltd., Singapore, 2010.

R4 - McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.

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	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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE4251	CONCRETE TECHNOLOGY	2	0	2	3

Course Objective

1. To understand the properties of ingredients of concrete
2. To learn the properties and applications of chemical and mineral admixtures
3. To gain knowledge on concrete design mix
4. To study the behaviour of concrete at its fresh and hardened state
5. To understand special concrete and their use

Unit	Description	Instructional Hours
I	**CONCRETE – INGREDIENTS AND MANUFACTURE** Concrete – Ingredients – Cement, Aggregates - Properties and tests - Quality of Water for mixing and curing - Production - Batching – Mixing –Transportation - Placing - Compacting – Curing. *Tests for cement: Fineness, Specific gravity, Normal consistency, Soundness, Setting time* *Test for CM: Compressive strength*	7+10(P)
II	**ADMIXTURES** Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline	7
III	**CONCRETE MIX DESIGN** Grades of Concrete - Factors influencing mix proportion - Mix design by ACI method and I.S. code method - Mix Design Examples.	7
IV	**TESTS ON FRESH AND HARDENED CONCRETE** Tests on fresh concrete - workability - Segregation and Bleeding –Tests on Hardened concrete - Compressive strength – Split tensile strength - Flexural strength– water absorption – permeability.	7
V	**SPECIAL CONCRETE** Ferrocement - Ready mix concrete- High Strength Concrete - High Performance Concrete - Self compacting concrete – Lightweight concrete –Fibre Reinforced concrete - Polymer concrete - Prestressed concrete – Techniques on prestressing.	7
	Total Instructional Hours	45

Course Outcome

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

CO1: Identify the various requirements of cement, aggregates and water for making concrete.
CO2: Interpret the effect of admixtures on properties of concrete
CO3: Design the concrete mix using ACI and IS code methods.
CO4: Determine the properties of fresh and hardened of concrete.
CO5: Recognize the importance and application of special concretes.

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 - Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
R2 - Neville, A. M.,"Properties of Concrete", Pearson India, fifth edition, 2002.
R3 - Kumar P Mehta, Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016.
R4 - Santhakumar, A. R., "Concrete Technology", Oxford University Press India, New Delhi 2006.

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.	21CE4001	SOIL MECHANICS LAB	0	0	4	2

Course Objective	1. Understand the characteristics of soil and study their behaviour under the influence of various forces using experimental methods. 2. Learn the various tests carried out to measure the index properties, density and compaction characteristics of the soil sample 3. Get conversant with the test procedures to determine the engineering properties of soil.

Exp No.	Description of the Experiment
1	Test for moisture content
2	Specific gravity test
3	Sieve analysis
4	Test for Consistency limits(Liquid limit, Plastic limit and Shrinkage limits)
5	Field density test (core cutter and sand replacement method)
6	Standard Proctor's Compaction test
7	Permeability Test
8	Direct shear test in cohesion less soil
9	Unconfined compression test in cohesive soil
10	Laboratory vane shear test in cohesive soil
11	California bearing ratio test
12	Tri-axial compression test (Demonstration)

Total Instructional Hours   45

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Carry out specific field investigations to collect, test, observe and record the soil characteristics and its behavior. CO2: Identify and classify soil based on standard geotechnical engineering practice. CO3: Conduct tests to determine and demonstrate the index properties of soil. CO4: Estimate compressive strength, shear strength, permeability and other engineering properties of soil CO5: Assess and justify the suitability of soil for construction purposes based on test results.

REFERENCE BOOKS:

R1 - Braja M Das ,"Soil Mechanics: Laboratory Manual" Oxford University Press , 2012.
R2 - Saibaba Reddy, E.andRamasastri, K. "Measurement of Engineering Properties of Soils", New Age International (P) Limited Publishers, New Delhi, 2002.
R3 - Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3		1	3		2	3	2	3		2	3	
CO2	3		1	3	2		2	3	1	2	1	3	3	2
CO3	2	3				2	1			1		2	2	
CO4	3	3	1		2	1	1	2	2	1	3	1	3	3
CO5	3	3		3	2	2			1	2	1	2	1	1
Average	2.8	3	1	2.3	2.25	1.6	1.5	2.6	1.5	1.8	1.6	2	2.4	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21CE4002	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	0	0	4	2

Course Objective	1. To understand the theories and principles governing the flow using experimental methods. 2. To learn how to determine the losses occurring in pipes. 3. To study the characteristics of pumps and turbines.

Expt . No.	Description of the Experiment
1.	Determination of loss coefficients for pipe fittings - Major and minor losses
2.	Flow through Venturimeter and Orificemeter
3.	Flow through variable duct area- Bernoulli's Experiment
4.	Flow through Orifice (CHM & VHM)
5.	Flow throughRectangular Notch
6.	Characteristics of Reciprocating pump
7.	Characteristics of Submersible pump
8.	Characteristics of Centrifugal pump
9.	Characteristics of Gear pump
10.	Characteristics of Pelton wheel turbine
11.	Characteristics of Francis turbine
12.	Characteristics of Kaplan turbine

Total Practical Hours   45

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Measure discharge in pipes and channels. CO2: Determine the major losses in pipes and conduits. CO3: Measure the losses in conduits. CO4: Demonstrate and plot the characteristic curves of pumps CO5: Demonstrate and plot the characteristic curves of turbines

REFERENCES:

R1 - Sarbjit Singh, "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2012.
R2 - "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
R3 - Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	1	2	2	1	2	1	2	3	3		2	3	3
CO2	3	2	1	2	1	2	1	2	3	3		2	3	2
CO3	3	1	2	2	1	2	1	1	3	3		1	3	3
CO4	3	1	1	2	1	2	1	2	3	3		2	3	3
CO5	3	2	1	2	1	2	1	2	3	3		1	3	3
Average	3	1.4	1.4	2	1	2	1	1.8	3	3	-	1.6	3	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21MC4191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

1. The course aims at imparting basic principles of thought process, reasoning and inferencing
2. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature
3. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions
4. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view, basic principles of Yoga and holistic health care system, Indian philosophical traditions, Indian linguistic tradition and Indian artistic tradition

Unit	Description	Instructional Hours
I	Basic Structure of Indian Knowledge System	4
II	Modern Science and Indian Knowledge System	4
III	Yoga and Holistic Health care	4
IV	Philosophical tradition	4
V	Indian linguistic tradition (Phonology, Morphology, Syntax and semantics), Indian artistic tradition and Case Studies	4
	Total Instructional Hours	**20**

Course Outcome

CO1: Ability to understand the structure of Indian system of life.
CO2: 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 Physics
R4 - 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, VidyanidhiPrakasham, Delhi, 2016
R8 - RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, VidyanidhiPrakasham, Delhi, 2016
R9 - P R Sharma (English translation), ShodashangHridayam

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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Course code	Course title	L T P C
21HE4072	Career Guidance – Level IV Personality, Aptitude and Career Development	2 0 0 0
Pre-requisite	None	Syllabus version 1

Course Objectives:
- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Crack mock interviews with ease [SLO 13]
- Be introduced to problem-solving techniques and algorithms [SLO 14]

Expected Course Outcome:
Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO):   6, 7, 8, 13, 14

Module:1   Logical Reasoning   3 hours   SLO:6
Logical connectives, Syllogism and Venn diagrams
- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation
- Venn Diagrams – Solving

Module:2   Quantitative Aptitude   6 hours   SLO: 7
Logarithms, Progressions, Geometry and Quadratic equations
- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded inequalities
- Quadratic Equations

Permutation, Combination and Probability
- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination
- Probability

Module:3   Verbal Ability   2 hours   SLO: 8
Critical Reasoning
- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

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Module:4   Recruitment Essentials   1 hour   SLO: 12
Cracking interviews - demonstration through a few mocks
Sample mock interviews to demonstrate how to crack the:

- HR interview
- MR interview
- Technical interview

Cracking other kinds of interviews

- Skype/ Telephonic interviews
- Panel interviews
- Stress interviews

Resume building – workshop
A workshop to make students write an accurate resume

Module:5   Problem solving and Algorithmic   8 hours   SLO: 12
**   skills**

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

                      Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, Mock interviews, 3 Assessments with End Semester (Computer Based Test)

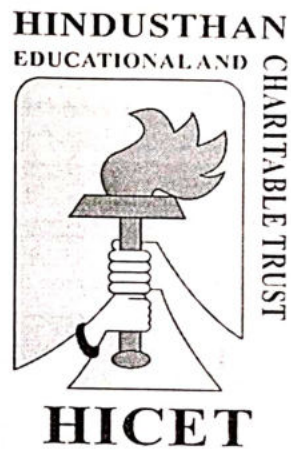|	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	2	1	2	2	3	-	3	1	-
CO2	2	1	1	1	1	2	2	2	2	3	-	2	-	1
CO3	2	2	1	1	1	2	2	2	2	3	1	3	1	-
CO4	2	2	1	1	2	2	2	2	3	3	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	3	1	3	1	1
Average	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1

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HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

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

COIMBATORE 641 032

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST

HICET

CURRICULUM

&

SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION-2019

(For the students admitted during the academic year 2020 – 2021and onwards)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE INSTITUTION

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

MISSION OF THE INSTITUTION

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

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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

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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 1 - 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

				L	T	P	C	CIA	ESE	TOTAL
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	Code	Course															
15.	19ME2001	Engineering Practices	3	-	3	-	3	-	-	-	1	-	-	-	-	1	2
16.	19HE2071	Language Competency Enhancement Course -II	2	1	1.7	-	-	2	3	2	2	3	-	2	3	-	-
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	1	2	-	1	2	2.6	3	3
19.	19CE3202	Geology and Construction Materials	3	1.2	1	1.4	1	1.4	1.6	1.6	-	1.6	-	-	2.4	1.8	1.8
20.	19CE3203	Surveying	3	3	2.2	2.4	2.6	3	2	2	2	2	1	1.6	2	3	3
21.	19CE3251	Mechanics of Solids	3	3	3	2	-	2.4	1	1	2	-	2	1	2.6	3	3
22.	19CE3001	Survey Lab	3	3	3	2	2.8	3	-	-	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	2.4	-	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	1.6	-	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	2.8	1.6	2.2	2.8	3	2.6
28.	19CE4203	Soil Mechanics	3	3	2.8	2.6	-	2.2	1	1.6	1.6	1	2	1.8	3	3	3
29.	19CE4251	Concrete Technology	3	3	1.6	2.4	1	1.75	3	1.6	1.6	3	1.8	1.4	1.5	3	3

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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 - 1	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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No.	Code	Course														
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	-	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

S.No	Code	Course	1	2	3	4	5	6	7	8	9	10	11	12	13	14
45.	19CE6204	Construction Management	3	3	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	1	2	2	2.4	2	-	2.2	-	2.4	-	-
50.	19CE5301	Advanced Surveying Techniques	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3
51.	19CE5302	Traffic Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1		1.4	2.2
52.	19CE5303	Housing Planning and Management	3	3	2.2	2.3	-	3	2.2	2.5	2	3	2.3	2	1.8	2
53.	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
54.	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
55.	19CE5306	Professional Ethics and Laws for Civil Engineers	1	2	3	1	1	1	3	2	2	2	1	2	1	1
56.	19CE6301	Building Services	2	2	1	1	-	2	-	1.5	2	2	-	2	2	1
57.	19CE6302	Airports, Docks and Harbour Engineering	3	2.5	1.5	1.5	2	2	2	1.5	1	-	1	1	3	3
58.	19CE6303	Subsurface Investigation and Field Testing	3	3	1.5	1	-	2	2	3	2.5	2	2.5	3	3	3
59.	19CE6304	Groundwater Engineering	3	2.5	3	2.75	-	1.5	2	-	2.25	1.75	-	2.25	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5201	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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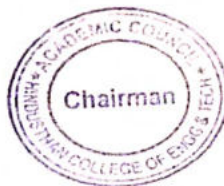
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No.	Code	Title													
60.	19CE6305	Architecture and Town Planning	3	1.8	2	1	-	2.8	2.8	2.8	-	2	2	2.4	3	2.8
61.	19CE6306	Disaster Preparedness and Planning	3	-	-	2	1	-	3	-	-	2	2	2	2	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5202	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	PSO1	PSO2
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.	19CE5203	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
I	**PLANNING OF WATER SUPPLY SYSTEM** 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
II	**CONVEYANCE OF WATER** 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
III	**WATER TREATMENT** 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
IV	**ADVANCED WATER TREATMENT** Principles and functions of aeration – Iron and manganese removal – Defluoridation and Demineralisation – Water softening – Desalination - Membrane systems – Recent advances.	9
V	**WATER DISTRIBUTION AND SUPPLY TO BUILDINGS** 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	PSO1	PSO2
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.	19CE5204	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	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.	19CE5205	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
I	**HIGHWAY PLANNING AND ALIGNMENT** 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
II	**PAVEMENT DESIGN** 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
III	**HIGHWAY MATERIALS, MAINTENANCE AND REHABILITATION** 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
IV	**RAILWAY PLANNING, DESIGN AND SIGNALLING** 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
V	**RAILWAY MAINTENANCE AND MODERNIZATION** 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	PSO1	PSO2
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.	19CE5001	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	PSO1	PSO2
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.	19CE5002	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

2.   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)

3.   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	PSO1	PSO2
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	-	-	3	2.8		3	3	3

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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. /B.Tech.	19HE5071	SOFT SKILLS - I	1	0	0	1

Course Objective

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

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

Course Outcome

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

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

	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. /B.Tech.	19HE5072	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
I	**DESIGN ABILITY** 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
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** 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 - 1. 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	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.	19CE6201	STRUCTURAL ANALYSIS II	3	0	0	3

Course Objective

1. To gain the knowledge on the analysis by flexibility method.
2. To gain knowledge on the analysis by stiffness matrix method.
3. To analyze the elements by finite element method.
4. To calculate the forces on indeterminate structures by plastic analysis.
5. To learn about basic concepts in space and cable structures.

Unit	Description	Instructional Hours
I	**FLEXIBILITY METHOD** Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Formation of flexibility matrices - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).	9
II	**STIFFNESS METHOD** Restrained structure –Formation of stiffness matrices - Equilibrium condition - Analysis of Continuous Beams - Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of Pin-jointed plane frames and rigid frames (with redundancy limited to two) by direct stiffness method.	9
III	**FINITE ELEMENT METHOD** Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements	9
IV	**PLASTIC ANALYSIS OF STRUCTURES** Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge - Mechanism and collapse load - Static and kinematic methods – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.	9
V	**SPACE AND CABLE STRUCTURES** Analysis of Space trusses using method of tension coefficients – Suspension cables – Equilibrium, Length and Anchorage of suspension cables - Suspension bridges with two and three hinged stiffening girders - Influence lines for three hinged stiffening girders.	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Determine the member forces and displacements for trusses and analyse beams and frames by flexibility method

CO2: Analyse beams and frames by stiffness matrix method

CO3: Discrete and analyse different elements by finite element method

CO4: Analyse the beams and frames by plastic analysis

CO5: Appraise the structural behavior of cable and space 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 – Devadas Menon, "Structural Analysis", Narosa Publishing House, 2nd Edition 2018

R2 – Pandit G.S., Gupta S.P. and Gupta, "Throry of structure (vol II)", Tata McGraw Hill, 2017.

R3 – William Weaver Jr. & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, Delhi, 2018.

R4 – Hibbeler, R.C., "Structural Analysis", Pearson Education, 10th Edition, 2018.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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.	19CE6202	DESIGN OF STEEL STRUCTURAL ELEMENTS	3	0	0	3

Course Objective	1. To understand the concept of limit state design and design of connections 2. To gain knowledge on the design of tension members 3. To gain knowledge on the design of compression members 4. To get familiar with the design of beams, plate girders, stiffeners and web splices 5. To learn the design of industrial structures

Unit	Description	Instructional Hours
I	**DESIGN OF CONNECTIONS** Properties of steel -Structural steel sections –Limit state design concepts – Loads on structures – Connections – Design of Bolted and welded joints -Failure of joints - Efficiency of joints - Eccentric connections.	9
II	**TENSION MEMBERS** Types of sections –Net area – Net effective sections for angles and Tee in tension –Design of connections in tension members – Use of lug angles –Design of tension splice –Concept of Shear lag.	9
III	**COMPRESSION MEMBERS** Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base - Design of Column splices.	9
IV	**BEAMS** Design of laterally supported and unsupported beams – Beams subjected to uniaxial and biaxial bending -Built up beams – Design of Plate Girders – Intermediate and bearing stiffeners –Flange and Web splicing.	9
V	**INDUSTRIAL STRUCTURES** Design of roof trusses –Elements of roof trusses – Design of purlins – Estimation of wind loads – Design of gantry girders.	9
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Interpret the limit state design concepts and design of connections CO2: Design tension members CO3: Design compression members CO4: Design beams, plate girders, stiffeners and web splice CO5: Design the components of steel trusses, purlins and gantry girders

TEXT BOOKS:

T1 - Gambhir, M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., New Delhi, 2013.
T2 - Shiyekar, M.R., "Limit State Design in Structural Steel", Prentice Hall of India Learning Pvt. Ltd., 2nd Edition, 2013.

REFERENCE BOOKS:

R1 - Bhavikatti S.S., "Design of Steel Structures", I. K. International Publishing House Pvt. Ltd., 2009.
R2 - Negi L.S., "Design of Steel Structures", Tata McGraw Hill Education India Pvt. Ltd., New Delhi, 2008.
R3 - Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., "Design of Steel Structures", McGraw-Hill Publications, 2010.
R4 – Dayarathnam P., "Design of Steel Structures", S Chand Publishers, New Delhi, 2012.

CODE BOOKS:

C1 - IS 800:2007 General Construction In Steel - Code of Practice, Bureau of Indian Standards, New Delhi, 2007
C2 – SP6(1)-1964 - Handbook for Structural Engineers –Part 1- Structural Steel Sections, Bureau of Indian Standards, New Delhi, 1974.
C3 - IS 875 (Part – 3) 2015 - Design Loads (Other than Earthquake) for Buildings and Structures - Code of Practice – Part 3- Wind Loads, Bureau of Indian Standards, New Delhi.
C4 - Murugesan, R. & Arulmanickam, A. P. "Steel Tables (S.I. Units)" - Fifth Edition, Pratheeba Publishers, 2009.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6203	WASTEWATER ENGINEERING	3	0	0	3

Course Objective

1. To understand the systems of sewerage and estimate the quantity of wastewater
2. To acquire knowledge on hydraulics and design of sewers
3. To study the characteristics and composition of sewage and understand the principles of primary sewage treatment
4. To learn the principles, components and working of various biological treatment processes
5. To explore the methods of sewage disposal and sludge management

Unit	Description	Instructional Hours
I	**QUANTITY, COLLECTION AND CONVEYANCE** Sources of wastewater generation - Systems of sewerage –Population Equivalent - Estimation of sewage flow -Fluctuations in flow pattern - Estimation of storm runoff - Computation of design flow - Drainage in buildings - Sanitary fixtures / fittings -General layout of house drainage - street connections.	9
II	**DESIGN OF SEWERS AND ITS OPERATION** Hydraulics of sewers - Self cleansing and non-scouring velocities - Full flow / partial flow conditions - Sewer sections and design - Sewer appurtenances - Materials for sewers - Sewer joints - Sewer laying and testing – Sewer ventilation, cleaning and maintenance - Sewage pumping - Types of pumps.	9
III	**QUALITY OF SEWAGE AND PRIMARY TREATMENT** Characteristics and composition of sewage - Effluent standards - Physical and chemical analysis - DO, BOD, COD and their Significance - Cycles of decomposition - Objectives and basic principles of sewage treatment - Primary treatment -Selection of unit operation and process - Screens - Grit chamber - Settling tank - Principles of sedimentations - Design of settling tanks - Sludge deposit.	9
IV	**BIOLOGICAL TREATMENT OF SEWAGE** Basic principles of biological treatment - Activated sludge process - Diffuser /Mechanical aeration - Extended aeration process -Trickling filters - Description and principle of operation of trickling filters - recirculation - Stabilization ponds - UASB –SBR – ASBR – Membrane Bioreactor – Constructed wetland - Septic tanks and effluent disposal system	9
V	**SEWAGE DISPOSAL AND SLUDGE MANAGEMENT** Disposal Methods - Dilution – self-purification of streams – Streeter Phelps equation - Oxygen sag curve - Zones of purification - Land disposal – Sewage farming, Sewage sickness- Objectives of sludge treatment - Properties and characteristics of sludge - Sludge digestion – Biogas Recovery - Sludge Thickening -Drying - Conditioning and dewatering - Sludge disposal - Elutriation.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Estimate the quantity of sewage produced and ascertains the type of sewerage system
CO2: Design the sewers and select the sewer materials
CO3: Interpret the characteristics of sewage and design the unit operations
CO4: Comprehend the principle of operation and design various biological treatment processes
CO5: Identify the various options for sewage disposal and sludge management

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 - Manual on Sewerage and Sewage Treatment Systems Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
R2 - Mark J. Hammer, Mark J. Hammer Jr, "Water and Wastewater Technology", Prentice Hall of India, 2012.
R3 - Metcalf and Eddy, "Wastewater Engineering-Treatment and Reuse", Tata Mc.Graw-Hill Company, New Delhi, 2010.

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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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Programme	Course Code	Name of the Course	L	T	P	C
B.E. Civil Engineering	19CE6204	CONSTRUCTION MANAGEMENT	3	0	0	3

Course Objective
1. To study the necessity of planning in the diverse construction projects
2. To know the appropriate techniques used for scheduling the resources
3. To have exposure on various costs, control methods and departmental procedure for accounting
4. To study the quality control and monitoring techniques and the necessity of training to personnel
5. To provide awareness on construction safety and management information system

Unit	Description	Instructional Hours
I	**CONSTRUCTION PLANNING AND ETHICS** Necessity - Basic concepts - Steps involved in planning - Phases and stages of project plan - Types of construction plans and construction projects – Resource Planning - Planning for materials, manpower, machinery, time and cost- Morals, Values, Work Ethics and Professional Rights -Defining work tasks - Precedence relationships among activities - Estimating activity durations - Estimating resource requirements for work activities - Program for progress of work and control - Bar chart - Milestone chart.	9
II	**MANAGEMENT AND MONITORING TECHNIQUES** Evolution of networks - Inter-relationship of events and activities - Fundamental rules for network construction - Critical path method - Program Evaluation and Review Technique - Probability of project completion time - Precedence networks - Scheduling for activity-on-node networks - Resource oriented scheduling - Scheduling with resource constraints - Improving scheduling process - Time-cost relationships - Crashing and time / cost trade- offs, Introduction to software application.	9
III	**CONTROL, FINANCING AND DEPARTMENTAL ACCOUNTING PROCEDURE** Costs and estimates associated with construction - Means of financing - Financial assistance - Project budget - Cost control system and codes - Cost accounts - Financial control and financial accounting systems - Project cash flows - Elements and control mechanism - Time value of money - Capital investment decision - Organization of PWD - Duties and responsibilities - Accounting procedure – Administrative and technical sanction - Payment of bills - Temporary advance account - Cash book - Work register - M-book - accounting for consumables - Record for tools and plants - Work charged establishment – Nominal Muster Roll - Daily Labour Reports.	9
IV	**QUALITY CONTROL, TRAINING AND DOCUMENTATION** Importance and elements of quality - Organization for quality control - Total quality control - Quality control circles - Material specifications - Quality assurance techniques - Quality control by statistical methods -Statistical quality control with sampling by attributes and variables - Methods of training - on job and in-plant training - Performance appraisal – Documentation – Definition of tender and contract – Deposits - Earnest Money Deposit and Security deposit – Legal implications – Penalties and Arbitration.	9
V	**MANAGEMENT INFORMATION SYSTEM** Introduction of Project Management Principles, Objectives, Stages and Scope of Project Management, Introduction to Workflow Management Systems – Waterfall, Lean, Agile, PRINCE 2, Understanding the Project Construction, Scope of Work of the Project, Various Type of Structures, Preparation of Project Gist - Preparation of Scope of Work Pie Chart - Time Management & Resource Management, - Procurement & Cost Management – Quality Management – Risk management	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Learn the requirement of planning techniques exercised in the construction projects
CO2: Choose suitable scheduling technique for the particular project
CO3: Interpret the modern cost account systems and control techniques adopted in the construction projects
CO4: Make use of advanced management tools for quality control and monitoring techniques towards speedy and guaranteed projects
CO5: Comprehend the aspects of management information system

TEXT BOOKS:
T1 - Chitkara, K.K., "Construction Project Management - Planning, Scheduling and Controlling", McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2012.
T2 - Jimmie W.Hinze, "Construction Planning and Scheduling", Prentice Hall Publication, 4th Edition, 2011.
REFERENCE BOOKS:
R1 - Halpin, D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 2014.
R2 - Willis, E.M., "Scheduling Construction projects", John Wiley and Sons, 2011.
R3 - Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pitsburgh, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1									3	2	2	2
CO2	3	2	2	2	3	2		2	2		3	2	2	2
CO3	3	2		2	2	2		2	2		3	2	2	2
CO4	3	3	3	2		2		2	2		3	2	2	2
CO5	3	2	3					1	2	2	3	2	2	1
Average	3	2	2.6	2	2.5	2	-	1.7	2	2	3	2	2	1.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6001	WATER AND WASTEWATER TESTING LAB	0	0	3	1.5

Course Objective

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

Expt . No.	Description of the Experiment
1.	Sampling, preservation methods and significance of characterization of water and wastewater
2.	Determination of pH and Turbidity
3.	Determination of Total, Fixed, Volatile and Settleable Solids
4.	Determination of Available Chlorine in Bleaching Powder
5.	Determination of Residual Chlorine in water
6.	Determination of Optimum Coagulant Dosage
7.	Determination of Biological Oxygen
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	1	3	1		2	1		2		1	2	1	3
CO2	3	2	3	2	1	2	2	1	1	1	1	2	1	3
CO3	3	3	3	3	2	3	3	1	1	1	2	2	2	3
CO4	3	3	3	3	3	3	3	2	2	1	2	3	2	3
CO5	3	1	3	3	2	3	3	2	2	2	1	3	2	3
Average	3	2	3	2.4	2	2.6	2.4	1.5	1.6	1.25	1.4	2.4	1.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6002	DESIGN AND DRAWING OF RC STRUCTURES	0	0	3	1.5

Course Objective

1. To understand the design and reinforcement detailing of Cantilever Retaining wall
2. To gain knowledge on the design and reinforcement detailing of Counter-fort Retaining wall
3. To acquire knowledge on the design and detailing of T beam Bridge
4. To learn the design concepts and reinforcement detailing of Circular water tank with dome
5. To acquire knowledge on the design and detailing of Underground water tank

Expt . No.	Description of the Experiment
1.	Design and Detailing of Cantilever retaining wall
2.	Design and Detailing of Counter-fort Retaining wall
3.	Design and Detailing of T beam Bridge for IRC loading
4.	Design and Detailing of Circular water tank with Dome
5.	Design and Detailing of Underground water tank

Total Practical Hours   45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Design and prepare structural detailing of Cantilever Retaining walls
CO2: Design and prepare structural detailing of Counter-fort Retaining wall
CO3: Design and prepare structural detailing of T beam Bridge
CO4: Design and prepare structural detailing of Circular water tank with dome
CO5: Design and prepare structural detailing of Underground water tank

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 -Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2015.
R4 -Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2010.
R5 - Krishnaraju N., "Design of Bridges", Oxford and IBH Publishing co. Pvt. Ltd, New Delhi and CBS Publishers & Distributors Pvt. Ltd. New Delhi., 2018.

CODE BOOKS:
C1- IS 456:2000 (R2016), "Plain and Reinforced Concrete - Code of Practice", BIS, New Delhi, 2016.
C2- SP16:1980, "Design Aids for Reinforced Concrete to IS456:1978", BIS, New Delhi, 1999.
C3- IS 875 (Part 1, 2, 3):2015, "Indian Standard Specification for Design Loads for Buildings", BIS, New Delhi, 2015.
C4- IS 3370 (Part 1, 2):2009 and IS3370 (Part 4): 1967 (R2008), "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2009.
C5- IRC 21:2000, "Standard specifications and code of practice for Road and Bridges – Section III – Cement Concrete (Plain and Reinforced)", IRC, New Delhi, 2000.
C6- IRC 112:2020, "Code of Practice for concrete Road Bridges", IRC, New Delhi, July 2020.

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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./B.Tech.	19HE6071	SOFT SKILLS - II	1	0	0	1

Course Objective

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

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

Course Outcome

CO1: Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict

CO2: Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations

CO3: Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment

CO4: Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems

CO5: Students will excel in complex reasoning

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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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. /B.Tech.	19HE6072	INTELLECTUAL PROPERTY RIGHTS (IPR)	1	0	0	1

Course Objective
1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI) and their registration aspects.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.	3
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non -Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	3
III	**COPYRIGHTS** Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.	3
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks -Registration of Trademarks.	3
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks -Procedure for registration.	3
	Total Instructional Hours	15

Course Outcome

CO1: Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP

CO2: Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development

CO3: Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing

CO4: Identify different types of trademarks and procedure for registration

CO5: Recognize the concept of design, geographical indication and procedure for registration

TEXT BOOKS:
T1- Neeraj, P., & Khusdeep, D. Intellectual Property Rights. India, IN: PHI learning Private Limited, 2014.
T2- V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India p; t. Ltd. 2012.

REFERENCE BOOKS:
R1- Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
R2-Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	19CE5301	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: Recognizethe 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.and A.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 Asia, 2000.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	19CE5302	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
I	**TRAFFIC CHARACTERISTICS** Road Characteristics – Classification – Functions and standards – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India.	9
II	**TRAFFIC SURVEYS AND ANALYSIS** 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
III	**GEOMETRIC DESIGN OF INTERSECTIONS** 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
IV	**TRAFFIC SAFETY AND ENVIRONMENT** 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
V	**TRAFFIC TECHNIQUES** 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	PSO1	PSO2
CO1	3	3	2	2	3	3		2	2	2	1	2	3	3
CO2	3	3	2	2	3	3		2	2	2	1	2	3	3
CO3	3	3	3	2	1	3		2	2	2	1	2	3	3
CO4	3	3	2	3	3	3		2	2	1	1	2	3	3
CO5	3	3	2	3	3	3		2	2	1	1	2	3	3
Average	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5303	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
I	**INTRODUCTION TO HOUSING** 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
II	**HOUSING PROGRAMMES** 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
III	**PLANNING AND DESIGN OF HOUSING PROJECTS** 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
IV	**CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS** 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
V	**HOUSING FINANCE AND PROJECT APPRAISAL** 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	PSO1	PSO2
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.	19CE5304	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., Aviad shapira 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			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.	19CE5305	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
I	**INTRODUCTION AND HYDRO METEOROLOGY** Definition - Development of hydrology - hydrologic design - Hydrologic failures - Importance in Engineering - Hydrological budget. Weather and hydrology - General circulation- Temperature, humidity -Wind systems - Introduction to Climate Change and its effects on Hydrological process.	9
II	**PRECIPITATION** Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.	9
III	**HYDROGRAPH ANALYSIS** Flood Hydrograph -Components of flood hydrograph - Factors affecting shape of Hydrograph - Base flow separation– Unit hydrograph - Advantages – Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph - Applications.	9
IV	**GROUND WATER HYDROLOGY** Occurrence of ground water - Types of aquifer – Dupuit's assumptions – Darcy's law - Estimation of aquifer parameters– Pump tests - steady state discharge in Confined and Unconfined Aquifers - Leaky aquifer - well loss - aquifer loss - problems - Methods of Artificial Recharge.	9
V	**FLOODS AND FLOOD ROUTING** Flood frequency studies – Recurrence interval - Gumbel's method- Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control.	9
	Total 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	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.	19CE5306	PROFESSIONAL ETHICS 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 I.C.E Contracts, 4th Edition, 2016.

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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.	19CE6301	BUILDING SERVICES	3	0	0	3

Course Objective
1. To study the various electrical systems and components in building construction
2. To have exposure on principles of illumination and lighting design
3. To impart knowledge on the various methods of ventilation systems and air-conditioning facilities
4. To emphasize the need for fire safety in buildings
5. To gain knowledge on importance of 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 – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering – Design of modern lighting – Lighting for stores and house lighting - Lighting for offices, schools, hospitals	9
III	**VENTILATION AND AIR CONDITIONING** Ventilation – Requirements – Natural and mechanical systems – Ventilation rate measurements - Thermodynamics – Terms and definitions - Refrigerants – Vapour compression cycle – Compressors – Evaporators – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire	9
IV	**FIRE SAFETY INSTALLATIONS** Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems - Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire lighting 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 will have ability to
CO1: Illustrate and design the electrical supply systems, systems of wiring and protective electrical installations included in buildings
CO2: Identify and incorporate the concepts of illumination and its principles while designing the lighting system of a building
CO3: Apply the principles of ventilation and air conditioning in the design of buildings
CO4: Compare the various fire safety systems and devices
CO5: Gain knowledge on 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, 2015.
T2 - Steffy, G., "Architectural Lighting Design", John Wiley and Sons, 2008.

REFERENCE BOOKS:
R1 - National Building Code of India, NBC, 2016.
R2 - Uniform Plumbing Code of India, IAPMO, 2018.
R3 - Arora, C.P., "Refrigeration and Air Conditioning", Tata McGraw Hill, New Delhi, 2017.
R4 - Curd, E. F. and Howard, C. A., "Introduction to Building services", Palgrave Macmillan, UK, 1996.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6302	AIRPORTS, DOCKS AND HARBOUR ENGINEERING	3	0	0	3

Course Objective

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

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

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Identify the components of aircraft and airport characteristics
CO2: Illustrate the various components and zones of an airport layout
CO3: Interpret the design principles of Runway and Taxiway
CO4: Differentiate the various components of docks and Harbour
CO5: Comprehend the various coastal structures and costal protection regulations

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 - Rangwala, "Aiport Engineering", Charotar Publishing House Pvt. Ltd., Gujarat, 17th Edition, 2018.
R2 - Oza H. P. &Oza G. H. "Dock and Harbour Engineering", Charotar Publishing House Pvt. Ltd., Gujarat, 2016.
R3 - Khanna, S.K. Arora, M.G and Jain, S.S, Airport Planning and Design, Nemchand and Bros, Roorkee, 1999.
R4 - Subramanian, K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	3		2	2			1	1	3	3
CO2	3	1	1	1	2	3	2	1	1		1		3	3
CO3	3	3	2	1	2		2	2				1	3	3
CO4	3	1	3	1	2	3	2	1	1		1		3	3
CO5	3	3	1	2	1	2	2	1	1		1	1	3	3
Average	3	2.5	1.5	1.5	2	2	2	1.5	1		1	1	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6303	SUBSURFACE INVESTIGATION AND FIELD TESTING	3	0	0	3

Course Objective	1. To gain knowledge on exploration and geophysical methods 2. To learn the various exploration techniques 3. To understand the various sampling techniques 4. To study the field tests in soil exploration 5. To acquire knowledge on the various instruments in soil engineering

Unit	Description	Instructional Hours
I	**PLANNING OF EXPLORATION AND GEOPHYSICAL METHODS** Scope and objectives, planning an exploration program. methods of exploration, exploration for preliminary and detailed design, spacing and depth of bores, data presentation. Geophysical exploration and interpretation, seismic and electrical methods. cross bore hole, single bore hole – up hole -down hole methods	9
II	**EXPLORATION TECHNIQUES** Methods of boring and drilling, non-displacement and displacement methods, drilling in difficult subsoil conditions, limitations of various drilling techniques, stabilization of boreholes, bore logs	9
III	**SOIL SAMPLING** Sampling Techniques – quality of samples – factors influencing sample quality - disturbed and undisturbed soil sampling - advanced sampling techniques, offshore sampling, shallow penetration samplers, preservation and handling of samples	9
IV	**FIELD TESTS IN SOIL EXPLORATION** Field tests, penetration tests, Field vane shear, Insitu shear and bore hole shear test, pressuremeter test, dilatometer test - plate load test–monotonic and cyclic; field permeability tests – block vibration test- Procedure, limitations, correction and data interpretation of all methods.	9
V	**INSTRUMENTATION** Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells, earth pressure cells, settlement and heave gauges, pore pressure measurements - slope indicators, sensing units, case studies.	9
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students will have ability to CO1: Select the suitable method of exploration and geophysical methods CO2: Comprehend various exploration techniques CO3: Comprehend the various sampling techniques CO4: Interpret the various field tests in soil exploration CO5: Interpret the principles applications of various instruments in soil engineering

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, 2018.

REFERENCE BOOKS:
R1 – Hunt, R.E., "Geotechnical Engineering Investigation Manual", McGraw Hill, New York, 2005.
R2 - Winterkorn, H.F. and Fang, H.Y., "Foundation Engineering Hand Book", Van Nostrand Reinhold, New York, 2010.
R3 - Alam Singh and Chowdhary, G.R., "Soil Engineering in Theory and Practice", Volume-2, CBS Publishers and Distributors, New Delhi, 2019.
R4 – Mair, R.J. and Wood, D.M., "Pressuremeter Testing Methods and Interpretation", CBS Publishers and Distributors, New Delhi, 2013.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	3		2	2			1	1	3	3
CO2	3	1	1	1	2	3	2	1	1		1		3	3
CO3	3	3	2	1	2		2	2				1	3	3
CO4	3	1	3	1	2	3	2	1	1		1		3	3
CO5	3	3	1	2	1	2	2	1	1		1	1	3	3
Average	3	2.5	1.5	1.5	2	2	2	1.5	1		1	1	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6304	GROUNDWATER ENGINEERING	3	0	0	3

Course Objective

1. To understand various hydro geological parameters and GEC norms
2. To learn the concepts of well hydraulics and groundwater governing equations
3. To gain knowledge on groundwater modelling and management
4. To acquire knowledge on groundwater quality and its significance on health and environment
5. To explore the techniques involved in groundwater conservation

Unit	Description	Instructional Hours
I	**HYDROGEOLOGICAL PARAMETERS** Introduction – Water bearing properties of rock – Type of aquifers - Aquifer properties - permeability, specific yield, transmissivity and storage coefficient – Methods of estimation – GEC norms - Steady state flow - Darcy's law - Groundwater velocity – Dupuit Forchheimer assumption – Steady radial flow into a well	9
II	**WELL HYDRAULICS** Unsteady state flow - Theis method - Jacob method – Chow's method – Law of Times – Theis recovery – Bailer method – Slug method - Tests - Image well theory – Partial penetrations of wells – Well losses – Specific capacity -and safe yield - Collector well and infiltration gallery	9
III	**GROUNDWATER MODELLING** Need for management model – Database for groundwater management – Groundwater balance study – Introduction to physical and mathematical models – Model conceptualization – Initial and boundary condition – Calibration – Validation – Future prediction – Sensitivity analysis – Uncertainty – Development of a model	9
IV	**GROUND WATER QUALITY** Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental regulatory requirements - Control of Ground Water Pollution Hazards – Evaluation of Pollution hazard and water supply pollution hazards – Strategies for control of Ground water pollution.	9
V	**GROUNDWATER CONSERVATION** Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) - Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Interpret the various hydro-geological parameters and GEC norms

CO2: Estimate the yield of groundwater from a source based on the data given

CO3: Illustrate the various physical and mathematical models of groundwater management

CO4: Recognize the importance of groundwater quality and its environmental concerns

CO5: Compare and contrast the various recharge techniques for groundwater conservation

TEXT BOOKS:

T1 - Raghunath H.M., "Ground water Hydrology", New Age International (P) Ltd., New Delhi, 2010

T2 - Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2011.

REFERENCE BOOKS:

R1 - Fitts R Charles, "Groundwater Science", Elsevier, Academic Press, 2018.

R2 - Karanth K.R, "Ground Water Assessment Development and Management" Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.

R3 - Bear J., "Hydraulics of Groundwater", McGraw-Hill India, 2014.

R4 - Cushman J.H., Tartakovsky D.M., "The Handbook of Groundwater Engineering", Taylor & Francis International, 2016.
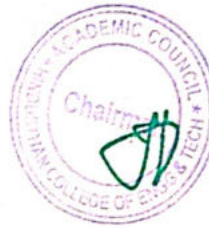
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1			2	2	3	3	3	3	3	3	3
CO2	3		2			1	2		3	2	2	3	3	3
CO3	3	1	2	1		2			2	2	3	3	3	3
CO4	3	3				2		3	2	2	2	3	3	3
CO5	3	3	2	1		2			2	1	2	3	3	3
Average	3	3	1.5	1		2	2	3	2.5	2	2.5	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6305	ARCHITECTURE AND TOWN PLANNING	3	0	0	3

Course Objective
1. Classify and explore the elements and principles of design in architecture
2. Understand the importance of site analysis, layout regulations and layout design concepts
3. Explore the concepts of anthropometry, safety standards and integration of basic building services
4. Learn the impact of climate in the architectural design and green building concepts
5. Study the basic principles of town planning, zoning regulations, and landscape design

Unit	Description	Instructional Hours
I	**ARCHITECTURAL DESIGN** Architectural design – An analysis – Integration of function and aesthetics – Introduction to basic elements and principles of design - Introduction to Ancient and Medieval time of architectures.	9
II	**SITE PLANNING AND LAYOUT DESIGN** Surveys – Necessity- Types of Survey and Site analysis – Development Control – Tools - Layout regulations- Layout design concepts- Principles -Advantages and disadvantages of layout design concept.	9
III	**ANTHROPOMETRY AND SPACE STANDARDS** Classification of residential, institutional, commercial and industrial buildings – Application of anthropometry and space standards - Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design.	9
IV	**CLIMATE AND ENVIRONMENT RESPONSIVE DESIGN** Man and environment interaction - Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept.	9
V	**TOWN PLANNING AND LANDSCAPING** Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Urban renewal – Conservation – Principles of Landscape design - 3D Approach – Landscape Maintenance.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Acknowledge the basic elements and principles of design in architecture
CO2: Apply the layout design concepts and regulations while designing a building
CO3: Integrate the principles of anthropometry, safety standards and basic building services in building design
CO4: Incorporate the climatic design principles and green building concepts in building design
CO5: Consider the principles of town planning; zoning regulations and landscaping while planning a building

TEXT BOOK
T1 - Francis D.K. Ching, "Architecture: Form, Space and Order", John Wiley & Sons, 2014.
T2 - Muthu Shoba Mohan, "Principles of Architecture", Oxford University Press, New Delhi, 2010.

REFERENCE BOOK
R1 - Daniel A. Barber, "Modern Architecture and Climate: Design Before Air Conditioning", Princeton University Press, New Jersey, 2020.
R2 – Aravind Krishnan, Nick Baker, Simos Yannas, Steve Szokolay, "Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings", McGraw Hill Education, New York, 2017.
R3 - "National Building Code of India", Vol 1 &2, Bureau of Indian Standards, New Delhi, 2016.
R4- Jain A. K., "Town Planning – Principles, Process and Practice", Khanna Publishing House, New Delhi, 2020.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1			3		3	2		2	3	3
CO2	3	3	3	2		1	2		2	2		1	3	3
CO3	3	2	3	3		2	1		2	1		3	3	3
CO4	3	3	3	3		2	2		3	2		3	3	3
CO5	3	2	3	3		1	3		2	2		2	3	3
Average	3	2.5	3	2.75	-	1.5	2	-	2.25	1.75	-	2.25	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6306	DISASTER PREPAREDNESS AND PLANNING	3	0	0	3

Course Objective	1. To study characteristics of disasters 2. To explore the primary approaches to disaster risk reduction 3. To learn the various advanced disasters and development management 4. To understand the components of disaster risk management in india 5. To give exposure on common applications of disaster management

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DISASTERS** Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.	09
II	**APPROACHES TO DISASTER RISK REDUCTION (DRR)** Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.	09
III	**INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT** Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.	09
IV	**DISASTER RISK MANAGEMENT IN INDIA** Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation,Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, RiskAssessment,Response and Recovery Phases of Disaster – Disaster Damage Assessment.	09
V	**DISASTER MANAGEMENT: APPLICATIONS , CASE STUDIES AND FIELD WORKS** Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm SurgeAssessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.	09
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students shall have ability to 1. Comprehend and understand the types of disasters 2. Handle the planning and design of various disaster risk reduction 3. Identify and incorporate the safety practices disasters and development 4. Gain knowledge on disaster risk management in India 5. Illustrate the various components disaster management

TEXT BOOKS:

T1 - Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427ISBN-13: 978-9380386423

T2 - Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India EducationPvt. Ltd., 2012. ISBN-10:1259007367, ISBN-13: 978-1259007361

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

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REFERENCE BOOKS:

R1 - Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management,NIDM, New Delhi, 2011
R2 – Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers,New Delhi, 2010.
R3 - Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
R4 - Government of India, National Disaster Management Policy,2009.

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

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OPEN ELECTIVES

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6401	REMOTE SENSING AND GIS	3	0	0	3

Course Objective

1. To understand the basic principles and components of Remote Sensing
2. To learn the characteristics and processing techniques of remote sensing imagery.
3. To gain knowledge on the various data and database systems involved in GIS
4. To get exposed to the various processes related to data analysis and modeling in GIS
5. To study the applications of remote sensing and GIS

Unit	Description	Instructional Hours
I	**REMOTE SENSING** Definition and its components - History of remote sensing and Indian Space Program. Electromagnetic spectrum - wavelength regions important to remote sensing - Wave theory, Particle theory, Stefan-Boltzman Law - Atmospheric scattering, absorption - Atmospheric windows – spectralreflectance of EMR with earth surface, water, vegetation and soil- spectral signature concepts - Platform and Sensors.	9
II	**IMAGE INTERPRETATION AND ANALYSIS** Types of Data Products - Types of image interpretation - Basic elements of image interpretation - Visual interpretation keys - Digital Image Processing - Pre-processing - Image enhancement techniques - Multispectral Image classification - Supervised and unsupervised	9
III	**GEOGRAPHICAL INFORMATION SYSTEM AND ITS ANALYSIS** Maps - Map projections - Types of map projections- GIS definition - Basic components of GIS - Data type - Spatial and non-spatial data - Database concepts - Vector and Raster data structures, Data compression, Edge matching	9
IV	**DATA INPUT EDITING AND ANALYSIS** Data stream - Input methods - GPS for data capture – Editing- Data Retrieval - Query - Simple Analysis - Spatial Analysis - Overlay - Vector Data Analysis - Raster Data Analysis- Topological analysis - Modeling surfaces - DEM -DTM - Slope Model - Integration of Remote Sensing and GIS	9
V	**REMOTE SENSING AND GIS APPLICATIONS** Applications- Land use - Water Resources and Watershed management - Irrigation and Agriculture - Environmental studies - ground water exploration - Defense Application - Wasteland Management - Weather Forecast - Flood and Storm Routing - Emergency Management and Real Estate.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Illustrate the principles of remote sensing and its components
CO2: Compare and interpret the characteristics and processing techniques of remote sensing imagery
CO3: Classify the various types of data and database systems involved in GIS
CO4: Comprehend the various processes related to data analysis and modeling in GIS
CO5: Interpret the applications of remote sensing and GIS in various field of engineering

TEXT BOOKS:
T1 - Anji Reddy, M., "Remote Sensing and Geographical Information Systems", Fourth Edition, B S Publications, India, 2019.
T2 - Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman, "Remote Sensing and Image Interpretation", Seventh Edition, John Wiley and Sons Inc. New York, 2015.

REFERENCE BOOKS:
R1 – Swain P. H. and Davis, S.M., "Remote Sensing: The Quantitative Approach", McGraw Hill Higher Education, 1979.
R2 – Kumar S. "Basics of Remote Sensing and GIS" Laxmi Publications, 2017.
R3 – Dale A. Quattorachi, Elizabeth Wentz "Integrating Scale in Remote Sensing and GIS" CRC Publications, 2019.
R4 - Kali CharanSahu "Textbook of Remote Sensing and Geographical Information Systems" Atlantic Publishers & Distributors Pvt Limited, 2020.

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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

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

&

SYLLABUS

CBCS PATTERN

UNDER GRADUATE PROGRAMMES

CIVIL ENGINEERING

REGULATION-2019

(For the students admitted during the academic year 2019 – 2020 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

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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

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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	-	-	-	-	-	-	-
			Total	13	2	10	20	350	350	700

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										
7	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	19HE2071	Language Competency Enhancement Course -II	HS	1	0	0	1	100	-	100
			Total	16	2	8	22	350	450	800

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	-	-	-
			Total	16	1	10	20	250	450	700

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	-	-	-
			Total	16	2	10	21	250	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 Element Analysis	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

				L	T	P	C	CIA	ESE	TOTAL
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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S.No	Code	Course													
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	2	-	-
17.	19MA3103	Fourier Analysis and Numerical Methods	3	3	3	3	2.6	-	-	-	-	-	2	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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S.No	Code	Course Name														
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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No.	Course Code	Course Title																
45.	19CE6204	Construction Management	3	2	2.6	2	2.5	2	-	2	1.7	2	2	3	2	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	1.6	1.6	3
47.	19CE6002	Design and Drawing of RC Structures	3	3	3	3	2	2	2	2	2	2	1	2	2	3	3	3
48.	19HE6071	Soft Skills – II	-	-	-	-	2	2.4	2.4	2	-	2.2	-	2.4	2.4	-	-	-
49.	19HE6072	Intellectual Property Rights	1	1	1	1	2	2	2	2	2	2.2	-	1	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	2	3
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	2.2	3	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	2.2	2.4	2.4	1.8
53.	19CE7001	Design and Drawing of Steel Structures	3	3	3	3	2	2	2	2	2	2	1	2	2	3	3	3
54.	19CE7901	Project I - Design Project	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
55.	19CE8901	Project II – Main Project	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
56.	19CE5301	Advanced Surveying Techniques	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	1.6	2	2	3	3
57.	19CE5302	Traffic Engineering	2.4	2	2.6	1	2.5	1	2	2	1.6	1.6	1	1.6	-	1.4	1.8	2.2
58.	19CE5303	Housing Planning and Management	3	3	2.2	2.3	-	2	2.2	2.5	2	3	2.3	3	2	2.2	1.8	2
59.	19CE5304	Construction Techniques, Equipment and Safety	3	1.4	1.4	1.6	1.6	1.4	1.6	1.6	-	-	-	2.8	-	2.8	2.2	1.8

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No.	Code	Subject														
60.	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
61.	19CE5306	Professional Ethics and Laws for Civil Engineers	1	2	3	1	1	1	3	2	2	2	1	2	1	1
62.	19CE6301	Building Services	2	2	1	1	-	2	-	1.5	2	2	-	2	2	1
63.	19CE6302	Airports, Docks and Harbour Engineering	3	2.5	1.5	1.5	2	2	2	1.5	1	-	1	1	3	3
64.	19CE6303	Subsurface Investigation and Field Testing	3	3	1.5	1	-	2	2	3	2.5	2	2.5	3	3	3
65.	19CE6304	Groundwater Engineering	3	2.5	3	2.75	-	1.5	2	-	2.25	1.75	-	2.25	3	3
66.	19CE6305	Architecture and Town Planning	3	1.8	2	1	-	2.8	2.8	2.8	-	2	2	2.4	3	2.8
67.	19CE6306	Disaster Preparedness and Planning	3	-	-	2	1	-	-	3	-	-	2	2	2	1
68.	19CE7301	Prestressed Concrete Structures	3	3	3	1	-	-	-	2	2	-	-	2	3	2
69.	19CE7302	Air Pollution Management	3	1	2	1	2.5	-	-	2	2	1.5	1	1	2	2
70.	19CE7303	Industrial Wastewater Treatment	3	2.6	2	1	3	2.6	2.6	1.3	2	2.6	2.4	2.8	3	2
71.	19CE7304	Composite Structures	3	2.5	3	2	-	2	1	2	2.5	2	1	2	2	2
72.	19CE7305	Finite Element Analysis	3	3	2	-	-	-	-	-	-	-	-	1	3	2
73.	19CE7306	Computer Aided Analysis and Design of Structures	3	3	3	-	3	3	-	2	3	3	-	2	3	1
74.	19CE8301	Ground Improvement Techniques	3	2	3	2	-	1	3	-	2.5	2	1	2	3	3

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No.	Code	Course Name															
75.	19CE8302	Prefabricated Structures	3	2.5	3	3	2	3	1	3	2	2	1	2	3	3	3
76.	19CE8303	Valuation of Land and Buildings	3	2	1.5	1.8	1	1.2	1	2.2	1	2.4	1.8	3	3	3	3
77.	19CE8304	Municipal Solid Waste Management	3	2	2.3	2	2	2.5	3	2.3	3	3	2.5	2	3	3	2
78.	19CE8305	Design of Formwork	3	3	3	2	3	3	1	2	3	3	1	2	2	3	1
79.	19CE8306	Non Destructive Testing of Structures	3	3	1.5	1	-	2	2	3	2.5	2	2.5	3	3	3	3
80.	19CE8307	Construction Economics and Finance	3	2.8	2.4	2	1.8	2.75	2.4	2	1.25	1	2.25	2.4	2.8	2.8	2.6
81.	19CE8308	Repair and Rehabilitation of Structures	2.6	2	3	2.2	-	-	1	1	1.2	-	-	1	3	3	3
82.	19CE8309	Disaster Resistant Structures	3	1	1	2	1	2	2	3	1	1	2	2	2	2	1
83.	19CE8310	Environmental Impact Assessment	2	2	1.6	1	1	1.2	2	1	-	-	-	1	2	2	2
84.	19CE8311	Construction Safety Practices	3	2	2.4	2	1.7	2.4	1.5	1.6	1.5	2.2	1.2	3	2.6	2.6	2.2
85.	19CE8312	IoT for Smart City Planning	2	2	2	1.2	3	1	-	-	1.8	1	1.8	1.8	2.6	2.6	2
86.	19CE6401	Remote Sensing and GIS	3	3	2.2	2.4	2.6	3	-	2	2	1.6	1	2	3	3	3
87.	19CE7402	Interior Design	2	-	1.6	2	-	-	1.6	2.3	2	-	-	-	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
I	**WATER RESOURCES** 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
II	**WATER RESOURCE MANAGEMENT** 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
III	**IRRIGATION ENGINEERING** Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water	9
IV	**CANAL IRRIGATION** 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
V	**IRRIGATION MANAGEMENT AND METHODS** 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
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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	2				1				1	2	2	2
CO2	2	2	1	1		1	2	1			2	2	2	2
CO3	3	3	2	1		1	2				2	2	2	2
CO4	3	3	2	1		1	2				2	2	2	2
CO5	2	2	1								1	2	2	2
Average	2.6	2.6	1.6	1		1.6	1				1.3	2	2	2

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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
I	**SINGLE DEGREE OF FREEDOM SYSTEM** Concept of inertia and damping – Types of damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealization – Equations of motion of SDOF system of mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation.	9
II	**MULTIPLE DEGREE OF FREEDOM SYSTEM** Formulation of equation of motion for multidegree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Orthogonality and Normality principles – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.	9
III	**ELEMENTS OF SEISMOLOGY** Introduction – Seismic waves – Earthquake magnitude, intensity of earthquake, epicenter – Plate tectonics – Seismic Energy – Earthquake resistance in masonry building – Short column effect – Soft Storey – Centre of stiffness – Centre of mass – Liquefaction – Potential deficiencies of RC building and masonry building – Remedial measures.	9
IV	**EARTHQUAKE EFFECTS ON STRUCTURES** Effect of earthquake on different types of structures – Behaviour of RCC, Steel and Prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Liquefaction of soil – Response Spectra – Causes of damage – Lessons learnt from past earthquakes.	9
V	**CONCEPTS OF EARTHQUAKE RESISTANT DESIGN** Planning considerations and Architectural concepts – Evaluation of Earthquake forces – Lateral load analysis – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry and RCC buildings - Design considerations – Guidelines– Design and 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	PSO11	PSO12
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
I	**ESTIMATION OF BUILDINGS AND STRUCTURES** 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
II	**RATE ANALYSIS** 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
III	**SPECIFICATION AND TENDERS** 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
IV	**FUNDAMENTALS AND METHODS OF VALUATION** 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
V	**REPORT PREPARATION** 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 packages for steel structural design
CO2: Design and draw steel roof truss elements
CO3: Design and draw industrial building with different components
CO4: Design and draw various types of steel water tanks
CO5: Design and draw plate girder and gantry girder

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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 1 - 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	PSO11	PSO12
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
I	**INTRODUCTION – THEORY AND BEHAVIOUR** 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
II	**DESIGN FOR FLEXURE AND SHEAR** 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
III	**DEFLECTION AND DESIGN OF ANCHORAGE ZONE** 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
IV	**COMPOSITE BEAMS AND CONTINUOUS BEAMS** 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
V	**MISCELLANEOUS STRUCTURES** 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 1 to 4), "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES901	PROJECT II – MAIN PROJECT	0	0	16	8

Course Objective

1. To develop the ability to solve a specific problem right from its identification, review literature, formulate proper methodology, conduct various tests and arrive at a solution.
2. To train the students to prepare project reports, face reviews and attend viva voce examination.

Description	Total Hours
The student in a group of 3 to 4 works on a topic approved by the Head of department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of Department. A project report is required at the end of the semester. The project work is evaluated based on an oral presentation and the project report jointly by external and internal examiners constituted by the Head of Department.	100

Course Outcome

On the completion of the project work, students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	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
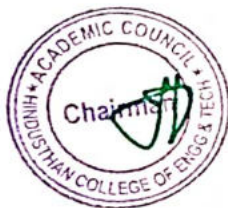
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7302	AIR POLLUTION MANAGEMENT	3	0	0	3

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
I	**SOURCES AND EFFECTS OF AIR POLLUTANTS** 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
II	**DISPERSION OF AIR POLLUTANTS** 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
III	**AIR POLLUTION CONTROL** 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
IV	**AIR QUALITY MANAGEMENT** 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
V	**INDOOR AIR QUALITY AND NOISE POLLUTION** 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	PSO11	PSO12
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	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
I	**INTRODUCTION AND SOURCES OF POLLUTION** 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
II	**PRIMARY TREATMENT METHODS** Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by floatation – Waste reduction – Volume reduction – Strength reduction	9
III	**ADVANCED TREATMENT METHODS** 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
IV	**CHARACTERISTICS OF INDUSTRIAL WASTEWATER** 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
V	**TREATMENT PLANTS AND PROBLEMS** 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	PSO11	PSO12
CO1	3				3			2	2	2	1		2	2
CO2	3			2		2					1	2	2	2
CO3	2	1	3		2		1		1	1	1	1	2	2
CO4	3	1	3		2		1				2		2	2
CO5	3	1	2	1	2				2	1	1	1	2	2
Average	3	1	2	1	2.5			2	2	1.5	1	1	2	2

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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
I	**INTRODUCTION** Introduction to steel-concrete composite construction -Design Philosophy - Eurocodes - Properties of the materials - Direct actions (loading) - Application - Codes - Serviceability and construction issues in design	9
II	**DESIGN OF COMPOSITE MEMBERS** Design of composite beams, slabs, floor slabs, columns - beam to columnjoints- Design of non-sway composite frames	9
III	**DESIGN OF CONNECTIONS** Shear connectors – Types and Properties – Methods of shear connection - Design of shearconnectors – Degree of shear connection - Partial shear interaction	9
IV	**COMPOSITE BOX GIRDER BRIDGES** Introduction - behavior of box girder bridges - design concepts	9
V	**CASE STUDIES** Case studies on steel-concrete composite construction in buildings - seismic behavior of composite structures	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1. 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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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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
I	**INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FORMULATION** 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
II	**ELEMENT PROPERTIES** 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
III	**FINITE ELEMENT ANALYSIS OF ONE AND TWO DIMENSIONAL PROBLEMS** 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
IV	**ISOPARAMETRIC ELEMENTS AND FORMULATION** Natural Coordinates in 1, 2 and 3 Dimensions – Isoparametric elements in 1, 2 and 3 Dimension – Lagrangean and Serendipity Elements – Numerical Elements.	9
V	**APPLICATIONS OF FINITE ELEMENT METHOD** 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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	19CE7306	COMPUTER AIDED ANALYSIS AND DESIGN OF STRUCTURES	2	0	2	3

Course Objective
1. To study the basic concepts of Computer Aided Design
2. To understand the concepts of Analyzing the beams for stiffness method using Microsoft Excel
3. To gain the knowledge on Analysis and design of Cantilever and simply supported beams by C++.
4. To learn about the Modelling, Analysis and Design of framed structure using ETABS.
5. To study the concepts of Modelling, Analysis and Design of framed structure using STAAD Pro.

Unit	Description	Instructional Hours
I	**Introduction to Computer Aided Design** Introduction to computer aided design – Reasons for implementing CAD – Design process – Applications of computers to design – Benefits of computer Aided design.	6
II	**Stiffness Method using Microsoft Excel** Stiffness method of analysis- step by step procedure – Analysis of Single Span Beams and continuous beams using Excel	4+6
III	**Analysis of beams using C++** Analysis of cantilever and simply supported beam using C++	4+6
IV	**Modelling, Analysis and Design using ETABS** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using ETABS	4+6
V	**Modelling, Analysis and Design using STAAD Pro.** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using STAAD Pro.	4+6
	Total Instructional Hours	45

Course Outcome
CO1: Interpret the concepts of computer Aided Design
CO2: Analyse the structure for Stiffness method using Microsoft Excel.
CO3: Analyse the beams using C++
CO4: Analyse the multistorey building using ETABS
CO5: Analyse the multistorey building using STAAD Pro.

TEXT BOOKS:
T1-Krishna Murthy C.S and Rajiv S. – Computer Aided Design, Software & Analytical tools –Alpha Science International Ltd,2005.
T2-DrShah V. L -Computer Aided design in reinforcedconcrete, Structures Publications, Pune, 2015.

REFERENCE BOOKS:
R1-Weaver W. and Gere J. M - Matrix Analysis of Framed Structure, CBS Publishers and Distributors Pvt Ltd, Delhi, 2018
R2- Meek J. L - Computer Methods in StructuralAnalysis, CRC Press, 1991
R3-YashavantKanetkar -Let Us C++, BPB Publications, 2020
R4- Prof. Sham Tickoo - Learning Bentley Staad.Pro V8i for Structural Analysis, Dreamtech Press,2015
R5 – Engr. Yousuf Dinar and Engr. Nurullah Siddique - Book for Beginners RCC Design by ETABS, University campus Publisher and seller, Dhaka, 2014

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CT7301	PRESTRESSED CONCRETE STRUCTURES	3	0	0	3

Course Objective

6. To introduce the need for prestressing as well as the methods, types and advantages of prestressed concrete
7. To gain knowledge on the design of prestressed concrete beams subjected to flexure and shear
8. To calculate deflection and acquire knowledge on design of anchorage zone
9. To learn how to analyze the composite beams and continuous beams
10. To gain knowledge on miscellaneous prestressed concrete structures

Unit	Description	Instructional Hours
I	**INTRODUCTION – THEORY AND BEHAVIOUR** 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
II	**DESIGN FOR FLEXURE AND SHEAR** 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
III	**DEFLECTION AND DESIGN OF ANCHORAGE ZONE** 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
IV	**COMPOSITE BEAMS AND CONTINUOUS BEAMS** 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
V	**MISCELLANEOUS STRUCTURES** 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
CO6: Describe the basic fundamentals of prestressed concrete in civil engineering
CO7: Design prestressed concrete beams
CO8: Calculate deflection and anchorage zone stresses
CO9: Evaluate the performance of composite beams and continuous beams
CO10: Design miscellaneous prestressed concrete structures

TEXT BOOKS:
T3- Krishna Raju, N., "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 2018.
T4- Pandit, G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2019.

REFERENCE BOOKS:
R5- Rajagopalan, N., "Prestressed Concrete", Narosa Publishing House, 2017.
R6- Dayaratnam, P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
R7- Lin, T.Y. and Ned H. Burns, "Design of Prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
R8- Ramaswamy, G.S., "Modern Prestressed Concrete Design", Arnold Heinimen, New Delhi, 1990.

CODE BOOKS:
C3- IS1343:2012, "Code of Practice for Prestressed Concrete", Bureau of Indian Standards, New Delhi, 2012.
C4- IS3370: 1967(R2008) (Part 1 to 4), "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2008.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CL7302	AIR POLLUTION MANAGEMENT	3	0	0	3

Course Objective

6. To classify the sources and understand the effects of air pollution.
7. To study the dispersion of pollutants.
8. To know the various techniques and equipment for control of air pollution.
9. To learn about the air quality standards and legislation.
10. To gain knowledge on indoor air pollution and noise pollution.

Unit	Description	Instructional Hours
I	**SOURCES AND EFFECTS OF AIR POLLUTANTS** 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
II	**DISPERSION OF AIR POLLUTANTS** 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
III	**AIR POLLUTION CONTROL** 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
IV	**AIR QUALITY MANAGEMENT** 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
V	**INDOOR AIR QUALITY AND NOISE POLLUTION** 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	PSO11	PSO12
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.	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
I	**INTRODUCTION AND SOURCES OF POLLUTION** 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
II	**PRIMARY TREATMENT METHODS** Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by floatation – Waste reduction – Volume reduction – Strength reduction	9
III	**ADVANCED TREATMENT METHODS** 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
IV	**CHARACTERISTICS OF INDUSTRIAL WASTEWATER** 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
V	**TREATMENT PLANTS AND PROBLEMS** 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: Interpret 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	PSO11	PSO12
CO1	3				3			2	2	2	1		2	2
CO2	3			2		2					1	2	2	2
CO3	2	1	3		2		1		1	1	1	1	2	2
CO4	3	1	3		2		1				2		2	2
CO5	3	1	2	1	2				2	1	1	1	2	2
Average	3	1	2	1	2.5			2	2	1.5	1	1	2	2

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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

6. To study the code provisions and design of steel-concrete composite construction
7. To understand the design of composite members
8. To learn the design of connections in composite structures
9. To understand the behavior of box girder bridges
10. To gain knowledge on seismic behavior of composite structures.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to steel-concrete composite construction -Design Philosophy – Eurocodes - Properties of the materials - Direct actions (loading) - Application - Codes - Serviceability and construction issues in design	9
II	**DESIGN OF COMPOSITE MEMBERS** Design of composite beams, slabs, floor slabs, columns - beam to columnjoints- Design of non-sway composite frames	9
III	**DESIGN OF CONNECTIONS** Shear connectors – Types and Properties – Methods of shear connection - Design of shearconnectors – Degree of shear connection - Partial shear interaction	9
IV	**COMPOSITE BOX GIRDER BRIDGES** Introduction - behavior of box girder bridges - design concepts	9
V	**CASE STUDIES** Case studies on steel-concrete composite construction in buildings - seismic behavior of composite structures	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO6. Recognize the codal provisions and the design of steel-concrete composite construction
CO7. Design composite members
CO8. Design connections in composite structures
CO9. Design composite box girder bridges
CO10. Understand the seismic behavior of composite structures

TEXT BOOKS:
T1 - Johnson R.P., "Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings", Vol. I, Blackwell Scientific Publications, 2004.
T2 - Oehlers D.J. and Bradford M.A., "Elementary Behaviour of Composite Steel and Concrete Structural Members ", Butterworth Heinemann, Oxford, 2002.

REFERENCES:
R1 - Owens, G.W. and Knowles, P, "Steel Designers Manual", Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.
R2 – Narayanan, R., "Composite Steel Structures – Advances, Design and Construction", Elsevier, Applied Science, UK, 1987.
R3 - "Teaching Resources for Structural Steel Design", Vol. 2 & 3, Institute of Steel Development and Growth (INSDAG), 2000.
R4 - Johnson R.P., "Composite Structures of Steel and Concrete - Beams, Slabs, Columns and Frames for Buildings", Wiley Blackwell Publishing, 2004.

CODE BOOK:
C1 - IS: 11384-1985, Code of Practice for Composite Construction in Structural Steel and Concrete, 1985

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7305	FINITE ELEMENT ANALYSIS	3	0	0	3

Course Objective	6. To understand the finite element analysis, modeling and various principles 7. To gain knowledge on element properties 8. To understand the concepts of Finite element analysis for one and two dimensional problems 9. To study about isoparametric elements and its formulation 10. To learn the applications of finite element method

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FORMULATION** 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
II	**ELEMENT PROPERTIES** 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
III	**FINITE ELEMENT ANALYSIS OF ONE AND TWO DIMENSIONAL PROBLEMS** 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
IV	**ISOPARAMETRIC ELEMENTS AND FORMULATION** Natural Coordinates in 1, 2 and 3 Dimensions – Isoparametric elements in 1, 2 and 3 Dimension – Lagrangean and Serendipity Elements – Numerical Elements.	9
V	**APPLICATIONS OF FINITE ELEMENT METHOD** 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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	19CE7306	COMPUTER AIDED ANALYSIS AND DESIGN OF STRUCTURES	2	0	2	3

Course Objective
1. To study the basic concepts of Computer Aided Design
2. To understand the concepts of Analyzing the beams for stiffness method using Microsoft Excel
3. To gain the knowledge on Analysis and design of Cantilever and simply supported beams by C++.
4. To learn about the Modelling, Analysis and Design of framed structure using ETABS.
5. To study the concepts of Modelling, Analysis and Design of framed structure using STAAD Pro.

Unit	Description	Instructional Hours
I	**Introduction to Computer Aided Design** Introduction to computer aided design – Reasons for implementing CAD – Design process – Applications of computers to design – Benefits of computer Aided design.	6
II	**Stiffness Method using Microsoft Excel** Stiffness method of analysis- step by step procedure – Analysis of Single Span Beams and continuous beams using Excel	4+6
III	**Analysis of beams using C++** Analysis of cantilever and simply supported beam using C++	4+6
IV	**Modelling, Analysis and Design using ETABS** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using ETABS	4+6
V	**Modelling, Analysis and Design using STAAD Pro.** Modelling (Skeletal members, Joints, material specification, Loadings) - analysis (Forces, Deflection, Stability, Displacement) – Design of Multi storey Building using STAAD Pro.	4+6
	Total Instructional Hours	45

Course Outcome
CO1: Interpret the concepts of computer Aided Design
CO2: Analyse the structure for Stiffness method using Microsoft Excel.
CO3: Analyse the beams using C++
CO4: Analyse the multistorey building using ETABS
CO5: Analyse the multistorey building using STAAD Pro.

TEXT BOOKS:
T1-Krishna Murthy C.S and Rajiv S. – Computer Aided Design, Software & Analytical tools –Alpha Science International Ltd,2005.
T2-DrShah V. L -Computer Aided design in reinforcedconcrete, Structures Publications, Pune, 2015.

REFERENCE BOOKS:
R1-Weaver W. and Gere J. M - Matrix Analysis of Framed Structure, CBS Publishers and Distributors Pvt Ltd, Delhi, 2018
R2- Meek J. L - Computer Methods in StructuralAnalysis, CRC Press. 1991
R3-YashavantKanetkar -Let Us C++, BPB Publications, 2020
R4- Prof. Sham Tickoo - Learning Bentley Staad.Pro V8i for Structural Analysis, Dreamtech Press,2015
R5 – Engr. Yousuf Dinar and Engr. Nurullah Siddique - Book for Beginners RCC Design by ETABS, University campus Publisher and seller. Dhaka. 2014

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES301	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

Course Objective

1. To study the role and methods of ground improvement and the geotechnical problems in soil
2. To acquire knowledge on engineering methods to improve the engineering properties of soil
3. To gain knowledge on existing insitu treatment of cohesive and cohesion less soil
4. To study the types and behavior of geotextile in various functions such as filtration, drainage, and separation in highway projects
5. To understand the principles of grouting methods, techniques and machinery

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

Course Outcome

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

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

TEXT BOOKS:

T1 - Purushothama Raj, P. "Ground Improvement Techniques", Laxmi publication, New Delhi, 2016.
T2 – Bikash Chandra Chattopadyay and Joyantamaity, "Ground Improvement Techniques" PHI Learning Private Ltd., New Delhi, 2017.

REFERENCE BOOKS:

R1 - Peter. G. Nicholson, "Soil Improvement and Ground Modification Methods", Elsevier Inc., 2015.
R2 - Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, First Edition, 2013.
R3 –NiharRanjanPatra, "Ground Improvement Techniques", Vikas Publishing House, First Edition, 2012.
R4 - Moseley. M.P and Kirsch. K., 'Ground Improvement", Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8302	PREFABRICATED STRUCTURES	3	0	0	3

Course Objective

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

Unit	Description	Instructional Hours
I	**INTRODUCTION** Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Shuttering and mould design – Dimensional tolerances - Disuniting of Structures - Introduction to 3D printing.	9
II	**PREFABRICATED COMPONENTS** Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.	9
III	**DESIGN PRINCIPLES** Design of Structural components – Beam, Column and Corbel - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces - Design and detailing of prefabricated units.	9
IV	**JOINTS IN STRUCTURAL MEMBERS** Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.	9
V	**DESIGN FOR EARTHQUAKES AND CYCLONES** Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Comprehend the basics of prefabrication
CO2: Know the behavior of prefabricated components
CO3: Design the structural components
CO4: Identify the different types of connections between structural members
CO5: Interpret the design concept of abnormal loads

TEXT BOOKS:

T1- Hubert Bachmann and Alfred Steinle ,"Precast Concrete Structures", 2012.
T2 - Laszlo Mokk, "Prefabricated Concrete for Industrial and Public Structures", AkademiaiKiado, Budapest, 2007.

REFERENCE BOOKS:

R1 – "PCI Design Hand Book", 6th Edition, 2004.
R2 – "Handbook on Precast Concrete for Buildings", ICI Bulletin 02, First Edition, 2016.
R3 - Bruggeling,A S G. and Huyghe, G. F., "Prefabrication with concrete" A.A. Balkema Publishers, Netherlands, 1991.
R4 - Glover C.W, "Structural Precast Concrete", Asia Publishing House, 1965.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8303	VALUATION OF LAND AND BUILDINGS	3	0	0	3

Course Objective

1. To understand the fundamentals of valuation
2. To study the characteristics of land and the various theories of land valuation
3. To learn the different methods of valuation of immovable properties
4. To explore the various techniques of building valuation
5. To get conversant with the principles and methods of rental valuation and depreciation

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF VALUATION** Basic concepts of valuation in India – Concepts of ownership – value and property – Types of property – Factors affecting value of the property – cost – price – value – Uncertainty in value estimation - Types of values – Elements of valuation – types of properties - Basics for successful valuer – Ethics for valuers - valuation report	9
II	**CLASSIFICATION OF LAND AND ITS CHARACTERISTICS** Characteristics of land – Infrastructure amenities – Land area – Residential and Industrial use – Frontage - zoning rules – Theories of land valuation – Recessed land concept – Land locked land concept - Belting theory – Hypothetical plotting scheme	9
III	**VALUATION METHODS** Methods of valuation : Land and building method. Rent capitalization method , Development method , Profit method , Composite rate method - Investment method of valuation – Discount cash flow – Net present value and internal rate of return method – profit method of valuation – cinema – petrol pump – Hotel and marriage hall valuation – Business valuation – income tax – wealth tax - Case studies in valuation (Residential Building).	9
IV	**VALUATION APPROACH** Residual technique – owner and tenant occupied – Hypothetical building scheme – Income and ownership concept – rental , profit , cash flow technique – Limitation of market approach – Belting – Historic cost – formula for workout net present value – method of estimating building cost – book value method – cost index method – Book value , flat rate, cost index – Detailed quantity method	9
V	**METHODS OF DEPRECIATION** Rental method of valuation – form of rent – different types of rent – standard rent – depreciation – different methods of calculating depreciation – straight line method, linear method – sinking fund method – declining balance method – quantity survey method – depreciation cost – obsolescence – Estimation and preparation of bills	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Employ the fundamental principles of valuation while evaluating a property
CO2: Apply the various theories and concepts of valuation when evaluating a land
CO3: Compare and contrast the various methods of valuation of immovable properties
CO4: Work out the net present value and estimate the cost of buildings
CO5: Estimate the rent and depreciation values of various properties

TEXT BOOKS:

T1- Gandhi, R.K., "Elements of Valuation of Immovable Properties",Tata McGraw –Hill Publishing Co. Ltd., Delhi, 2013.
T2 - Rangwala S. C., "Valuation of Real Properties", Charotar Publishing House, India, 2015.
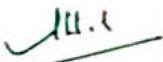
REFERENCE BOOKS:

R1- Kanagasabapathy .B.andArun, K., "Practical Valuation", volume – I
R2 - Roshan Nannavati, Professional practice (Estimation and valuation), U.B.S Publishers & Distributors Pvt. Ltd., New Delhi, 2000.
R3 - C.P.W.D. Specifications and Schedule of rates.
R4 - Ramachandran. V. G., "Law of Land Acquisition and Compensation", Eastern Book, 1995.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8304	MUNICIPAL SOLID WASTE MANAGEMENT	3	0	0	3

Course Objective

1. To gain knowledge on the types and characteristics of solid waste and the elements of solid waste management system.
2. To acquire adequate information on various options for on-site storage and processing.
3. To know about the collection and transfer methodologies of solid waste.
4. To study the various off-site processing techniques for solid waste management.
5. To provide basic knowledge on the various methods of disposal of solid waste.

Unit	Description	Instructional Hours
I	**SOURCES AND TYPES OF MUNICIPAL SOLID WASTES** Sources and types of solid wastes – Waste generation rates - Factors affecting generation: Characteristics–Methods of sampling and characterization –Effects of improper disposal of solid wastes–Public health and environmental effects –Functional elements of solid waste management system – Social & economic aspects - Solid Waste (M&H) rules - Public awareness - Role of NGOs – Public Private Partnership	9
II	**ON-SITE STORAGE & PROCESSING** On-site storage methods – Materials used for containers – On-site segregation of solid wastes–Public health & environmental aspects of open storage - Source reduction of waste - options under Indian conditions	9
III	**COLLECTION AND TRANSFER** Methods of Collection - Time and frequency of collection - Types of vehicles – Manpower requirement– Collection routes –Analysis of collection systems - Need for transfer operations-Transfer stations – Selection of location - operation & maintenance - Options under Indian conditions.	9
IV	**OFF-SITE PROCESSING** Objectives of waste processing - Processing techniques and Equipment-Resource recovery from solid wastes – Composting – Biomethanation - Incineration – Pyrolysis - Options under Indian conditions	9
V	**DISPOSAL** Dumping of solid waste - Sanitary landfills – Site selection-Design and operation of sanitary landfills–Leachate collection & treatment - Landfill gas management – Landfill closure and post closure – Landfill bioreactor – Landfill mining	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1: Classify solid waste and determine the effects of poor waste management on public health and the environment
CO2: Assess the options for source reduction of wastes and suggest suitable methods for on-site storage and processing
CO3: Determine the manpower requirement, collection techniques and transport methodologies of solid waste
CO4: Compare various techniques of off-site processing and their effectiveness
CO5: Comprehend the various options for disposal of wastes and their selection criteria.

TEXT BOOKS:
T1 - George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, "Integrated Solid Waste Management", McGraw-Hill Publishers, 2015.
T2 - Cherry, P.M., "Solid and Hazardous Waste Management", CBS Publishers and Distributors Pvt. Ltd., 2018.

REFERENCE BOOKS:
R1-"Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2016.
R2 - William A. Worrell, Aarne, P., Christian Ludwig, "Solid Waste Engineering – A Global Perspective", Cengage Learning, 2017.
R3- Landreth.R.E and Rebers.P.A, "Municipal Solid Wastes– Problems and Solutions", Lewis Publishers, 2002.
R4 -Bhide.A.D. andSundaresan.B.B, "Solid Waste Management in Developing Countries", INSDOC, 2003.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	2	-	2	1	1	1	2	1	3	3	3	3	3
CO2	3	2	1	1	1	1	1	2	1	2	2	3	3	3
CO3	3	2	1	1	-	1	1	2	1	2	1	3	3	3
CO4	3	3	3	3	1	2	1	3	-	2	2	3	3	3
CO5	3	1	1	-	1	1	1	2	1	3	1	3	3	3
Average	3	2	1.5	1.8	1	1.2	1	2.2	1	2.4	1.8	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	BCE 7416	DESIGN OF FORMWORK	3	0	0	3

Course Objective
1. To gain knowledge on formwork, its types and causes of formwork failure
2. To understand the formwork materials and formwork supports
3. To study the design of formwork for structural elements
4. To get familiar with design of formwork for special structures
5. To learn the concept of flying formwork

Unit	Description	Instructional Hours
I	**INTRODUCTION** Formwork.-Types of formwork - Requirement of formwork -Selectionofformwork - Trenchless technology - Causes and case studies in formwork failure. Formwork issuesin multi-storey building construction	9
II	**FORMWORK MATERIALS AND SUPPORTS** Materials, Accessories and Proprietary Products - Timber, Plywood, Steel, Aluminium, Plastic and Accessories - Types of supports - Horizontal and vertical formwork supports	9
III	**FORMWORK DESIGN** Foundation , Wall , Column, Slab and Beam formworks - Loads and concepts - Codal provisions - Allowable stresses - Check for deflection, bending and lateral stability - Design of timber and steel forms, Concrete pressure on forms- Loading and moment of formwork	9
IV	**FORMWORK FOR SPECIAL STRUCTURES** Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, and Lift Shaft - Slip forms- Principles -Types -Advantages -Safety in slip forms -Special structures built with slip form technique	9
V	**FLYING FORMWORK** Introduction - Flying Formwork Cycle - Advantages and Limitations of Flying Forms - Design Issues in Flying Forms - Safety Issues in Flying Forms - Table Forms - Tunnel Formwork System - Column Mounted Shoring System - Gang Forms- Formwork for Precast Concrete – Pre and Post-Award Formwork Management Issues	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to
CO1:Appraise the types, requirement and selection of formworks
CO2:Comprehend the various formwork materials and supports
CO3: Realize the codal provisions and design the formwork.
CO4:Compare the formwork for special structures
CO5:Interpret various flying formworks

TEXT BOOKS:
T1 - KumarNeerajJha, "Formwork for Concrete Structures", Tata McGraw Hill Publishing Company Ltd., 2013.
T2 - Robert Peurify andGaroldD. Oberlender, " Formwork for Concrete Structures", McGraw Hill Education, 2015

REFERENCE BOOKS:
R1- "Guide to Formwork for Concrete", ACI 347R-14, American Concrete Institute, 2014.
R2 - M.K. Hurd, "Formwork for Concrete", Special Publication No. 4, 7th Edition, American Concrete Institute, 2005.
R3 - Geoffrey Lee, Peter McAdam,"Formwork: A practical guide", Taylor & Francis e-Library, 2010.
R4 - Awad S. Hanna, "Concrete Formwork Systems", Marcel Dekker inc., New York, 1999.

CODE BOOKS:
C1 - IS 14687:1999, "False work for Concrete Structures-Guidelines", Bureau of Indian Standards.
C2 - IS 4990:2011,"Plywood for concrete shuttering work – Specification", Bureau of Indian Standards.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES306	NON DESTRUCTIVE TESTING OF STRUCTURES	3	0	0	3

Course Objective	1. To understand the principle and applications of visual inspection and liquid penetrant testing 2. To gain knowledge on the principle and applications of ultrasonic and acoustic emission testing 3. To get familiarized with the principle and applications of magnetic particle, eddy current and magnetic flux leakage testing 4. To understand the testing procedure by thermography and radiography 5. To gain knowledge on the industrial applications of non-destructive testing

Unit	Description	Instructional Hours
I	**VISUAL INSPECTION AND LIQUID PENETRANT TESTING** Introduction: Comparison of Destructive and Non-Destructive Tests -Conditions for Effective Non-Destructive Testing - Visual Inspection-Optical aids used for visual Inspection - Applications, Liquid Penetrant Testing: Physical Principles - Procedure for Penetrant Testing - Penetrant Testing Materials – Penetrant Testing Methods - Water washable and Post - Emulsifiable Method	9
II	**ULTRASONIC AND ACOUSTIC EMISSION TESTING** Ultrasonic Testing: Principle - Ultrasonic Transducers - Flaw detection equipment-Modes of display-Variables affecting Ultrasonic Test-Pulse echo, through transmission and Angle Beam Testing-Applications, Advantages and Limitations. Acoustic Emission Testing: Principle – Instrumentation – Advantages, Limitations and applications - Acoustic Emission testing of metal pressure vessels - Fatigue crack detection in Aerospace structures	9
III	**MAGNETIC PARTICLE, EDDY CURRENT AND MAGNETIC FLUX LEAKAGE TESTING** Magnetic Particle Testing: Principle- magnetizing techniques- Procedure used for testing a component – Advantages, Limitations and applications Eddy current Testing: Principles – Instrumentation for Eddy current testing – Inspection of ferromagnetic materials - Pulsed eddy current testing- Applications. Magnetic Flux Leakage (MFL) Testing: Principle Magnetizing and Demagnetizing methods – MFL sensors – Flaw detection and analysis in ferromagnetic specimen – advantages, Limitations and applications	9
IV	**THERMOGRAPHY AND RADIOGRAPHY TESTING** Thermography: Principle - Detectors and Equipments for active thrermography – heating sources – applications - Thermal imaging for condition monitoring of Industrial Components Radiography: Principle - Electromagnetic radiation sources – Radiographic imaging equipments various inspection techniques - Reading and interpretation of radiographs - Safety in industrial radiography	9
V	**INDUSTRIAL APPLICATIONS OF NON-DESTRUCTIVE TESTING** Industrial Applications of Non-Destructive Testing: Railways- Nuclear industry – Concrete structures - Aircraft and aerospace industries –Automotive industries - Selection of NDT methods – Codes, Standards, Specifications and Procedures	9
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students will have ability to CO1: Interpret the principle and applications of visual inspection and liquid penetrant testing CO2: Comprehend the principle and applications of ultrasonic and acoustic emission testing CO3: Recognize the principle and applications of magnetic particle, eddy current and magnetic flux leakage testing CO4: Identify the testing techniques by thermography and radiography CO5: Recognize the industrial application of non-destructive testing.

TEXT BOOKS:

T1 – Baldev Raj, Jeyakumar, T., Thavasimuthu, M., "Practical Non Destructive Testing", NarosaPublishing House, New Delhi, 2014.
T2– Maierhofer, C.&Dobmann,G.,"Non-Destructive Evaluation of ReinforcedConcrete Structures",Woodhead Publishing Ltd.,2010.

REFERENCE BOOKS:

R1 - Hellier C., "Handbook of Nondestructive Evaluation",Mc-Graw Hill Education, 2012.
R2 - Christiane Maierhofer, Hans-Wolf Reinhardt and GerdDobmann, "Non-destructive Evaluation of Reinforced Concrete Structures", Volume 2, CRC Press, New York, 2010.
R3 - Prasad, J. and Nair, C.G.K., "Non-Destructive Test and Evaluation of Materials", Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2008.
R4 - Malhotra, V.M. and Carino, N.J., "Handbook on Non-destructive Testing on Concrete", 2nd Edition, CRC Press, New York, 2004.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	19CE8307	CONSTRUCTION ECONOMICS AND FINANCE	3	0	0	3

Course Objective

1. To learn the concept of basic principles of payments.
2. To understand the cost analysis of projects.
3. To have exposure on various real estate and investment property for accounting
4. To gain knowledge on financial management
5. To study the principles of financial accounting

Unit	Description	Instructional Hours
I	**BASIC PRINCIPLES** Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient (G). Geometric Gradient (C).	9
II	**COMPARING ALTERNATIVES PROPOSALS** Comparing alternatives - Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.	9
III	**EVALUATING ALTERNATIVE INVESTMENTS** Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Case study in real estate – GST on real estate - Tax before and after depreciation – Value Added Tax (VAT) – Inflation.	9
IV	**FUNDS MANAGEMENT** Approaches in Fund Management - Project Finance – Sources of finance - Long-term and short - term finance, Working Capital Management. Inventory valuation, Mortgage Financing - International financial management foreign currency management.	9
V	**FUNDAMENTALS OF MANAGEMENT ACCOUNTING** Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students will have ability to
CO1: Identify the economic principles that underpin construction projects
CO2: Know the rate analysis required to complete a typical construction project
CO3: Produce a feasibility study for tax and real estate
CO4: Comprehend the various aspects of financial management
CO5: Calculate the management accounting statement

TEXT BOOKS:

T1 - Blank, L.T., and Tarquin,a.J., "Engineering Economy", Mc-Graw Hill Book Co., 4th Edn., 1988.
T2 – Collier, C. and GlaGola, C., "Engineering Economics & Cost Analysis", Addison Wesley Education Publishers, 3rd. Edn. 1998.

REFERENCE BOOKS:

R1 - Shrivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd. New Delhi, 2nd Edn., 2000.
R2 - Steiner, H.M.,"Engineering Economic Principles, Mc-Graw Hill Book, New York, 2nd Edn., 1996.
R3 - Patel, B. M." Project management- strategic Financial Planning. Evaluation and Control", Vikas Publishing House Pvt. Ltd. New Delhi,2000.
R4 - Gould, F.E.,"Managing the Construction Process", 2nd ed.,Prentice Hall, Upper Saddle River, New Jersey, 2002.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	3	1			2	2	3	3	3	3	3	3	3
CO2	3		2			1	2		3	2	2	3	3	3
CO3	3	1	2	1		2			2	2	3	3	3	3
CO4	3	3				2		3	2	2	2	3	3	3
CO5	3	3	2	1		2			2	1	2	3	3	3
Average	3	3	1.5	1		2	2	3	2.5	2	2.5	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES308	REPAIR AND REHABILITATION OF STRUCTURES	3	0	0	3

Course Objective

1. To get awareness on maintenance and repair strategies
2. To understand the strength and durability of concrete
3. To gain knowledge on special concretes
4. To learn the various repair techniques and corrosion protection methods
5. To acquire knowledge on repair, rehabilitation and retrofitting of structures

Unit	Description	Instructional Hours
I	**MAINTENANCE AND REPAIR STRATEGIES** Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Observation of repair, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration. Root Cause, Analysis of the problems, Diagnosing the problems.	9
II	**STRENGTH AND DURABILITY OF CONCRETE** Quality assurance for concrete - need – components – conceptual bases for quality assurance schemes Strength, Durability and Thermal properties of concrete - Cracks, different types, causes – Effects due to climate, temperature, chemicals, Design and construction errors, Effects of cover thickness	9
III	**SPECIAL CONCRETES** Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.	9
IV	**TECHNIQUES FOR REPAIR AND PROTECTION METHODS** Maintenance and repair strategies –Inspection – Structural appraisal – Economic appraisal – Diagnosis of distress – Procedure - Non-destructive Testing Techniques, Epoxy injection, shotcrete, Gunite, Shoring, Underpinning - methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection, rust eliminators.	9
V	**REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES** Need for retrofitting - Techniques available for strengthening of structural elements - Repair of structures distressed due to corrosion, fire, leakage, earthquake - Demolition techniques - Engineered demolition methods - Case studies.	9
	Total Instructional Hours	45

Course Outcome

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

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

CO2: Deduce the factors affecting the quality of concrete

CO3: Comprehend the properties and applications of special concretes

CO4: Interpret the principles of non-destructive testing and the latest techniques in the repair and corrosion protection methods

CO5: Recommend suitable techniques for repair, rehabilitation and retrofitting of structures

TEXT BOOKS:

T1 - Allen, R.T. and Edwards, S.C., "Repair of Concrete Structures", SponPress, Taylor & Francis group, 2005.

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

REFERENCE BOOKS:

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

R2 -DovKominetzky, "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2008.

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

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

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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.	19CE8309	DISASTER RESISTANT STRUCTURES	3	0	0	3

Course Objective

1. To gain knowledge on behavior of disasters, characteristics of materials and different codes of practice for designing a disaster resistant structure
2. To study the response of different community structures and their reliability assessment
3. To gain knowledge on modern construction materials, design and construction for reducing the impacts
4. To assess the damage of structures due to disasters
5. To understand the importance of rehabilitation and retrofitting methods for different disaster

Unit	Description	Instructional Hours
I	**BEHAVIOUR OF LIFE LINE STRUCTURES** Disasters - earthquake, cyclone, flood, tsunami, land slide, fire and blasting etc., Basic characteristics of disasters, its behaviour and Important parameters - Behaviour of materials and their characteristics - steel and concrete - National and International codes of practice, By-Law of urban and semi-urban areas – Traditional and modern structures.	9
II	**COMMUNITY STRUCTURES** Different architectural forms to resist disasters - Response of dams, bridges, buildings. Strengthening measures. Safety analysis and rating – Reliability assessment.	9
III	**STRUCTURES AND COMPONENTS** Different architectural forms to resist different disasters - Use of modern materials and their impact on disaster reduction. Ductility design - Design basis for disaster resistant structural design .	9
IV	**DAMAGE ASSESSMENT OF STRUCTURES** Damage surveys - Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety - Ground improvement techniques.	9
V	**REHABILITATION AND RETROFITTING** Testing and evaluation - Classification of structures for safety point of view – methods of strengthening for different disasters - qualification test.	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Comprehend the behaviour of disasters, response of materials and codal provisions to analyze and design disaster resistant structures

CO2: Predict response of different community structures and assess their reliability

CO3: Suggest modern materials and analysis for disaster resistant design

CO4: Assess the damages and suggest suitable maintenance techniques and modifications to improve hazard resistance

CO5: Propose rehabilitation and retrofitting options

TEXT BOOKS:

T1 -Agarwal,P., "Earthquake Resistant and Design of Structures", PHI Learning Pvt. Ltd., New Delhi, 2011.
T2 –Battacharjee, "Concrete Structures Repair, Rehabilitation and Retrofitting", CBS Publishers and Distributors Pvt. Ltd., New Delhi, 2019.

REFERENCE BOOKS:

R1 - Moskvin, V., "Concrete and Reinforced Concrete Deterioration and Protection", Mir Publishers, Moscow 1983.
R2 – Allen, R. T. and Edward S. C., "Repair of Concrete Structures", Blakie and Sons,U.K., 2000.
R3 - Proceedings IABSE 14th Congress, "Civilisation through Civil Engineering" New Delhi, May 1992.
R4 – Tilly, G. P., "Dynamic Behaviour of Concrete Structures", Elsevier Science Ltd., Chennai, 1986.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES310	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	0	3

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

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

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

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

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CES311	CONSTRUCTION SAFETY PRACTICES	3	0	0	3

Course Objective

1. To study the causes, principles and management of accidents
2. To know the appropriate techniques and construction safety programme
3. To have exposure on various contractual obligations
4. To study the safety procedures and personal protective equipment in construction
5. To provide awareness on occupational health practice

Unit	Description	Instructional Hours
I	**CONSTRUCTION ACCIDENTS** Accidents and causes - Accident prevention - Definition and principles - Potential hazards/risks associated with construction sites - High risk activities - Use of hoists - Working at height & in confined space - Equipment safety - Costs of construction injuries - Accident management.	09
II	**CONSTRUCTION SAFETY PROGRAMME** Elements of effective safety program - Job safety analysis - Fault tree analysis - Job-site safety assessment - Safety regulations at construction sites - Human factors in construction safety - Safety meetings - Safety incentives - Safety training - Safety policy - Safety committees - Safety inspection - Safety audit.	09
III	**CONTRACTUAL OBLIGATIONS** Government's policy in industrial safety - Safety & health legislation in India - The Factories Act, 1948 - Equipment Safety - Safety provisions in construction contracts - Sub contractual obligation - Workers compensation - Substance abuse - Safety record keeping.	09
IV	**DESIGNING FOR SAFETY** Project coordination and safety procedures - Safety culture - Safe workers - Company activities on safety - Principles of risk and loss control - Machinery safety - Machine guarding Workplace ergonomics - Personal protective equipment - First aid and emergency preparedness - Fire safety - Electrical hazards.	09
V	**OCCUPATIONAL HEALTH PRACTICE** Statutory requirements and regulations related to health hazards - Legal Implications - Dust hazards and control - Occupational and safety hazard assessment - Noise assessment and control measures - Impact and vibration - ISO 18001 & ISO 14001 codal provisions - Case Studies.	09
	Total Instructional Hours	45

Course Outcome

CO1: Learn the causes, principles and management of accidents
CO2: Choose suitable techniques and construction safety programme
CO3: Interpret the various contractual obligations
CO4: Make use of advanced safety procedures and personal protective equipment in construction
CO5: Comprehend the aspects of occupational health practice

TEXT BOOKS:

T1 – Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2011.
T2 - Tim Howarth and Paul Watson, "Construction Safety management", Wiley – Blawel, 2008.

REFERENCE BOOKS:

R1 - Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 2015.
R2 - Mishra, R. K., "Construction safety", Aitbs Publishers, India, 2013.
R3 - Waldron H A, "Occupational Health Practice", Publishers Elsevier Science, 2015.
R4 - Tamilnadu Factory Act, Department of Inspectorate of factories, Tamilnadu.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
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.	19CE8312	IOT FOR SMART CITY PLANNING	3	0	0	3

Course Objective

1. To introduce the principles and Internet of Things.
2. To learn the various Layer of Internet of Things architecture.
3. To introduce the concepts framework and logical design of internet of things platforms.
4. To acquire knowledge Standards and Policies of Internet of Things.
5. To study the Applications of Internet of Things.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IOT** Overview and Introduction - Internet of Things (IoT) - Web of Things (WoT) - Cloud of Things Need for IoT on Cloud - Services in the Cloud for the Internet of Things - Applications of IoT Detailed Domain Model.	09
II	**IOT ARCHITECTURE** IoT Architecture - Sensor Layer - Gateway and Network Layer - Management Service Layer Application Layer - IoT Enabling Technologies - Addressing Schemes - Data Storage and Analytics – Visualization - Connected Domains – Connected Home -Connected Worker Connected Automobile - Connected Industry.	09
III	**IOT PLATFORMS DESIGN METHODOLOGY** IoT Systems – Intel IoT Framework - Qualcomm IoT Framework - Microsoft IoT Framework ARM IoT Framework - Logical Design - Programming IoTplatform (eg: Python, Mono C# Objective-C, Ruby), Raspberry Pi - Program for Firmware – Case Studies.	09
IV	**IOT STANDARDS** Need for the IOT standards - IOT and Smart City Standards and Policies: Global perspective Policy Research and Standardization in Europe – Indian Standards formulation – Sectional committee and composition – Challenges in standardization - Digital infrastructure.	09
V	**IOT APPLICATIONS** Lighting as service – Smart Parking -Smart metering – Smart water management- Smart energy– Smart solid waste management - Smart mobility –Intelligent Transportation System-Smart governance- Challenges in IoT Management.	09
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have
CO1: Interpret the concepts Internet of Things.
CO2: Interpret the various Layer of Internet of Things architecture
CO3: Comprehend the concepts framework and logical design of internet of things platforms.
CO4: Interpret theStandards and Policies of Internet of Things.
CO5:Appreciate the need forInternet of Things

TEXT BOOKS:

T1 –Olivier Hersent, David Boswarthick and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", Second Edition, Wiley Publisher, 2012.

T2 - Uckelmann, Dieter, Mark Harrison, and Florian Michahelles, "Architecting the Internet of Things". Springer Science & Business Media, 2011

REFERENCE BOOKS:

R1 - ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", 2014.

R2 –Doukas, Charalampos, Building internet of things with the Arduino, CreateSpace Independent Publishing Platform,2012.

R3 –Lu, Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning. "The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems", CRC Press.

R4 –Massimo Banzi, "Getting Started with Arduino (Make: Projects)", O'Reilly Media. 2008.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	3	1	2	2	-	3	-	2	-	3	1	3	3	2
CO2	3	2	3	2	-	2	3	1	1	2	1	3	3	2
CO3	3	3	1	2	1	3	2	1	2	3	1	3	3	2
CO4	3	2	3	2	2	2	-	2	2	1	1	3	2	2
CO5	3	2	3	2	2	2	-	2	1	2	2	3	2	3
Average	3	2	2.4	2	1.7	2.4	1.5	1.6	1.5	2.2	1.2	3	2.6	2.2

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OPEN ELECTIVES

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2	2	2	1	3	1	-	-	2	1	2	2	3	3
CO2	2	2	2	1	3	1	-	-	2	1	2	2	3	2
CO3	2	2	1	1	3	1	-	-	1	1	2	2	2	2
CO4	3	3	3	2	3	1	-	-	2	1	2	2	3	1
CO5	1	1	2	1	3	1	-	-	2	1	1	1	2	2
Average	2	2	2	1.2	3	1	-	-	1.8	1	1.8	1.8	2.6	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.,	19CE7401	INTERIOR DESIGN	3	0	0	3

Course Objective	1. Learn the basic principles and processes of interior design 2. Explore the historical development of interior design through the ages. 3. Compare and contrast the various elements, methods and materials involved in interior design. 4. Get conversant with the principles, types and effects of lighting and interior landscaping. 5. Understand the significance of anthropometry and space standards in furniture design and space planning

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTERIOR DESIGN** Definition of interior design - Interior design process - Vocabulary of design in terms of principles andelements - Introduction to the design of interior spaces as related to typologies and functions, themes andconcepts - Study and design.	8
II	**HISTORY OF INTERIOR DESIGN** Brief study of the history of interior design through the ages relating to historical context, design movementsand ideas etc. - Brief study of folk arts and crafts - Vernacular design in Indiawith reference to interior designand decoration.	8
III	**ENCLOSING ELEMENTS** Introduction to various elements of interiors like floors. ceilings, walls, staircases, openings, interior service elements, incidental elements etc. and various methods of their treatment involving use of materials andmethods of construction in order to obtain certain specific functional, aesthetic and psychological effects.	9
IV	**LIGHTING ACCESSORIES AND INTERIOR LANDSCAPING** Study of interior lighting - Different types of lighting their effects types of lighting fixtures. Other elements ofinteriors like accessories used for enhancement of interiors – Paintings, objects de art, etc. Interior landscaping -Elements like rocks, plants, water, flowers, fountains, paving, artifacts, etc. their physical properties, effects onspaces and design values.	10
V	**FURNITURE DESIGN AND SPACE PLANNING** Introduction to Anthropometry- Study of the relationship between furniture and spaces - human movements & furniture design as related tohuman comfort. Function, materials and methods of construction - changing trends and lifestyles – innovationsand design ideas - Study on furniture for specific types of interiors like office furniture, children's furniture, residential furniture, display systems, etc. – Design Projects on Residential, Commercial and Office Interiors.	10
	Total Instructional Hours	45

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Recognize the basic principles and concepts of interior design CO2: Interpret the history of interior design. CO3: Combine the right elements, materials and methods in order to obtain certain specific functional, aesthetic and psychological effects. CO4: Identify the Suitable light accessories and interior landscaping CO5:Comprehend anthropometry space standards for different furnitures.

TEXT BOOKS:
T1 - Linda O'Shea, Chris Grimley, "The Interior Design Reference & Specification Book", Rockport Publishers Inc., USA, 2013.
T2 – PremavathySeetharaman, ParveenPannu, "Interior Design and Decoration" CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2018

REFERENCE BOOKS:
R1 - Steport - De Van Kness, Logan and Szebely, "Introduction to Interior Design", Macmillan Publishing Co., New York, 1980
R2 - Inca / Interior Design Register, Inca Publications, Chennai. 1989.
R3 –SyanneSlesin, Stafford Ceiff "Indian Style", Clarkson N. Potter, New York, 1990.
R4 - Simon Dodsworth, Stephen Anderson "The Fundamentals of Interior Design", Bloomsbury Publishing, New Delhi, 2015.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO11	PSO12
CO1	2		1				2	2					2	1
CO2	2		2	2			1						2	2
CO3	2		2				2	2	2				2	2
CO4	2		1	2			2						2	2
CO5	2		2				1	3					2	1
Average	2		1.6	2			1.6	2.3	2				2	1.6

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