



ERODE SENGUNTHAR ENGINEERING COLLEGE

**(An Autonomous Institution, Affiliated to Anna University)
PERUNDURAI, ERODE - 638 057**

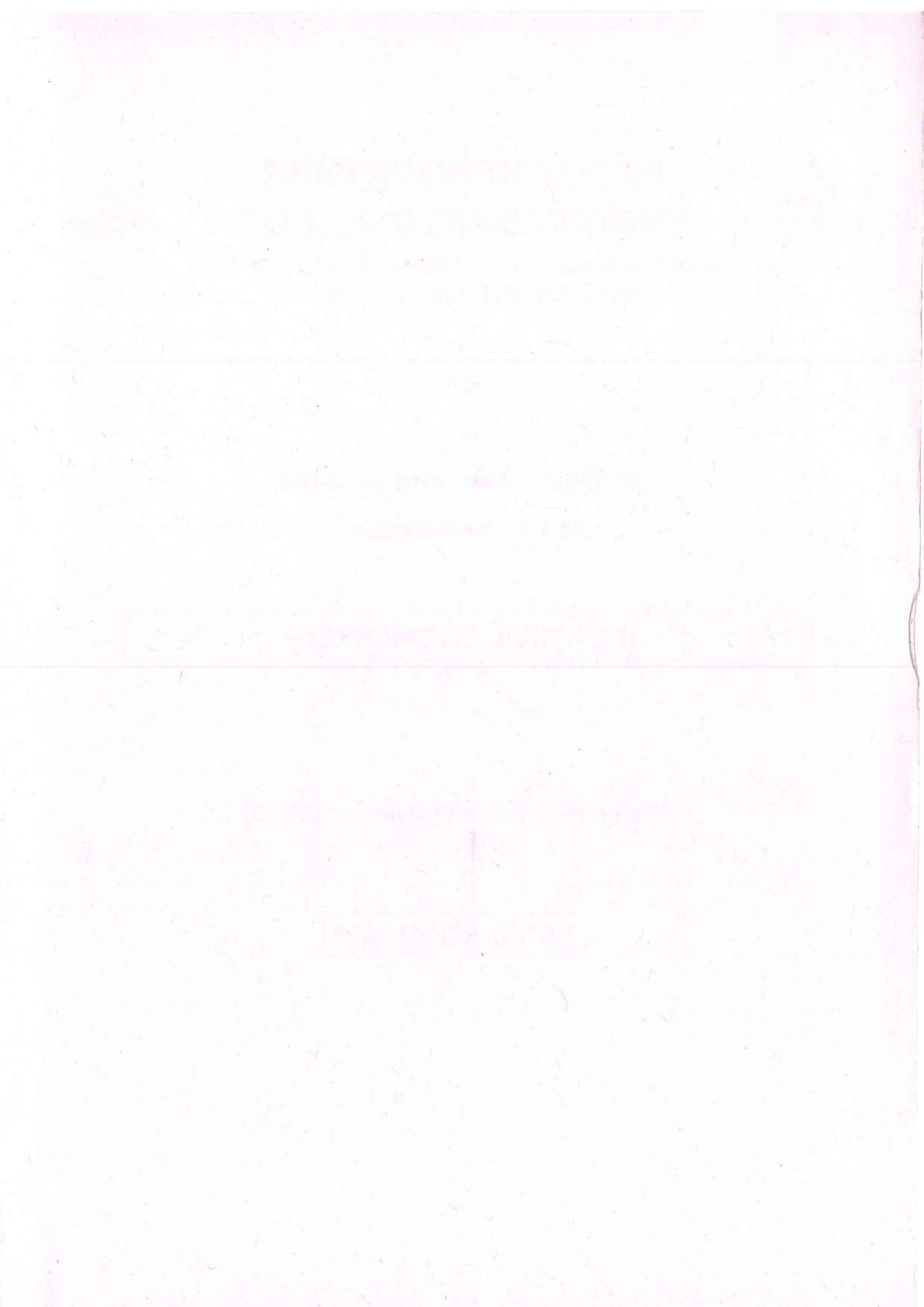


UG Curriculum and Syllabus (1 to 8 Semesters)

B.E – CIVIL ENGINEERING

Choice Based Credit System (CBCS)

REGULATION 2019



ERODE SENGUNTHAR ENGINEERING COLLEGE, ERODE
DEPARTMENT OF CIVIL ENGINEERING
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM

Induction Program (Mandatory)	3 weeks duration
Induction program for students to be offered right at the start of the first year	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept. / Branch & Innovations


B.E. CIVIL ENGINEERING												
Total Credit : 165												
SEMESTER I												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	POs	PSOs					CA	ES	Total	
19BS101	Calculus and its Applications	I, III	1,2,3,4,12	1	3	1	0	4	40	60	100	BS
19BS102	Engineering Physics	I, III	1,2,4,5,6,8,9	1	2	0	2	3	40	60	100	BS
19BS103	Engineering Chemistry	I, III	1,2,3,4,5,7,12	1	3	0	0	3	40	60	100	BS
19HS101	Communicative English	III	2,3,6,9,10,11	1	3	0	0	3	40	60	100	HS
19ES102	Basics of Electrical and Electronics Engineering	I, III	1,2,3,4,9	1	2	0	2	3	40	60	100	ES
19TPS01	Soft Skills – I	III	8,9,10,12	1	1	0	0	1	40	60	100	EEC
PRACTICAL												
19ES106	Engineering Graphics	II	1,2,3,5,10,12	2	0	0	4	2	60	40	100	ES
19ES107	Workshop Practices	II	1,3,9,12	3	0	0	2	1	60	40	100	ES
TOTAL					15	1	11	20	360	440	800	-

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SEMESTER II												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	POs	PSOs					CA	ES	Total	
19BS201	Vector Calculus and Complex Variables	I, III	1,2,3,4,12	1	3	1	0	4	40	60	100	BS
19BS203	Applications of Physics to Civil Engineers	I, III	1,5,7	1	3	0	0	3	40	60	100	BS
	Language Elective	III	2,3,6,9,10,12	1	3	0	0	3	40	60	100	HS
19ES201	Problem Solving and Python Programming	II	1,2,3,4,5	1	3	0	0	3	40	60	100	ES
19ES209	Mechanics for Engineers	II	1,2,3,4,6,7,8,9,10	1	3	0	0	3	40	60	100	ES
19MC201	Environmental Science and Engineering	I, III	1,2,3,4,5,6,7,8,12	1	3	0	0	0	40	60	100	MC
19TPS02	Soft Skills – II	III	8,9,10,12	1	1	0	0	1	40	60	100	EEC
PRACTICAL												
19ES212	Computer Aided Drawing Practices	II	1,5,6	2	0	0	4	2	60	40	100	ES
19ES213	Problem Solving and Python Programming Laboratory	II	1,2,3,4,5,12	1	0	0	2	1	60	40	100	ES
19BS208	Engineering Chemistry Laboratory	I, III	1,2,3,4,5	1	0	0	4	2	60	40	100	BS
Total					21	2	11	22	460	540	1000	-


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SEMESTER III

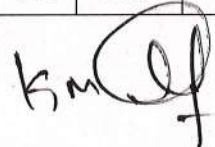
THEORY

Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	POs	PSOs					CA	ES	Total	
19BS303	Transform Techniques and Partial Differential Equations	I, III	1,2,3,4	1	3	1	0	4	40	60	100	BS
19CE301	Mechanics of Solids	I, III	1,2,3,4,6	1	3	0	0	3	40	60	100	PC
19ES309	Fluid Mechanics and Machineries	I, III	1,2,3,4,5,6,7,8,10,12	1	3	0	0	3	40	60	100	ES
19CE302	Surveying	I, III	1,4,5,6,8,9,11,12	1	3	0	0	3	40	60	100	PC
19ES301	Applied Geology	III	1,2,6,7,12	1	3	0	0	3	40	60	100	ES
19CE303	Construction Materials and Practices	I, III	1,5,6,7,8	1	2	0	2	3	40	60	100	PC
19MC301	Indian Constitution	IV	6,8,10,11,12	1	2	0	0	0	40	60	100	MC
19TPS03	Quantitative Aptitude and Logical Reasoning - I	III	1,2,9,10,12	1	2	0	0	0	40	60	100	EEC
PRACTICAL												
19CE304	Surveying Practical	I, II, IV	1,2,4,5,6,8,9,11,12	3	0	0	4	2	60	40	100	PC
19HS301	Communication skills	I, II, III, IV	9,10,12	3	0	0	4	2	60	40	100	HS
Total					21	1	10	23	440	560	1000	-

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SEMESTER IV												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	Pos	PSOs					CA	ES	Total	
19BS402	Numerical Methods	I, III	1,2,3,4	1	3	1	0	4	40	60	100	BS
19CE401	Strength of Materials	I, III	1,2,3,4,6,11,12	1	3	0	2	4	40	60	100	PC
19CE402	Soil Mechanics	I, III	1,2,3,4,6,7,12	1	3	0	0	3	40	60	100	PC
19CE403	Concrete Technology	I, III	1,6,7,10,11,12	1	3	0	0	3	40	60	100	PC
19CE404	Water Resource and Irrigation Engineering	I, III	1,2,3,5,6,7,8,11,12	1	3	0	0	3	40	60	100	PC
19HS402	Universal Human Values 2 : Understanding Harmony	I, III	2, 3, 5, 6, 8, 11,12	1	3	0	0	3	40	60	100	HS
19TPS04	Quantitative Aptitude and Logical Reasoning - II	I, II, III, IV	1,2,9,10,12	3	2	0	0	0	40	60	100	EEC
PRACTICAL												
19CE405	Hydraulic Engineering Laboratory	I, IV	1,4,5,6,10,11	2	0	0	4	2	60	40	100	PC
19CE508	Survey Camp	I, II, IV	1,2,3,4,5,6,9	1	0	0	2	0	100	-	100	EEC
Total					17	1	8	22	360	440	800	-


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SEMESTER V												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	Pos	PSOs					CA	ES	Total	
19CE501	Analysis of Indeterminate Structures	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19CE502	Foundation Engineering	I,III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19CE503	Design of RCC Elements	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19ES501	Water Supply Engineering	I,III	1,2,3,6,7	1	3	0	0	3	40	60	100	ES
	Professional Elective I				3	0	0	3	40	60	100	PE
	Professional Elective II				3	0	0	3	40	60	100	PE
19TPS05	Quantitative Aptitude and Logical Reasoning - III	III	1,2,9,10,12	1	2	0	0	0	40	60	100	EEC
PRACTICAL												
19CE504	Soil Engineering Laboratory	I,II, IV	1,2,3,4,5,6,9	1	0	0	4	2	60	40	100	PC
19ES502	Environmental Engineering Lab	I,II, IV	1,2,3,4,5,6,9	1	0	0	4	2	60	40	100	ES
Total					20	0	10	22	600	500	1100	-

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SEMESTER VI												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	Pos	PSOs					CA	ES	Total	
19CE601	Advanced Structural Analysis	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19CE602	Design of RCC Structures	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19CE603	Basic Structural Design	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19ES601	Waste Water Engineering	I,III	1,2,3,6,7	1	3	0	0	3	40	60	100	ES
	Professional Elective II				3	0	0	3	40	60	100	PE
	Open Elective I				3	0	0	3	40	60	100	OE
19TPS06	Quantitative Aptitude and Logical Reasoning - IV	III, IV	1,2,9,10,12	3	0	0	2	0	40	60	100	EEC
PRACTICALS												
19CE604	Concrete and Highway Laboratory	I,II, IV	1,2,3,4,5,6,9	1	0	0	4	2	60	40	100	PC
19CE605	Comprehensive Review	IV	2,4,9,10	3	0	0	2	1	100	-	100	EEC
Total					18	0	12	21	540	460	1000	-

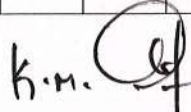
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SEMESTER VII												
THEORY												
Code No	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	Pos	PSOs					CA	ES	Total	
19CE701	Estimation and Costing	I,III	1,2,3,6	1	3	0	0	3	40	60	100	PC
19CE702	Structural Dynamics and Earthquake Engineering	I, III	1,2,3,6	1	3	0	0	3	40	60	100	PC
	Professional Elective III				3	0	0	3	40	60	100	PE
	Professional Elective IV				3	0	0	3	40	60	100	PE
	Open Elective II				3	0	0	3	40	60	100	OE
PRACTICALS												
19CE703	Computer Aided Design and Drafting Laboratory	I, II, III, IV	1, 5, 6, 9	2	0	0	4	2	60	40	100	PC
19CE704	Design Project	I,II, IV	1,2,3,4, 5,6,7,8, 9,11,12	3	0	0	4	2	60	40	100	EEC
19CE705	Industrial Training	I, IV	1, 5,6 ,8,9,10 ,11,12	3	0	0	0	1	100	-	100	EEC
Total					14	0	12	20	520	380	900	-

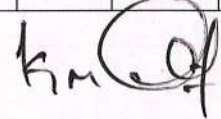
SEMESTER VIII												
THEORY												
Code No.	Course	Objective & Outcomes			L	T	P	C	Maximum Marks			Category
		PEOs	Pos	PSOs					CA	ES	Total	
	Professional Elective V				3	0	0	3	40	60	100	PE
	Professional Elective VI				3	0	0	3	40	60	100	PE
	Open Elective III				3	0	0	3	40	60	100	OE
PRACTICALS												
19CE801	Project Work	I,II, IV	1,2,3,4 ,5,6,7, 8,9,10, 12	3	0	0	12	6	60	40	100	EEC
Total					6	0	10	15	140	160	300	-


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ELECTIVES

LANGUAGE ELECTIVES								
Code No	Course	Objective & Outcomes			L	T	P	C
		PEOs	POs	PSOs				
19HX201	English for Engineers	I	2,3,6,9,10,12	1	3	0	0	3
19HX202	Hindi	I	2,3,6,9,10,12	1	3	0	0	3
19HX203	Japanese	I	2,3,6,9,10,12	1	3	0	0	3
19HX204	French	I	2,3,6,9,10,12	1	3	0	0	3

PHYSICS ELECTIVES								
Code No	Course	Objective & Outcomes			L	T	P	C
		PEOs	POs	PSOs				
19BX201	Physics for Electronics Engineering	I,II	1,2,3,5,7,1 2	1	3	0	0	3
19BX202	Physics for Information Science	I,II	1,2,3,5,7,1 2	1	3	0	0	3
19BX203	Physics of Materials	I,II	1,2,3,5,7,1 2	1	3	0	0	3
19BX204	Materials Science	I,II	1,2,3,5,7,1 2	1	3	0	0	3
19BX205	Application of Physics to Civil Engineers	I,II	1,5,7	1	3	0	0	3



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PROFESSIONAL ELECTIVES								
Code No.	Course	Objective & Outcomes			L	T	P	C
		PEOs	POs	PSOs				
PROFESSIONAL ELECTIVE – I								
19CEX01	Hydrology	I	1,2,3,6,7	1	3	0	0	3
19CEX02	Highway Engineering	I,II,III	1,2,3,6,8	1	3	0	0	3
19CEX03	Total Station and GPS Surveying	I,III	1,2,3,4,5,6	2	3	0	0	3
19CEX04	Disaster Management	I	1,2,4,5,6,7	1	3	0	0	3
19CEX05	Ground Improvement Techniques	I	1,5,7	1	3	0	0	3
PROFESSIONAL ELECTIVE – II								
19CEX06	Traffic Engineering and Management	I	1,6,9,10,11	1	3	0	0	3
19CEX07	Remote Sensing and GIS	I	1,2,3,5,7	1,2	3	0	0	3
19CEX08	Air Pollution and Control Engineering	I	1,5,6,7,8	1	3	0	0	3
19CEX09	Railways, Airports and Harbour Engineering	I	1,6,9,10,11	1	3	0	0	3
19CEX10	Municipal Solid Waste Management	I,III	1,6,7,8,9	1	3	0	0	3
PROFESSIONAL ELECTIVE – III								
19CEX11	Sustainable construction methods	I	1,2,3,4,5,6	1	3	0	0	3
19CEX12	Industrial Structures	I,III	1,6,9,10,11	1	3	0	0	3
19CEX13	Design of Prestressed Concrete Structures	I,III	1,2,3,5,7	1	3	0	0	3
19CEX14	Construction Planning and Scheduling	I	1,2,3,4,5,6	1	3	0	0	3
19CEX15	Building Services	I	1,2,3,4,5,6	1	3	0	0	3
PROFESSIONAL ELECTIVE - IV								
19CEX16	Safety in Construction Practices	I	1,2,3,5,7	1	3	0	0	3
19CEX17	Housing Planning and Management	I,II	1,2,3,4,5,6	1	3	0	0	3
19CEX18	Public transportation system	I,II	1,2,3,4,5,6	1	3	0	0	3
19CEX19	Bridge Engineering	I	1,2,3,4,5,6	1	3	0	0	3
19CEX20	Design of Timber, Masonry and Steel Elements	I	1,2,3,4,5,6	1	3	0	0	3
PROFESSIONAL ELECTIVE – V								
19CEX21	Industrial Waste Management	I,II	1,2,3,4,5,6	1	3	0	0	3
19CEX22	Prefabricated Structures	I, III	1,2,3,6	1	3	0	0	3
19CEX23	Ecological Engineering	I,II	1,2,3,4,5,6	1	3	0	0	3



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19CEX24	Fundamentals of Nano Science	I	1,2,3,5,7	1	3	0	0	3
19CEX25	Intelligent transport Engineering	I,II	1,2,3,4,5,6	1	3	0	0	3
PROFESSIONAL ELECTIVE – VI								
19CEX26	Ground Water Engineering	I,III	1,2,3,4,5,6	1	3	0	0	3
19CEX27	Repair and Rehabilitation of Structures	I,II	1,2,3,4,5,6	1	3	0	0	3
19CEX28	Construction Management	I,II	1,2,3,5,7	1	3	0	0	3
19CEX29	Entrepreneurship development	I,II	1,2,3,4,5,6	1	3	0	0	3
19CEX30	Instrumentation and sensor Technologies for civil engineering	I,II	1,2,3,4,5,6	1	3	0	0	3
PROFESSIONAL ELECTIVE – VII								
19CEX31	Environmental Impact Assessment	I,III	1,6,7,8,9	1	3	0	0	3
19CEX32	Finite Element Analysis	I,III	1,6,7,8,9	1	3	0	0	3
19CEX33	Coastal Engineering	I	1,6,7,8,9	1	3	0	0	3
19CEX34	Geo Environmental Engineering	I,III	8,9,10,11	1	3	0	0	3
19CEX35	Concepts of Engineering Design	I	1,2,3,4,5,6	1	3	0	0	3

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OPEN ELECTIVES offered to other Departments


Code No	Course	Objective & Outcomes			L	T	P	C
		PEOs	POs	PSOs				
OPEN ELECTIVE – I								
19CEY01	Green Buildings	I	1,2,11,12	1	3	0	0	3
19CEY02	Hazardous Waste Management	I	1,2,3	1	3	0	0	3
19CEY03	Disaster Preparedness And Planning	I	6,7,8	1	3	0	0	3
19CEY04	Mass transportation system	I	1,2,6	1	3	0	0	3
19CEY05	Transport and Environment	I	1,2,4,5,6	1	3	0	0	3
19CEY06	Contract Management	I	1,2,4,5,6,7	1	3	0	0	3
19CEY07	Wealth From Waste	I	1,2,5,6,7	1	3	0	0	3
19CEY08	Risk and Safety Management	I	1,2,5	1	3	0	0	3
19CEY09	Project Formulation And Appraisal	I	1,2,4,5,6	1	3	0	0	3
19CEY10	Integrated Water Resource Management	I	1,2,4,5,6,7	1	3	0	0	3
19CEY11	Renewable Energy Sources	I	1,2,5,6,7,8	1	3	0	0	3
19CEY12	Architecture and Urban Planning	I	1,2,4,	1	3	0	0	3
19CEY13	Modern Construction Materials	I	1,2,4,5,6,7	1	3	0	0	3

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ADDITIONAL ONE CREDIT COURSES

Code No.	Course	Objective & Outcomes			L	T	P	C
		PEOs	POs	PSOs				
19CEZ01	E-Waste Management	I	1,2,5	1,2	1	0	0	1
19CEZ02	Interior Design	I	1,2,5	1	1	0	0	1
19CEZ03	Construction Communication	I	1,2,5	1	1	0	0	1
19CEZ04	Lesson From Failure Of Structures	I	1,2,5,6	1	1	0	0	1
19CEZ05	Topographic Maps	I	1,2,5	1	1	0	0	1
19CEZ06	Practical Project Guidance And Personality Development	I	1,2,5,14	1	1	0	0	1
19CEZ07	Recent Practices In Planning, Design, Construction And Maintenance Of Building	I,II	1,2,5	1	1	0	0	1
19CEZ08	Arbitration And Dispute Resolution	I	1,2,6,7,8,11	1	1	0	0	1
19CEZ09	Valuation Practice Of Immovable Properties - I	I	1,2,4,5	1	1	0	0	1
19CEZ10	Project Delivery Systems In Building Sector	I	1,2,5,12,14	1	1	0	0	1

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Summary of Credit Distribution

S.No.	Category	Credits Per Semester								Total Credit	AICTE Credit
		I	II	III	IV	V	VI	VII	VIII		
1	BS	10	9	4	4	-	-	-	-	27	26
2	ES	6	9	6	-	5	3	-	-	29	29
3	HS	3	3	2	3	-	-	-	-	11	12
4	PC	-	-	11	15	11	11	8	-	56	47
5	PE	-	-	-	-	6	3	6	6	21	23
6	OE	-	-	-	-	-	3	3	3	9	11
7	EEC	1	1	-	-	-	1	3	6	12	12
8	MC										
Total		20	22	23	22	22	21	20	15	165	160

BS- Basic Science

ES- Engineering Science

HS- Humanities and Social Science

PE- Professional Elective

OE- Open Elective


PC- Professional Core

MC- Mandatory course

CA- Continuous Assessment

ES- End semester Examination

EEC- Employability Enhancement Course

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Department	CIVIL ENGINEERING					R 2019	Semester	I
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19BS101	CALCULUS AND ITS APPLICATIONS	3	1	0	4	60	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Interpret the introductory concepts of Limit and continuity Interpret the introductory concepts of calculus, this will enable them to model and analyze physical phenomena involving continuous change of variables Find eigen values and eigen vectors which is one of the powerful tools to handle practical problems arising in the field of engineering. Summarize and apply the methodologies involved in solving problems related to functions of several variables. Develop enough confidence to identify surface and area there by solving using integration 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Apply differentiation to solve maxima and minima problems use both the limit definition and rules of differentiation to differentiate functions Identify and model the real time problems using first order linear differential equations. Recognize and solve the higher order ordinary differential equations. Analyze the characteristics of a linear system with Eigen values and Eigen vectors. Characterize the functions of several variables and get the solutions of the same. Integrate the functions for evaluating the surface area and volume. 								
Unit I	LIMITS AND CONTINUITY						12	
Representation of a function-Limit of a function-Continuity-Derivatives-Differentiation rules-Maxima and Minima of one variable								
Unit II	ORDINARY DIFFERENTIAL EQUATIONS						12	
Linear differential equations of second and higher order with constant coefficients. Linear differential equations of higher order with variable coefficients: Cauchy's linear differential equation - Method of variation of parameters for second order differential equations-Vibrating string-Electrical circuits								
Unit III	MULTIVARIABLE CALCULUS						12	
Functions of Two Variables - Total Differential - Derivative of implicit functions- Jacobian's- constrained maxima and minima								
Unit IV	MULTIPLE INTEGRALS						12	
. Double integration with constant and variable limits-Region of integration -Change the order of integration -Area as double integral in cartesian coordinates. Triple integral in Cartesian coordinates.								
Unit V	EIGEN VALUES AND EIGEN VECTORS						12	
Eigen Values and Eigen Vectors of a real matrix - Properties of Eigen Values- Cayley - Hamilton Theorem Orthogonal matrix- Diagonalisation-Quadratic form: Reduction of a quadratic form to a canonical form.								
REFERENCE(S):								
1.	Thomas Calculus, 14th Edition by Pearson							
2.	Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited, New Delhi 2015.							
3.	Peter V. O Neil , Advanced Engineering Mathematics, Eight Edition , Cengage Learning India Private Limited, 2018							
4.	C. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.							
5.	Glyn James, Advanced Engineering Mathematics, Third Edition, Wiley India, 2014.							


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Department	CIVIL ENGINEERING					R 2019	Semester I	BS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19BS102	ENGINEERING PHYSICS	2	0	2	3	60	100	

Course Objective (s): The purpose of learning this course is

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology
- To get the basic knowledge on the properties of matters
- To acquire knowledge in Ultrasonic, Laser and fibers
- To enhance the knowledge in quantum theory
- To understand basic concepts of thermal properties of materials

Course Outcomes: At the end of this course, learners will be able :

- To gain knowledge on the basics of properties of matter and its applications
- To acquire knowledge on the concepts of Ultrasonic and their applications
- To have adequate knowledge on the concepts of fiber & Laser and their applications
- To get knowledge on advanced Physics concepts of quantum theory and its applications in tunneling microscopes and
- To understand knowledge on the concepts of thermal properties of materials and their applications in expansion of joints and heat exchangers

Unit I **PROPERTIES OF MATTER** **6**

Elasticity – Stress-strain diagram and its uses - torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders.

Unit II **ULTRASONICS** **6**

Introduction–Classification of Sound- Ultrasonic Production - Magnetostriction generator - Piezo electric generator-cavitations-ultrasonic cleaning-Non Destructive Testing- Pulse echo system through transmission and reflection modes- A, B and C – scan displays- Engineering Applications-Cutting, welding and drilling.

Unit III **LASER AND FIBRE OPTICS** **6**

Lasers: population of energy levels, Einstein's A and B coefficients derivation – Semiconductor lasers: homojunction and heterojunction – Industrial applications of laser. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – fibre optic sensors: pressure and displacement.

Unit IV **QUANTUM PHYSICS** **6**

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – 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.

Unit V **THERMAL PHYSICS** **6**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – applications: heat exchangers, ovens and solar water heaters.

REFERENCE(S):

- Halliday, D., Resnick, R. & Walker, J. —Principles of PhysicsII. Wiley, 2015
- Serway, R.A. & Jewett, J.W. —Physics for Scientists and EngineersII. Cengage Learning, 2010
- Tipler, P.A. & Mosca, G. - Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007

LIST OF EXPERIMENTS (Any Five)

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|---|
| <ol style="list-style-type: none">1. Determination of rigidity modulus – Torsion pendulum2. Determination of Young's modulus by non-uniform bending method3. Determination of Young's modulus by uniform bending method4. Determination of wavelength and particle size using Laser5. Determination of acceptance angle and numerical aperture in an optical fiber6. Determination of thermal conductivity of a bad conductor – Lee's Disc method7. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer8. Determination of wavelength of mercury spectrum – spectrometer grating9. Determination of band gap of a semiconductor10. Determination of thickness of a thin wire – Air wedge method |
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Department	B.E CIVIL ENGINEERING					R 2019	Semester	I
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19BS103	ENGINEERING CHEMISTRY	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

1. Understand the basic concepts of water characterization and treatment methods.
2. Know the fundamental concepts of electrochemistry and corrosion.
3. Understand the principles and generation of energy in batteries and nuclear reactors.
4. Gain knowledge on polymers.
5. Know the types of fuels and the manufacture of solid, liquid and gaseous fuels.

Course Outcomes: At the end of this course, learners will be able to:

1. Make the students conversant with water treatment techniques
2. Know the reaction involved in corrosion and corrosion protection methods
3. Impart knowledge on renewable energy sources like nuclear and to impart knowledge on energy storage devices
4. Aware the synthesis & industrial application of polymers
5. Impart knowledge on different types of fuels (solid liquid, gas, primary, secondary and synthetic) and combustion process.

Unit I	WATER CHEMISTRY	9
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Hardness of water – types – Estimation of hardness of water by EDTA method – Domestic water treatment-boiler troubles (scales, sludge, priming, foaming, caustic embrittlement) – Internal conditioning (carbonate, phosphate, sodium aluminate and calgon) .External treatment – Demineralization process – Reverse Osmosis.

Unit II	ELECTROCHEMISTRY AND CORROSION	9
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Electrochemical cell - redox reaction, electrode potential- Nernst equation (derivation and problems). Electro Chemical series-Standard hydrogen electrode-Calomel Electrode. Corrosion: chemical & electrochemical corrosion (galvanic, differential aeration) - types-factors influencing corrosion rate corrosion control - sacrificial anode and impressed current cathodic protection method.

Unit III	ENERGY SOURCES	9
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Introduction- nuclear energy- nuclear fission- nuclear fusion- nuclear chain reactions- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium ion battery. Fuel cell :H₂ -O₂ fuel cell.

Unit IV	POLYMER CHEMISTRY	9
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Monomers - polymers - polymerization - functionality - degree of polymerization - classification of polymers based on source and applications. Types of polymerization: addition, condensation and copolymerization. Preparation, properties and applications of thermosetting (epoxy resin and bakelite) and thermoplastics (poly vinyl chloride, poly tetrafluoroethylene and PMMA). Rubber: SBR. Compounding of plastics (blow moulding, injection, extrusion) .

Unit V	FUELS AND COMBUSTION	9
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Fuel: Introduction- classification of fuels- solid fuels-coal- proximate and ultimate analysis-manufacture of metallurgical coke (Otto Hoffmann method) – Liquid fuels: Refining of petroleum-synthetic petrol Fischer-Tropsch and Bergius processes- knocking- octane number- cetane number – Gaseous fuels: liquefied petroleum gases(LPG)- water gas- bio diesel. Combustion- flue gas analysis (ORSAT Method).

TEXT BOOK(S):	
1.	Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2019
2.	Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2019
REFERENCE(S):	
1.	Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2016
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2017.
3.	Gowariker V.R, Viswanatha. N.V, Jayadev Sreedhar- "Polymer Science", Publishing company New Age International Publishers, New Delhi, 2015.
4.	Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2017.
5.	Ashima Srivastava and Janhavi N N., "Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2015.

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Department	CIVIL ENGINEERING					R 2019	Semester I	BS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19HS101	COMMUNICATIVE ENGLISH	3	0	0	3	45	100	

Course Objective (s):

- To acquire basic English grammar.
- To develop listening skills to listen lectures and basic videos.
- To enhance the reading skill to comprehend technical writings.
- To improve writing skills to express thoughts freely.
- To develop speaking skills to speak fluently in real contexts.

Course Outcomes: At the end of this course, learners will be able to:

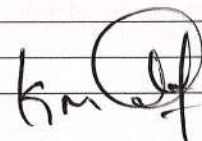
- Improve language usage in LSRW skills.
- Develop listening skills to comprehend general / technical talks.
- Acquire the ability to understand different written texts.
- Enhance the writing skills to express the ideas of the learners.
- Communicate fluently in real time context.

Unit I	LANGUAGE FOCUS	9
Parts of speech - Word formation - Sentence types (declarative, imperative, exclamatory & interrogative) - Tense forms - Subject - Verb agreement		
Unit II	LISTENING	9
Listening for specific information: Short conversations / monologues - Gap filling - Telephone conversations - Telephone etiquette - Note-taking - Listening for gist / interviews - Listening to songs and completing the lyrics - Clear individual sounds - Word stress		
Unit III	READING	9
Completing the sentences - Prediction - Skimming for gist - Scanning for specific information - Understanding text and sentence structure - Close reading		
Unit IV	WRITING	9
Paragraph writing (descriptive, narrative, expository & persuasive) - Letter (formal and informal) - Dialogue writing - E-mail - Instructions		
Unit V	SPEAKING	9
Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Mini-presentation - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes		
TEXT BOOK(S):		
1. Communicative English by KN Shoba , Lourdes Joavani Rayen Published by Cambridge university 2017.		
REFERENCE(S):		
1	Murphy, Raymond. English Grammar in Use – A Self-Study Reference and Practice Book For Intermediate learners Of English .Ived. United Kingdom: Cambridge University Press. 2012.	
2	Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.	
3	Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press 1992.	
4	Wren and Martin, High school English Grammar and Composition, Publisher: S.Chand. 2019.	



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Department	CIVIL ENGINEERING					R 2019	Semester I	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19ES102	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2	3	60	100	
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> Understand the basic concepts of electric circuits and magnetic circuits. Illustrate the construction and operation of various electrical machines and semiconductor devices. Learn the fundamentals of communication systems. 								
Course Outcomes: At the end of this course, learners will be able <ul style="list-style-type: none"> Apply the fundamental laws to electric circuits and compute the different alternating quantities Apply the laws of magnetism for the operation of DC motor. Examine the construction and working principle of different AC machines. Analyze the different speed control methods of DC motors and special machines Analyze the performance characteristics and application of semi-conductor devices 								
Unit I	ELECTRIC CIRCUITS						6	
Definition of Voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchoffs Law & its applications - Series and Parallel circuits - Voltage division and Current division techniques - Generation of alternating emf - RMS value, average value, peak factor and form factor-Definition of real, reactive and apparent power.								
Unit II	DC MACHINES						6	
Introduction of magnetic circuits-Law of electromagnetic induction, Fleming's Right and Left hand rule-types of induced EMF-Definitions of self and mutual inductance-DC Motor- Construction - Working Principle -Applications.								
Unit III	AC MACHINES						6	
Single Phase Transformer - Alternator - Three phase induction motor - Single phase induction motor - Construction - Working Principle - Applications.								
Unit IV	ELECTRICAL DRIVES						6	
Speed control of DC shunt motor and series motor-Armature voltage control-Flux control-Construction and operation of DC servo motor and stepper motor-								
Unit V	ELECTRONIC DEVICES AND COMMUNICATION						6	
Characteristics of PN Junction Diode and Zener Diode - Half wave and Full wave Rectifiers – Bipolar Junction Transistor – Operation of NPN and PNP transistors – Logic gates-Introduction to Communication Systems								
TEXTBOOKS(S):								
1.	T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.							
2.	Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd.,2010							
REFERENCE(S):								
1.	A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill, 2010							
SL. NO	LIST OF EXPERIMENTS							
1	Load test on DC Shunt motor							
2	Load test on DC Series motor							
3	Load test on single phase transformer							
4	Speed control of DC shunt motor							

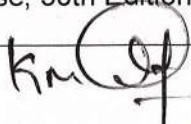


5	Load test on single phase Induction Motor.	
6	VI characteristics of Diodes	
7	Half and full wave rectifier with and without filter-observe the waveform using CRO	
SL. NO	NAME OF EQUIPMENT	NO OF QUANTITY
1	DC Shunt motor	2
2	DC Series motor	1
3	Single phase transformer	2
4	Single phase Induction motor	1
5	Ammeter AC & DC	20
6	Voltmeter AC & DC	20
7	Wattmeter LPF & UPF	4
8	Dual regulated Power Supply	4
9	CRO	4
10	AC Signal generator	4
11	Diode	As required

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Department	CIVIL ENGINEERING				R 2019	Semester I	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19ES106	ENGINEERING GRAPHICS	L	T	P	C	60	100
Course Objective(s): The purpose of learning this course is: <ul style="list-style-type: none"> To learn conventions and use of drawing tools in making engineering drawings. To draw orthographic projection of points and lines. To draw the projection of planes and simple solids. To draw the section of solids and obtain the development of surfaces of given solids. To draw the isometric projection of the given solids. 							
Course Outcome(s): At the end of this course, learners will be able to: <ul style="list-style-type: none"> Recognize the conventions and apply construct basic engineering curves. Draw the orthographic projection of points and lines. Draw the projection of planes and simple solids. Draw the section of solid drawings and development of surfaces of given solids. Draw the isometric projection of the given objects. 							
CONCEPTS AND CONVENTIONS (Not for Examination)							01
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.							
Unit I	PLANE CURVES						12
Basic Geometrical constructions, Curves used in engineering practice: Conics – Construction of ellipse, parabola and hyperbola by Eccentricity method – Construction of Cycloid – construction of Involute of triangle, square and circle – Drawing of tangents and normal to the above curves.							
Unit II	PROJECTION OF POINTS AND LINES						09
Orthographic projection – principles - Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projection) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.							
Unit III	PROJECTION OF PLANES & SOLIDS						14
Projection of planes (polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by Rotating Object method.							
Unit IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES						12
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the 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, cylinders and cones.							
Unit V	ISOMETRIC VIEW / PROJECTION & PERSPECTIVE PROJECTION						12
Principles of Isometric view – isometric scale – Isometric projections of simple solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions. Introduction to Perspective projection.							
TEXT BOOK(S):							
1.	Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.						
2.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Ltd, 2008.						
3.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.						
REFERENCE(S):							
1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.						


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2.	Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4.	N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2 nd Edition, 2009.

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Department	CIVIL ENGINEERING				R 2019	Semester I	E S
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19ES107	WORKSHOP PRACTICE	L	T	P	C	30	100

Course Objective(s): The purpose of learning this course is:

- To provide hands-on training in fabrication of components using carpentry, sheet metal and welding equipment / tools.
- To acquire the skill for making fitting joints and household pipe line connections using suitable tools.
- To develop the skill for preparing the green sand mould.
- To provide hands-on training in assembling and dismantling of petrol engines, gear boxes and pumps.
- To develop the skill for making wood/sheet metal models using suitable tools.

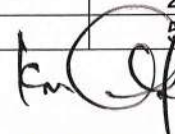
Course Outcome(s): At the end of this course, learners will be able to:

- Fabricate simple components using carpentry, sheet metal and welding equipment/tools.
- Make fitting joints and household pipe line connections using suitable tools.
- Prepare green sand mould.
- Assemble and dismantle petrol engines, gear boxes and pumps.
- Make simple models using wood and sheet metal.

Exp. No.	Name of the Experiments
1	Forming of simple object in sheet metal using suitable tools (Example: Dust bin / Tray)
2	Fabrication of a simple component using thin and thick plates. (Example: Book rack)
3	Hands-on-exercise: Wood work, joints by sawing, planing and cutting.
4	Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box)
5	Prepare a "V", Half-round or Square joint from the given mild steel flat plate.
6	Construct a household pipe line connections using pipes, Tee-joint, Four-way joint, elbow, union, bend, gateway and taps (or) Construct a pipe connection for domestic application (centrifugal pump) using pipes, bend, gate valve, flanges and foot valve.
7	Prepare a green sand mould using solid pattern/split pattern.
8	Dismantling and assembly of two-stroke and four-stroke petrol engine.
9	a) Preparation of butt joints, lap joints and T- joints by Electric Arc Welding. b) Gas Welding practice.
10	Mini-Project (Fabrication of small components).

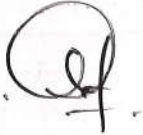
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	QUANTITY
1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings	15 sets
2.	Carpentry Vice (fitted to work bench)	15 Nos.
3.	Standard wood working tools	15 Sets.
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power Tools: (a) Rotary Hammer	2 Nos.
	(b) Circular Saw	2 Nos.
	(c) Planer	2 Nos.
	(d) Hand Drilling Machine	2 Nos.
	(e) Jigsaw	2 Nos.
6.	Arc welding transformer with cables and holders	5 Nos.



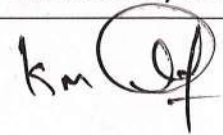
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7.	Welding booth with exhaust facility	2 Nos.
8.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
9.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfits	2 Nos.
10.	File Sets	2 Nos.
11.	Hearth furnace, anvil and smithy tools	2 Sets.
12.	Moulding table, foundry tools	2 Sets.
13.	Power Tool: Angle Grinder	2 Nos.
14.	Study-purpose items: Centrifugal pump, Air-conditioner	One each.
15.	2S & 4S IC Engines	One each.

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Department	CIVIL ENGINEERING				R 2019	Semester I	EEC
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19TPS01	SOFT SKILLS -I	1	0	0	1	30	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To develop basic grammar knowledge in English. To enhance Speaking Skills in English To improve Verbal and Non-verbal Communication Skills To develop Confidence and Emotional Intelligence To develop Inter Personal Skills. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Have competent knowledge of grammar Speak fluent English by enriching Vocabulary Knowledge. Have good Presentation Skills through verbal and non verbal communication. Handle any Situation with confidence by being emotionally stable. Work in a team by having team coherence and dealing with people. 							
UNIT 1 Effective English – Written English							6
Basic rules of Grammar - Parts of Speech – Tenses – Verbs.Sentence Construction.Dialogues and Conversations – Writing. Exercises to practice and improve these skills.							
UNIT 2 Effective English – Spoken English							6
Vocabulary – Idioms & Phrases – Synonyms – Antonyms.Dialogues and Conversations –Writing. Exercises to practice and improve these skills.							
UNIT 3 Art of Communication & The Hidden Data Involved							6
Verbal Communication - Effective Communication - Active listening –Paraphrasing – Feedback. Non Verbal Communication - Body Language of self and others. Importance of feelings in communication - dealing with feelings in communication.							
UNIT 4 World of Teams – Part -01							6
Self Enhancement - importance of developing assertive skills- developing self confidence – developing emotional intelligence.							
UNIT 5 World of Teams – Part -02							6
Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved Working with Groups – Dealing with People- Group Decision Making.							
TOTAL : 30(15 Theory + 15 Practical) Hours							


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REFERENCES:

1. The Seven Habits of Highly Effective People - Stephen R. Covey.
2. All the books in the "Chicken Soup for the Soul" series.
3. Man's search for meaning - Viktor Frankl
4. The greatest miracle in the world - Og Mandino
5. Goal - Eliyahu Goldratt.
6. Working with Emotional Intelligence - David Goleman.
7. Excel in English - Sundra Samuel, Samuel Publications
8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
9. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
10. Effective Presentation Skills (A Fifty-Minute Series Book) by Steve Mandel
11. "Strategic interviewing" by Richard Camp, Mary E. Vielhaber and Jack L. Simonetti - Published by Wiley India Pvt. Ltd
12. "Effective Group Discussion: Theory and Practice" by Gloria J. Galanes, Katherine Adams, John K. Brillhart

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Department	Common to ALL Branches				R 2019	Semester II	BS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19BS201	VECTOR CALCULUS AND COMPLEX VARIABLES	3	1	0	4	60	100

Course Objective (s): The purpose of learning this course is to

- Summarize problems related to fundamental principles of Vector Calculus
- Apply the methodologies involved in solving problems related to fundamental principles Vector Differentiation and Vector Integration.
- Implement the Complex Analysis, an elegant method in the study of heat flow, fluid dynamics and electrostatics.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.
- Defining a complex function and solving through complex integration

Course Outcomes: At the end of this course, learners will be able to:

- Characterize the calculus of vectors.
- Apply the theoretical aspects of vector integral calculus in their core areas.
- Recognize the differentiation properties of complex functions.
- Identify the complex functions and their mapping in certain complex planes.
- Use the concepts of integration to complex functions in certain regions.

Unit I	DIFFERENTIATION OF VECTORS	12
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Vector point function- Directional derivative - Gradient -Divergence -Curl - Solenoidal – Irrotational vector fields –Scalar potential

Unit II	INTEGRATION OF VECTORS	12
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Work done - Line Integral - Surface integral- Green's theorem in a plane- Stroke's Theorem- Gauss divergence theorem- Applications involving cubes and parallelepiped.

Unit III	ANALYTIC FUNCTIONS	12
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Analytic Functions- Necessary and Sufficient conditions of Analytic Function- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method -Applications to the problems of Potential Flow.

Unit IV	MAPPING OF COMPLEX FUNCTIONS	12
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Conformal mapping- Application of transformation: translation, rotation, magnification and inversion of multi valued functions - Linear fractional Transformation (Bilinear transformation).

Unit V	COMPLEX INTEGRATION	12
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Cauchy's Fundamental Theorem - Cauchy's Integral Formula - Taylor's and Laurent's series- Classification of Singularities - Cauchy's Residue Theorem

REFERENCE(S):

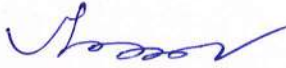
1	Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited, New Delhi 2015
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2.	C. Ray Wylie and C. Louis Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003
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3.	J. A. Brown and R. V. Churchill, Complex Variables and Applications , Sixth Edition, McGraw Hill, New Delhi, 1996
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4.	Peter V. O. Neil, Advanced Engineering Mathematics, Eighth Edition, Cengage Learning India Private Limited, 2018
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5.	Glyn James, Advanced Engineering Mathematics, Third Edition, Wiley India, 2007
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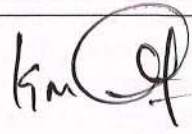
Department	CIVIL ENGINEERING				R-2019	Semester II	BS
Course Code	Course Name	Hours / Week			Credit C	Total Hours	Maximum Marks
		L	T	P			
19BS203	APPLICATIONS OF PHYSICS TO CIVIL ENGINEERS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To introduce the principles of thermal, acoustics, nanomaterials and new materials for civil engineering applications. 							
Course Outcomes: At the end of this course, learners will be able: <ul style="list-style-type: none"> To acquire knowledge on the acoustic properties of buildings, To have knowledge on the thermal performance of buildings, To get knowledge on basic concepts of nonmaterial's and its uses, To gain knowledge on the properties and performance of new engineering materials, and To understand the hazards of buildings. 							
Unit I	ACOUSTICS						9
Classification of sound- Weber-Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions - absorbing materials - noise							
Unit II	THERMAL PROPERTIES						9
Mode of heat transfer- Thermal conductivity-Thermal diffusivity- Heat transfer through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, thermal measurements, climate and design of solar radiation, shading devices - central heating. Principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners -Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C.Systems.							
Unit III	NANOMATERIALS						9
Introduction – synthesis-top down approach- bottom up approach- precipitation technique-hydrothermal method-Properties of nanomaterials-Applications of nanomaterials-Photocatalytic activity-role of metals and non metals in catalytic activity. Industrial waste treatment-metal removal from effluent							
Unit IV	NEW ENGINEERING MATERIALS						9
Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing -Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics							
Unit V	HAZARDS						9
Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.							
TEXT BOOK(S):							
1.	Alexander, D. "Natural disaster", Springer (1993)						
2.	Budinski, K.G. & Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.						


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3	Severns, W.H. & Fellows, J.R. "Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
4	Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.
REFERENCE(S):	
1.	Gaur R.K. and Gupta S.L., Engineering Physics. Dhanpat Rai publishers, 2012.
2.	Reiter, L. "Earthquake hazard analysis - Issues and insights", Columbia University Press, 1991.
3.	Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 1999.


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Department	CIVIL ENGINEERING					R 2019	Semester II	MC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19MC201	ENVIRONMENTAL SCIENCE AND ENGINEERING	3	0	0	0	45	100	
<p>Course Objective (s): The purpose of learning this course is to</p> <ol style="list-style-type: none"> 1. Study the nature and facts about environment. 2. Finding and implementing scientific, technological and economic solutions to environmental problems. 3. Know the types of natural resources and the individual role in conserving the resources. 4. Apply the knowledge to various social issues by understanding the environmental legislation laws. 5. Study the integrated themes and biodiversity, natural resources, pollution control and waste management. 								
<p>Course Outcomes: At the end of this course, learners will be able to:</p> <ol style="list-style-type: none"> 1. Extend their knowledge in maintaining ecological balance and make use of their knowledge in the preservation of biodiversity. 2. Outline the role of human being in maintaining a clean environment and useful environment for the future generations. 3. Explain the constituents of environment, precious resources in the environment and conservation of natural resources. 4. Find the role of government and Non-Government organization and explain the various rain water harvesting techniques. 5. Develop their awareness about population growth, Family planning programme and HIV/AIDS and extend their knowledge in role of information technology in environment & human health. 								
Unit I	ECOSYSTEMS AND BIODIVERSITY							10
<p>Environment: Scope – importance - need for public awareness -Concepts of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Food chains- food webs - types of ecosystem - structure and functions of forest ecosystem and river ecosystem – Biodiversity - value of biodiversity - consumptive use-productive use - social - ethical - aesthetic values - Hotspots of biodiversity - Threats to biodiversity - Habitat loss - poaching of wildlife and man wildlife conflicts. Conservation of biodiversity - In-situ and Ex-situ conservation.</p>								
Unit II	ENVIRONMENTAL POLLUTION							8
<p>Pollution: Causes - effects and control measures of Air pollution - Water pollution - Soil pollution and Noise pollution - Solid waste management - Causes - effects -control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster managements - Floods - cyclone- landslides.</p>								
Unit III	NATURAL RESOURCES							9
<p>Forest resource - Use-over exploitation -deforestation - Water resource - use-over utilization of surface and ground water - conflicts over water - Mineral resource - use-exploitation-environmental effects of extracting and using mineral resource - Food resources - world food problems changes caused by agriculture - Effects of modern agriculture - fertilizer- pesticide problems - Energy resource - Renewable energy sources - solar energy - wind energy. Land resources - land degradation - soil erosion - Role of an individual in conservation of natural resources.</p>								
Unit IV	SOCIAL ISSUES AND THE ENVIRONMENT							9

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Sustainable & Unsustainable development-Water conservation - rain water harvesting (roof top method)- climate change-global warming - acid rain - ozone layer depletion - Environment protection act - Air (Prevention and control of pollution) Act - Water (prevention and control of pollution) Act - Green Chemistry – 12 Principles of Green chemistry – Application of Green chemistry.

Unit V	HUMAN POPULATION AND THE ENVIRONMENT	9
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Population growth - variation among nations - Population explosion & its consequences – Family, child, women welfare programmes - Human rights - HIV/AIDS – Human health and environment - Role of information technology in environment and human health.

TEXT BOOK(S):

- | | |
|----|--|
| 1. | Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International Publishers, New Delhi (2015) |
| 2. | Dr. A.Ravikrishan, Environmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt. Ltd., Chennai, 12th Edition (2016) |

REFERENCE(S):

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|----|--|
| 1. | Masters, Gilbert M, —Introduction to Environmental Engineering and Sciencell, Second Edition, Pearson Education, New Delhi (2012). |
| 2. | Santosh Kumar Garg, Rajeshwari garg, smf Ranjni Garg —Ecological and Environmental Studiesl Khanna Publishers, Nai Sarak, Delhi (2014). |
| 3. | R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard", Vol. I and II, Enviro Media. |
| 4. | Dharmendra S. Sengar, "Environmental law", Prentice Hall of India PVT LTD, New Delhi, 2007. 4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2005 |
| 5. | Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2015. |

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Department	CIVIL ENGINEERING					R 2019	Semester II	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19ES201	PROBLEM SOLVING AND PYTHON PROGRAMMING	3	0	0	3	45	100	

Course Objective (s):

The purpose of learning this course is

- To understand problem solving techniques .
- To understand why Python is a useful scripting language for developers and to read and write simple Python programs.
- To develop Python programs with conditionals and loops
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python

Course Outcomes:

At the end of this course, learners will be able to

- Apply problems solving techniques to real world problems.
- Recognize and construct common programming idioms: variables, loop, branch, and input/output.
- Be able to design, code, and test Python programs using List, Tuples and Strings
- Able to write code using dictionaries and functions
- Able to read and write data from/to files in Python Programs.

Unit I	PROBLEM SOLVING TECHNIQUES	9
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Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems, Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Unit II	INTRODUCTION TO PYTHON	6
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History- Installation and Working with Python- Understanding Python variables - Python basic Operators - Declaring and using Numeric data types: int, float, complex-Using string data type and string operations- Methods

Unit III	FLOW CONTROL, LIST AND TUPLES	12
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Conditional blocks using if, else and elif - Simple for loops in python - For loop using ranges- Use of while loops in python - Loop manipulation using pass, continue, break and else- Programming using Python conditional and loops block Creating List - Accessing list - Operations on List - Working with lists - Function and Methods – Creating tuple - Tuple Operations – Functions and Methods

Unit IV	DICTIONARIES ,FUNCTIONS AND MODULES	9
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Creating Dictionaries - Accessing values in dictionaries - Working with dictionaries - Properties – Functions - Defining a function - Calling a function - Types of functions - Function Arguments - Anonymous functions - Global and local variables - Modules - Importing module - Math module - Random module - Packages - Composition.

Unit V	FILES AND EXCEPTION HANDLING	9
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Files - Opening and closing file- File Opening Modes - Reading and writing files - Functions. Exception Handling - Exception - Exception Handling - Except clause - Try , finally clause User Defined Exceptions

TEXT BOOK(S)

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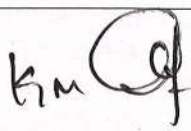
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1.	David Riley and Kenny Hunt, "Computational Thinking for the Modern Problem Solver", Chapman & Hall/CRC, 2014.
2.	M. Sprankle, "Problem Solving and Programming Concepts", 9 th Edition, Pearson Education, New Delhi, 2011.
REFERENCE(S)	
1.	Brian Heinold, "Introduction to Programming Using Python", Mount St. Mary's University, 2013.
2.	Michael Dawson, "Python Programming for the Absolute Beginner", 3 rd Edition, 2010.
3.	Allen Downey, Green Tea Press Needham, "Think Python, How to Think Like a Computer Scientist", Massachusetts.
4.	Cunningham, sams teach yourself python in 24 hours, Second edition Pearson, 2014



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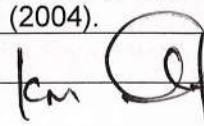
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Department	CIVIL ENGINEERING				R 2019	Semester II	HS
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19HX201	ENGLISH FOR ENGINEERS	3	0	0	3	45	100
Course Objective (s):							
<ul style="list-style-type: none"> To acquire the usage of grammar in English language. To develop listening skills which will enable to listen lectures and comprehend different types of texts. To enhance the reading skill to comprehend technical writings. To improve writing skills to express thoughts freely. To develop speaking skills to speak fluently in real contexts. 							
Course Outcomes: At the end of this course, learners will be able to:							
<ul style="list-style-type: none"> Improve their language usage in LSRW skills. Develop listening skills to understand sentence stress and intonations. Acquire the ability to understand different written texts. Enhance the writing skills to express the ideas of the learners. Communicate fluently in pair / team. 							
Unit I	LANGUAGE FOCUS						9
Voice(Active & Passive) - Reported speech - Conditionals - Collocations - Discourse markers - One word substitution - Phrasal verbs - Error identification							
Unit II	LISTENING						9
Listening for specific information – Identifying sentence stress - Rhythm - Intonation							
Unit III	READING						9
Reading graphs and charts - Skimming and scanning texts – Identifying topic sentences - Understanding the structure of a text							
Unit IV	WRITING						9
Job Application, Letter and Resume - Recommendations - Report writing (accident and survey) - Writing review (book and movie) - Transcoding (interpreting charts & diagrams)							
Unit V	SPEAKING						9
Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging - Language Functions: suggesting - comparing and contrasting - Expressing - finding out facts, attitudes and opinions							
TEXT BOOK(S):							
1.	Communicative English by KN Shoba ,Lourdes Joavani Rayen Published by Cambridge university Revised Edition 2018						
REFERENCE(S):							
1.	Jeremy Comfort, Pamela Rogerson, Trish Stott, and Derek Utley, Speaking Effectively and Developing Speaking Skills for Business English, Cambridge: Cambridge University Press, 2002.						
2.	Eric H. Glendinning and Beverly Holmstrom, Study Reading: A Course In Reading for Academic Purposes. United Kingdom: Cambridge University Press, 2004.						
3.	Murphy, Raymond. English Grammar in Use – A Self-Study Reference and Practice Book For Ir learners Of English .Ived. United Kingdom: Cambridge University Press. 2012.						
4.	Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.						


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Department	CIVIL ENGINEERING					R 2019	Semester II	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19ES209	MECHANICS FOR ENGINEERS	3	0	0	3	45	100	
Course Objectives: The purpose of learning this course is to: <ul style="list-style-type: none"> Familiarize basic concepts and force systems in real-world environment. Provide knowledge on statics of particles in space with moment & equilibrium of rigid bodies. Study the moment of inertia of surfaces and solids. Determine the solution for the problems related to kinematics of particles and forces associated with work, energy, impulse and momentum. Learn the concepts of static friction & geometric motion of rigid bodies. 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Illustrate the vectorial and scalar representation of forces and moments. Analyze the rigid body in equilibrium. Evaluate the properties of surfaces and solids. Calculate dynamic forces exerted in rigid body. Determine the friction and the effects by the laws of friction. 								
Unit I	STATICS OF PARTICLES						9	
Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.								
Unit II	EQUILIBRIUM OF RIGID BODIES						9	
Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force - Equilibrium of Rigid bodies in two dimensions.								
Unit III	PROPERTIES OF SURFACES AND SOLIDS						9	
Centroids and centre of mass – Centroids of areas - Rectangular, circular, triangular areas by integration – T- section, I-section, Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia of prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.								
Unit IV	DYNAMICS OF PARTICLES						9	
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work-Energy Equation– Impulse and Momentum – Impact of elastic bodies.								
Unit V	FRICTION AND RIGID BODY DYNAMICS						9	
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.								
TEXT BOOK(S)								
1.	Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).							
2.	Vela Murali, "Engineering Mechanics", Oxford University Press (2010)							



REFERENCE(S)	
1.	Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2.	Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11 th Edition, Pearson Education 2010.
3.	Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4 th Edition, Pearson Education 2006.
4.	Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5.	Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

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Department	CIVIL ENGINEERING				R 2019	Semester II	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19ES212	COMPUTER AIDED DRAWING PRACTICE	0	0	4	2	60	100

Course Objective (s): The purpose of learning this course is to

- Make the students learn the various elements of Residential / Institutional / Workshop buildings
- Impart fundamental knowledge on AutoCAD and to make the students draw truss structures, the plan, elevation and sectional view of a building.

Course Outcomes: At the end of this course, learners will be able to

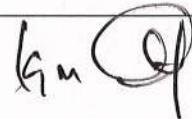
- Know the various components of different types of building.
- Acquire knowledge of minimum size of the various components of a building as per National Building Code of India.
- Draw a building plan for a given area.
- Prepare an elevation and sectional views of the given building code of India.

List of Experiments

1. Simple drawing using basic draw commands and coordinate system
2. Develop a model of a Brick wall using basic draw and modify commands
3. Plan of a single storied residential building
4. Elevation and cross section of a single storied residential building
5. Plan, elevation and cross section of an industrial building
6. Steel truss and its connection details

REFERENCE(S):

1. Donnie Gladfelter, Autocadd 2013 and Autocadd LT 2013, Autodesk official training guides, 2013
2. Ellen Finkelstein, Autocadd 2012 and Autocadd LT 2012 Bible, 2012.



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Department	CIVIL ENGINEERING				R 2019	Semester II	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19ES213	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	0	0	2	1	30	100

Course Objective (s):

The purpose of learning this course is

- To apply problem solving techniques
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

Course Outcomes:

At the end of this course, learners will be able to

- To write algorithm, pseudo code and draw flowchart
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

List of Experiments

- Write algorithms and pseudo code to solve real time problems
- Draw flow Chart
- Working in Python Interpreter
- Simple python programming using looping and conditional statements
- Programs to handle strings
- Programs using list, tuples and dictionaries
- Programs using functions
- Programs using modules and packages
- Program to handle files and exception handling
- Program to draw various charts

Platforms needed : Python 3 interpreter for Windows / Linux

TEXT BOOK(S)

1. David Riley and Kenny Hunt, "Computational Thinking for the Modern Problem Solver", Chapman & Hall/CRC, 2014.
2. M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education, New Delhi, 2011.

REFERENCE(S)

1. Brian Heinold, "Introduction to Programming Using Python", Mount St. Mary's University, 2013.
2. Michael Dawson, "Python Programming for the Absolute Beginner", 3rd Edition, 2010.
3. Allen Downey, Green Tea Press Needham, "Think Python, How to Think Like a Computer Scientist", Massachusetts.
4. Cunningham, sams teach yourself python in 24 hours, Second edition Pearson, 2014


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Department	CIVIL ENGINEERING				R 2019	Semester II	BS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19BS208	ENGINEERING CHEMISTRY LAB	L	T	P	C		
		0	0	4	2	60	100


Course Objective (s): The purpose of learning this course is to

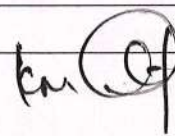
1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of chloride content of water sample by Argentometric method.
3. Estimation of iron content of the given solution using potentiometer.
4. Determination of strength of given hydrochloric acid using pH meter
5. Conductometric titration of strong acid vs strong base.

Course Outcomes: At the end of this course, learners will be able to


1. Make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis.
2. Acquire the knowledge about chloride content in water sample.
3. Make the student to acquire practical skills about strength of iron using potentiometric titrations.
4. Understand the how to estimate hydrochloric acid in water sample using pH meter.
5. Gain the knowledge about conductance of ions.

Exp No.	Name of Experiments (Any Ten)
1	Determination of Total, Temporary & Permanent hardness of water by EDTA method.
2	Determination of chloride content of water sample by Argentometric method.
3	Determination of Dissolved oxygen content in water sample using Winklers Method
4	Determination of Alkalinity in Water Sample
5	Determination of strength of given hydrochloric acid using pH meter.
6	Determination of strength of acids in a mixture of acids using conductivity meter.
7	Conductometric titration of Weak acid vs Weak base.
8	Estimation of iron content of the given solution using potentiometer.
9	Conductometric titration of strong acid vs strong base.
10	Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer
11	Estimation of iron content of the water sample using spectrophotometer
12	Estimation of Copper in Brass


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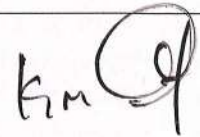
Department	CIVIL ENGINEERING				R 2019	Semester II	EE C
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19TPS02	SOFT SKILLS -II	1	0	0	1	30	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To train the Students on Group Discussion Do's and Don'ts. To coach the students on Interview Skills. To develop Presentation Skills. To develop Business Etiquette. To teach importance of Ethics and Values. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Participate Group Discussion with Confidence by knowing the tips and Tricks. Attend the interview with positive attitude by having Mock Interviews. Present them very well by enhancing their Presentation Skills. Behave very well in official gathering and Meeting by knowing Etiquette. Have good ethics and values in their Personal and Professional Life. 							
UNIT 1	GROUP DISCUSSION						6
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.							
UNIT 2	INTERVIEW SKILLS						6
Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback.							
UNIT 3	PRESENTATION SKILLS						6
Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback.							
UNIT 4	Business Etiquette						6
Grooming etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress.							
UNIT 5	Ethics						6
Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.							
TOTAL : 30(15 Theory +15 Practical)							
Hours							

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REFERENCES:

1. The Seven Habits of Highly Effective People - Stephen R. Covey.
2. All the books in the "Chicken Soup for the Soul" series.
3. Man's search for meaning – Viktor Frankl
4. The greatest miracle in the world – Og Mandino
5. Goal - Eliyahu Goldratt.
6. Working with Emotional Intelligence - David Goleman.
7. Excel in English – Sundra Samuel, Samuel Publications
8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
9. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
10. Effective Presentation Skills (A Fifty-Minute Series Book) by Steve Mandel
11. "Strategic interviewing" by Richard Camp, Mary E. Vielhaber and Jack L. Simonetti – Published by Wiley India Pvt. Ltd
12. "Effective Group Discussion: Theory and Practice" by Gloria J. Galanes, Katherine Adams , John, K. Brilhart



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Department	CIVIL ENGINEERING				R 2019	Semester III	BS
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19BS303	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS	3	1	0	4	60	100

Course Objective (s): The purpose of learning this course is to

- Understand the concepts of Fourier series, Transforms and Boundary Conditions, which will enable them to model and analyze the physical phenomena
- Understand the concepts of Laplace transforms involved in time and space domain.
- Implement the Fourier analysis, an elegant method in the study of heat flow, fluid mechanics and electromagnetic fields.
- Summarize and apply the mathematical aspects that contribute to the solution of one dimensional wave equation
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Course Outcomes: At the end of this course, learners will be able to:

- Recognize the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.
- Formulate a function in frequency domain whenever the function is defined in time domain.
- Apply the Fourier transform, which converts the time function into a sum of sine waves of different frequencies, each of which represents a frequency component.
- Classify a partial differential equation and able to solve them.
- Apply and solve the engineering problems in the area of heat, wave equations.

Unit I | **FOURIER SERIES** | 12

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range cosine and sine series - Root mean square value

Unit II | **LAPLACE TRANSFORM** | 12

Laplace Transform- Existence Condition - Transforms of Standard Functions - Unit step function, Unit impulse function- Properties- Transforms of Derivatives and Integrals - Initial and Final Value Theorems - Laplace transform of Periodic Functions - Inverse Laplace transforms.

Unit III | **FOURIER TRANSFORM** | 12

Fourier Integral Theorem- Fourier Transform and Inverse Fourier Transform- Sine and Cosine Transforms - Properties - Transforms of Simple Functions - Convolution Theorem - Parseval's Identity

Unit IV | **PARTIAL DIFFERENTIAL EQUATIONS** | 12

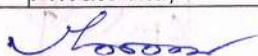
Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous types

Unit V | **APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS** | 12

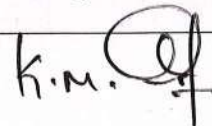
Classification of Second Order Quasi Linear Partial Differential Equations - Fourier Series Solutions of One Dimensional Wave Equation - One Dimensional Heat Equation - Steady State Solution of Two-Dimensional Heat Equation - Fourier Series Solutions in Cartesian Coordinates

REFERENCE(S):

1. C. Ray Wylie and C. Louis Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, Inc, Singapore, 2008.
3. Peter V. O. Neil, Advanced Engineering Mathematics, Seventh Edition, Cengage Learning India Private Ltd,.



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Department	CIVIL ENGINEERING					R 2019	Semester III	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE301	MECHANICS OF SOLIDS	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

- Develop the understanding on the state of stresses and strains in engineering components as a result of different loading conditions
- Provide the principles and equations, and necessary tools to analyze structural members under axial loads, bending, shear, and torsion.

Course Outcomes: At the end of this course, learners will be able to:

- Determine the stresses and strains in the members subjected to axial loads
- Determine the principal stresses and strains in structural members
- Determine the stresses and strains in the members subjected to loads in various types of beams
- Determine the bending stress and strain energy due to bending moment.
- Determine the stresses in shaft due to torsion loads.

Unit I STRESSES AND STRAINS **10**

Stress at a point - Types of stress - Strain at a point - Types of strain - Elastic limit - Hooke's law - Modulus of elasticity - Stress-Strain diagram - Stresses in composite bars - Thermal stresses - Poisson's ratio Rigidity modulus - Bulk modulus - Relation between elastic constants - Strain energy due to axial force - Stresses and strain energy due to suddenly applied load and impact load

Unit II TWO DIMENSIONAL STATE OF STRESS **8**

Two dimensional state of stress at a point -Normal and shear stresses on any plane -Principal planes and principal stresses -Maximum shear stress -Analytical methods and Mohr's circle method -Two dimensional state of strains at a point-Principal strains and their directions. Thin Cylinder: Stresses and deformations in thin walled cylinders and spherical shells due to internal pressure

Unit III BEAMS AND BENDING **9**

Types of beams -Types of supports -Shear force and bending moment in beams -Sketching of shear force and bending moment diagrams for cantilever, simply supported and over hanging beams for any type of loading - Relationship between rate of loading, shear force and bending moment

Unit IV STRESSES IN BEAMS **10**

Theory of simple bending -Assumptions Analysis for bending stresses -Load carrying capacity of beams - Proportioning sections -Flitched beams - Leaf springs -Strain energy due to bending moment - Shear stress distribution - Strain energy due to pure shear

Unit V TORSION OF CIRCULAR SHAFTS AND SPRINGS **8**

Derivation of torsion equation -Assumptions -Theory of torsion -Stresses in solid and hollow circular shafts -Power transmitted by the shaft -Stepped shafts - Composite shafts- Strain energy due to torsion-Deformations and stresses in closed and open coiled helical springs - Stress due to combined bending and torsion

FOR FURTHER READING

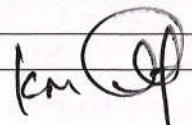
Determination of principal stresses at any point in a beam - Strain rosettes

TEXT BOOK(S):

1. S. Rajput, Strength of Materials, S. Chand & Co., 2014.
2. R. K. Bansal, A Textbook of Strength of Materials, Laxmi Publications, 6th Edition 2015.
3. S. M. A. Kazimi, Solid Mechanics, Tata McGraw Hill Book Co Ltd., 2001.


REFERENCE(S):

1. P. Boresi, Richard J. Schmidt, Advanced Mechanics of Materials, 6th Edition, 2002.


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2. B. S. Basavarajaiah and P. Mahadevappa, Strength of Materials, CBS Publishers & Distributors Pvt. Ltd., 2014.

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Department	CIVIL ENGINEERING				R 2019	Semester III	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19ES309	FLUID MECHANICS AND MACHINERIES	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is to

- Enhance the students' knowledge on fluid statics, kinematics and dynamics
- Impart knowledge on the analysis and design of water turbines and pumps

Course Outcomes: At the end of this course, learners will be able to:

- Identify the fluid- classifications, properties and their units of measurement
- Analyze the various types of flows and pressure
- Analyze the flows in circular pipes and losses in pipes
- Handle various pressure measuring instruments in the field
- Analyze the performance of turbines under different operating conditions
- Design and analyzes the efficiency of pumps

Unit I FLUID PROPERTIES AND FLUID STATICS 9

Dimensions and units -Fluid properties - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension Fluid statics- Hydrostatic law- Pascal's law - Atmospheric, absolute, gauge and vacuum pressures - Measurement of pressure by various types of manometers - Buoyancy and meta-centre.

Unit II FLUID KINEMATICS AND DYNAMICS 9

Fluid kinematics :Classification of fluid flow - Stream line, streak line and path line - Convective and local acceleration - Continuity equation for one, two and three dimensional flows - Stream function and velocity potential function . Fluid dynamics : Pressure, kinetic and datum energy - Euler's equations of motion - Bernoulli's theorem and proof - Application of Bernoulli's equation - Pitot tube - Orifice meter, Venturimeter.

Unit III FLOW THROUGH PIPES 9

Development of laminar and turbulent flows in circular pipes-Laminar flow through circular tubes (Hagen Poiseuille's Equation) - Darcy-Weisbach equation for flow through circular pipe - Major and minor losses of flow in pipes- Pipes in series - Equivalent pipe- Pipes in parallel

Unit IV TURBINES 9

Application of momentum principle - Impact of jets on plane and curved plates - Turbines - Radial flow turbines - Axial flow turbines - Impulse and reaction turbines - Specific speed and characteristic curves.

Unit V PUMPS 9

Centrifugal pumps - Multistage pumps - Minimum speed to start the pump - Specific speed and characteristic curves - Reciprocating pumps - Negative slip - Indicator diagram - Functions of air vessels

FOR FURTHER READING

Methods of dimensional analysis - Rayleigh's method - Buckingham's - theorem - Hydraulic similitude - Model analysis - Types of models.

TEXT BOOK(S):

1. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, 2005.
2. R. K. Rajput, A Text Book of Fluid Mechanics, S. Chand & Co., New Delhi, 2006.
3. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, Delhi, 2010.

REFERENCE(S):

1. V. L. Streeter and B. E. Wylie, Fluid Mechanics, McGraw Hill International Book Co., 2006.
2. Yunus A. Cengel and John M. Cimbala, Fluid Mechanics - Fundamentals and Applications (In SI Units), McGraw Hill International Book Co., 2004.


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Department	CIVIL ENGINEERING					R 2019	Semester III	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE302	SURVEYING	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

- Impart knowledge on the basic principles of field surveying procedures
- Impart a clear understanding on the working principles and use of theodolite

Course Outcomes: At the end of this course, learners will be able to:

- Demonstrate the various functional aspects of surveying instruments
- Acquire knowledge in surveying by compass and plane table in the field.
- Determine the leveling, contouring, longitudinal and cross section
- Perform a highway road alignment project.
- Calculate the area and volume of earthwork

Unit I	INTRODUCTION AND CHAIN SURVEYING	9
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Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.

Unit II	COMPASS SURVEYING AND PLANE TABLE SURVEYING	9
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Prismatic compass - Bearing - Systems and conversions - Local attraction - True and magnetic meridians - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors by graphical and analytical methods - Plane table instruments and accessories - Methods: Radiation, Intersection, Resection and Traversing - Three and two point problems.

Unit III	LEVELLING	9
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Level line - Horizontal line - Spirit level - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Effect of curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics of contours - Plotting - Earthwork volume - Capacity of reservoirs - Block contouring

Unit IV	THEODOLITE SURVEYING	9
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Theodolite - Vernier and microptic - Temporary and permanent adjustments of vernier transit - Horizontal angles and their measurement - Vertical angles and their measurement - Heights and distances - Traversing - Closing error and distribution - Gales tables.

Unit V	TACHEOMETRIC SURVEYING	9
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Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Fixed hair method - Horizontal and inclined sights - Determination of Stadia constants of the tacheometer - Anallactic lens - Tangential system - Subtense measurements - Subtense bar - Direct reading tachometry.

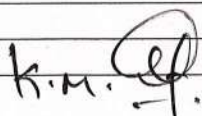
FOR FURTHER READING

Field and office work - Conventional signs Surveyor's compass - Merits and demerits of plane table surveying Levels and Staves - Sensitiveness - Bench marks - Uses of contours - Microptic Description and uses of theodolite - Omitted measurements - Radial contouring Principles, instruments required - Vertical and normal staffing - Fixed and movable hairs

TEXT BOOK(S):


1. K. R. Arora, Surveying, Vol. I, Standard Book House, 15th Edition 2015.
2. N.N. Basak, Surveying, Tata McGraw Hill, 2007.

REFERENCE(S):


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1.	T. P. Kanetkar, Surveying and Levelling, Vol. I & II, United Book Corporation, 2002.
2.	B. C. Punmia, Er. Ashok Kr. Jain, Dr. Arun Kumar Jain Surveying, Vol. I & II, Laxmi Publications, New Delhi, Seventeenth Edition, 2016.

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Department	CIVIL ENGINEERING				R 2019	Semester III	E S
Course Code	Course Name	Hours / Week			Credit C	Total Hours	Maximum Marks
		L	T	P			
19ES301	APPLIED GEOLOGY	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> • Provide basic knowledge on earth sciences and their applications in civil engineering. • Provide essential knowledge on classification of rocks and their uses in civil engineering constructions. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> • Acquire knowledge in structure and weathering of earth. • Understand the structure and mineral properties • Understand the formation of rocks and its properties. • Understand the failure of rocks • Analyze the rocks for the construction of tunnels, dams and road cuttings. 							
Unit I	GENERAL GEOLOGY						9
Introduction to geological time scale and stratigraphy, Laws of stratigraphy. Geology in civil engineering - Branches of geology - Earth Structures and composition- Elementary knowledge on continental drift and plate technologies. Weathering - Work of rivers - Wind and their engineering importance - Earthquake belts in India -Groundwater: Mode of occurrence- Prospecting - Importance in civil engineering.							
Unit II	MINERALOGY						8
Elementary knowledge on symmetry elements of important crystallographic systems -Physical properties of minerals - Study of the rock forming minerals - Quartz family - Felspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, behaviour and engineering significance of clay minerals - Fundamentals of process of formation of ore.							
Unit III	PETROLOGY AND ROCK MECHANICS						10
Rocks - Introduction - Rock cycle - Physical description of rock types - Igneous rocks - Granite - Syenite and Basalt - Sedimentary rocks - Conglomerate - Sandstone - Shale and Limestone - Metamorphic rocks - Schist - Gneiss - Quartzite and marble -Rock mechanics - Introduction - Study of rock properties - Porosity - Permeability - Moisture content-Swelling - Durability.							
Unit IV	STRUCTURAL GEOLOGY AND GEOPHYSICAL INVESTIGATIONS						9
Introduction to primary and secondary geological structures. - Introduction to geological maps -Folds - Faults and joints -Their bearing on engineering construction - Seismic and electrical methods for civil engineering investigations.							
Unit V	GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING						9
Remote sensing techniques - Study of aerial photos and satellite images - Interpretation for Civil Engineering projects - Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Landslides - Causes and preventions - Sea erosion and coastal protection							
FOR FURTHER READING							
Stress and strain in rocks. Evaluation for suitability of site, Geo Engineering classification, Duncan's classification.							
TEXT BOOK(S):							
1. Parbin Singh, Engineering and General Geology, Katson Publication House, 2014							
2. Prakash Jadhav and Raviraj Sorate, Engineering geology, Nirali Prakashan, 2015							
3. A.Parthasarathy, V.Panchapakesan and R. Nagarajan, Engineering geology, Willey India Pvt. Ltd, 2013.							
REFERENCE(S):							

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1.	Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
2.	Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988

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Department	CIVIL ENGINEERING				R 2019	Semester III	P C
Course Code	Course Name	Hour/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CE304	CONSTRUCTION MATERIALS AND PRACTICES	2	0	2	3	60	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Gain knowledge about the properties and uses of various materials for constructions Recognize the necessity for composite materials like concrete, RCC Understand the need for Construction equipments in site 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Understand the composition and manufacturing of building materials Illustrate the operation and uses of various construction equipments Identify different types of bonding in masonry Know the application of various types of metals, plastics, rubber and other building materials. 							
Unit I	STONE - BRICKS - LIME						6
Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks - Lime – Preparation of lime mortar							
Unit II	CEMENT – AGGREGATES – WATER						6
Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement – Hydration – Compressive strength – Fineness– Soundness and consistency – Setting time – Fine aggregate-Bulking of sand - Sieve analysis-Fineness modulus- interpretation of grading charts - Coarse aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – IS specifications - Grading - Quality of water for mixing and curing							
Unit III	ALLOY, RUBBER AND PLASTICS						6
Ferrous Metals: Introduction - Manufacturing Process - Iron - Pig iron - Cast Iron - Wrought Iron - Alloy Steel. Non Ferrous Metals: Introduction- Manufacturing Process - Aluminum- Copper - Zinc - Lead - Tin - Nickel. Properties of Tar steel, Stainless steel, Structural steel. Ceramic Materials: Introduction & Classification - Refractories - Glass - Mechanical, Thermal & Electrical Properties. Polymeric Materials: Rubbers - Plastics - Constituents - Properties - Applications.							
Unit IV	TIMBER AND OTHER MATERIALS						6
Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates – Aluminum and Other Metallic Materials – Composition – Aluminum composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.							
Unit V	CONSTRUCTION EQUIPMENTS						6
Selection of equipment for earth work - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers - Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling							
FOR FURTHER READING							
Ferro cement, super plasticizers, FAL - G brick, plastics, and geotextiles. Fibre reinforced plastic in sandwich panels, modeling.							
CONSTRUCTION MATERIALS PRACTICES							30

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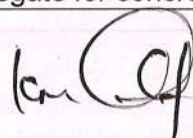
I. TEST ON FINE AGGREGATES	10
1. Grading of fine aggregates	
2. Test for specific gravity and test for bulk density	
3. Compacted and loose bulk density of fine aggregate	
II. TEST ON COARSE AGGREGATE	10
1. Determination of impact value of coarse aggregate	
2. Determination of elongation index	
3. Determination of flakiness index	
4. Determination of aggregate crushing value of coarse aggregate	
III. TEST ON CONCRETE	10
1. Test for Slump	
2. Test for Compaction factor	
3. Test for Compressive strength	

TEXT BOOK(S):

1. Dr.S.Christian Johnson, Construction Materials, Chese Publication,2017
2. P. C. Varghese, Building Materials, PHI Learning Private Limited, New Delhi, 2010.
3. S. P. Arora and S. P. Bindra, Textbook of Building Construction, Dhanpat Rai Publications (P) Ltd., 2003.

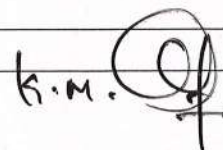
REFERENCE(S):

1. Shetty .M.S., "Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi, 2006.
2. Neville. A.M., "Properties of Concrete", 4th Edition Longman,1995.
3. Construction Materials Laboratory Manual, Anna University, Chennai-600 025.
4. IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by dry sieving
5. IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete



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Department	CIVIL ENGINEERING					R 2019	Semester III	MC
Course Code	Course Name	Hours /Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19MC301	INDIAN CONSTITUTION	2	0	0	0	30	100	
<p>Course Objective (s): The purpose of learning this course is</p> <ul style="list-style-type: none"> To Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution. 								
<p>Course Outcomes: At the end of this course, learners will be able to:</p> <ul style="list-style-type: none"> Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. Discuss the passage of the Hindu Code Bill of 1956. 								
Unit I	HISTORY OF MAKING OF INDIAN CONSTITUTION						5	
History of Indian Constitution - Drafting Committee, (Composition & Working)								
Unit II	PHILOSOPHY OF THE INDIAN CONSTITUTION						5	
Preamble - Salient Features								
Unit III	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES						5	
Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation -Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.								
Unit IV	ORGANS OF GOVERNANCE						5	
Parliament - Composition - Qualifications and Disqualifications - Powers and Functions Executive - President - Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.								
Unit V	LOCAL ADMINISTRATION						5	
District's Administration head: Role and Importance, - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZilaPachayat - Elected officials and their roles, CEO ZilaPachayat: Position and role- Block level: Organizational Hierarchy (Different departments) -Village level: Role of Elected and Appointed officials - Importance of grass root democracy.								
Unit VI	ELECTION COMMISSION						5	
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women								
TEXT BOOK(S):								
1. "The Constitution of India", 1950 (Bare Act), Government Publication								


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2. Dr. S. N. Busi, "Dr. B. R. Ambedkar Framing of Indian Constitution", 1st Edition, 2016. Ava Publishers
3. M. P. Jain, "Indian Constitution Law", 7th Edn., Lexis Nexis, 2014.
REFERENCE (s)
1. D.D. Basu , Introduction to the Constitution of India, Lexis Nexis, 2015.



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Department	CIVIL ENGINEERING				R 2019	Semester III	P C
Course Code	Course Name	Hours / Week		Credit	Total Hours	Maximum Marks	
19CE304	SURVEYING PRACTICAL	L	T	P			C
		0	0	4	2	60	100

Course Objective (s): The purpose of learning this course is to

- Impart knowledge on the basic principles of field surveying procedures
- Impart a clear understanding on the working principles and use of theodolite

Course Outcomes: At the end of this course, learners will be able to:

- Demonstrate the various functional aspects of surveying instruments
- Prepare topographic map including contours of any site
- Perform a highway road alignment project.
- Calculate the area and volume of earthwork

Exp No.	Name of Experiments
1	Chain surveying: Aligning, Ranging and Chaining
2	Plane table surveying: Radiation, Intersection, Traversing
3	Plane table surveying: Resection. Two and Three point problems
4	Fly levelling using Dumpy and Tilting level
5	Check levelling using dumpy level
6	Longitudinal and cross section levelling
7	Repetition and Reiteration
8	Heights and distances - Single plane method.
9	Tacheometric Constants
10	Subtense bar system to calculate distance

Equipments		No of Equipments
1	Total Station	02
2	Theodolites	05
3	Dumpy level / Filling level	10
4	Pocket stereoscope	01
5	Ranging rods	10
6	Levelling staff	10
7	Chain	05
8	Tape	05
9	Cross staff	10
10	Arrow	10
11	Prismatic compass	05
12	Surveyor compass	05
13	Survey grade or Hand held GPS	02

TEXT BOOK(S):


1. B. C. Punmia, Surveying, Vol. I & II, Laxmi Publications, New Delhi, 2005.
2. K. R. Arora, Surveying, Vol. I, Standard Book House, 2008.

REFERENCE(S):

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1.	T. P. Kanetkar, Surveying and Levelling, Vol. I & II, United Book Corporation, 2002.
2.	T. P. Kanetkar, Surveying and Levelling, Vol. I & II, United Book Corporation, 2002.
3.	N.N. Basak, Surveying, Tata McGraw Hill, 2007.

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Department	ENGLISH				R 2019	Semester III	HS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19HS301	COMMUNICATION SKILLS	0	0	4	2	30	100

Course Objective (s): The purpose of learning this course is

- To involve the students in effective listening activities.
- To improve the oral communication skills in proper manner.
- To focus the effective reading of general and technical text.
- To enhance and comprehend the written text.
- To integrate LSRW skills.

Course Outcomes: At the end of this course, learners will be able to:

- Understand the technical talks.
- Communicate to his peer group properly.
- Comprehend the general and technical text.
- Write the reports and job application in clear manner.
- Integrate LSRW skills.

Unit I LISTENING 6

Listening and its importance –Listening strategies - Listen to a process information - give information, as part of a simple explanation - Being an active listener: giving verbal and non-verbal feedback - taking lecture notes

Unit II SPEAKING 6

Give personal information - ask for personal information - express ability - ask for clarification - pronunciation basics - pronunciation practice - conversation starters: Pep talk - stressing syllables and speaking clearly - summarizing academic readings and lectures

Unit III READING 6

Strategies for effective reading - Read and recognize different types of texts - Predicting content using photos and title - Read for details - Use of graphic organizers to review and aid comprehension - Understanding pronoun reference and use of connectors in a passage- speed reading techniques

Unit IV WRITING 6

Plan before writing - Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph – Write a paragraph with reasons and examples - Write an opinion paragraph – E-mail writing - Types of essays- descriptive-narrative- issue-based-argumentative- analytical

Unit V INTEGRATION OF LSRW 6

Task based Instruction : watching a video –Listing, Sorting, ordering, comparing and analyzing the ideas – Reading a newspaper and creating topic based videos

TEXT BOOK(S):

- Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
- Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011
- Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010


REFERENCE(S):

- Davis, Jason and Rhonda Llss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.


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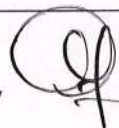

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2.	E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan:
3.	Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press 1992.

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Department	CIVIL ENGINEERING					R 2019	Semester III	EEC
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19TPS03	QUANTITATIVE APTITUDE AND LOGICAL REASONING - I	2	0	0	0	30	100	
Course Objective (s): <ul style="list-style-type: none"> To crack aptitude assessment by using speed math concepts. To solve problems using fast track method by learning simplification and numbers. To learn the basic of ratio and proportion and mixture concepts. To calculate different ways of solving problems on average and ages. To learn the logical skills by analyzing the objects. 								
Course Outcomes: At the end of this course, learners will be able to: <ol style="list-style-type: none"> Solve the question with speed and accuracy. Crack the quantitative aptitude questions by using simplification and numbers system. Solve most of the aptitude topics by knowing ratio and proportion topics with allegation. Solve the problems on average and ages by using logical way of approach. Develop their logical thinking. 								
UNIT 1	SPEED MATHS AND NUMBER SYSTEMS						6	
SPEED MATHS: Square and square roots – Square for numbers from 31 to 50. Finding squares of numbers between 81 to 100. Cubes and cubes roots. NUMBER SYSTEMS: Numbers and types of Numbers – Properties of Numbers –Face value and place value - Divisibility rules – Concept on unit digit and remainder theorem.								
UNIT 2	SIMPLIFICATIONS & PROBLEMS ON NUMBERS						6	
SIMPLIFICATIONS: BODMAS rule – Application of algebraic formulae –Simplification of decimal fraction & mixed fraction – Continued fraction and its simplification – Recurring decimals. PROBLEMS ON NUMBERS: Set of numbers – Assume the unknown numbers and form equations								
UNIT 3	RATIO & PROPORTION ,ALLIGATIONS & MIXTURE						6	
RATIO AND PROPORTION: Ratio between two or more persons – Miscellaneous problems. ALLIGATIONS ANS MIXTURES: Definition – Allegation rule – Mean value (or cost price) of the mixture – Six golden rules to solve problems on mixture – Removal among the quantities more than two.								
UNIT 4	AVERAGES & PROBLEM ON AGES						6	
AVERAGES: Average from total –Total from the average – Miscellaneous problems. PROBLEMS ON AGES: Ages - Persons in Past - Present - Future. Miscellaneous problem.								
UNIT 5	ANALOGY & MIRROR & WATER IMAGES						6	
ANALOGY: Study and topic relationship – Worker and tool relationship – Tool and action relationship – Work and working place – Worker and product – Product and raw materials – Instrument and measurement – Quantity and unit – Animals and young ones – Male and female. MIRROR IMAGES AND WATER IMAGES: Letter inverted – Object inverted.								
TOTAL : 30 HOURS								

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REFERENCES:

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
3. R.V.Praveen, "Quantitative Aptitude and Reasoning" Third Edition, PHI Learning ,2016.
4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
5. Arun Sharma "How to Prepare for Quantitative Aptitude" Eight Edition, McGraw Hill Education, 2018.
6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

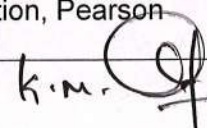
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Department	CIVIL ENGINEERING				R 2019	Semester IV	BS
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19BS402	NUMERICAL METHODS	3	1	0	4	60	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Acquire the knowledge of finding approximate solutions of algebraic, linear and non linear equations, differentiation and integration by numerical methods and interpolating the values of a function. Able to interpolate and predict a data Able to analyse differentiation and integration numerically Ability to find solution of initial and boundary value problems using single and multi-step approximations. Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Classify the equations into Algebraic, Transcendental or simultaneous and apply the techniques to solve them numerically. Demonstrate and implement an appropriate numerical method for interpolation. Apply numerical computational techniques to obtain the differentiation and Integration of functions. Obtain the solutions of first order ordinary differential equations, numerically. Classify the partial differential equations and able to get the solutions of those equations using numerical methods. 							
Unit I	SOLUTION OF SYSTEM OF EQUATIONS						12
Newton Raphson method- Method of False Position – Graffes root square method – Crou'ts Method – Gauss Jordan, Gauss Seidal method.							
Unit II	INTERPOLATION						12
Interpolation: Newton's forward and backward difference formulae, Lagrange's and Newton's divided difference interpolation formulae							
Unit III	NUMERICAL DIFFERENTIATION AND INTEGRATION						12
Numerical differentiation: Newton's forward and backward difference formulae, Numerical Integration: Trapezoidal, Simpson's 1/3 rule – Two point Gaussian quadrature formula – Three point Gaussian quadrature formula							
Unit IV	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION						12
Initial value Problem: Single step methods: Taylor's series method, Euler's method and Fourth order Runge - Kutta method for solving first order equations - Multi step methods: Milne's - Adams – Bashforth predictor and corrector methods for solving first order equations.							
Unit V	NUMERICAL TECHNIQUES FOR THE SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS						12
Finite difference solution of parabolic equation by Crank-Nicholson method-Solution of elliptic equations of simple harmonic motions and its solutions numerically.							
REFERENCE(S):							
1. Steven Chapra, Numerical Methods for Engineers, Tata McGraw Hill seventh Edition, 2015.							
2. Burden R. L and Douglas Faires J, Numerical Analysis Theory and Applications, Cengage Learning, Ninth Edition, 2005.							
3. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Seventh Edition, Pearson Education, New Delhi, 2006.							




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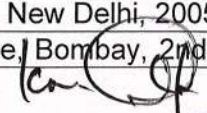
Department	CIVIL ENGINEERING					R 2019	Semester IV	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE401	STRENGTH OF MATERIALS	3	1	0	4	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Impart knowledge on deflection of statically determinate beams and ideal and real columns Determine the stresses due to unsymmetrical bending and understand various theories of failures Analyze the deflection in statically determinate beams and calculate buckling load in columns and determine the stresses in curved beams and thick walled cylinders 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Analyse stresses and deflection of beams experiencing a combination of internal transverse shear and bending moment. Identify the buckling and stability of columns subjected to axial loads. Figure out the stress distribution in simple structural elements such as thick walled cylinders under external load, axial load, bending moment and shear force. Estimate the stresses due to unsymmetrical bending and calculate the shear centre. Interpret the behaviour and quantification method of stress and strain in structural members under various theories for failure of materials 								
Unit I	DEFLECTION OF STATICALLY DETERMINATE BEAMS						9	
Governing differential equation - Macaulay's method - Moment area method - Conjugate beam method - Strain energy method.								
Unit II	COLUMNS AND STRUTS						9	
Columns - Slenderness ratio - Calculation of stresses in short columns due to axial load and uni-axial and biaxial bending moments - Core of the section - Buckling load of long columns - Euler's theory - Different end conditions - Rankine's formula - Straight line formula								
Unit III	THICK WALLED CYLINDERS AND CURVED BEAMS						9	
Thick walled cylinders - Lamé's equations - Hoop stress and radial stress distribution - Compound cylinders - shrink fit. Curved beams - Stresses due to bending by Winkler Bach theory - Rectangular, trapezoidal, circular solid sections - Crane Hook Problems								
Unit IV	SHEAR CENTRE AND UNSYMMETRICAL BENDING						9	
Shear flow in thin walled beam cross section - Shear centre of mono/symmetric open sections - Hollow thin walled torsion members - Single and multi connected sections - Symmetrical and unsymmetrical bending - Bending stresses in beams subjected to unsymmetrical bending								
Unit V	THEORIES OF ELASTIC FAILURE						9	
Types of Failure: Brittle and ductile - Maximum principal stress theory - Maximum Principal strain theory - Maximum strain energy theory - Maximum shear stress theory - Mohr's theory - simple problems								
FOR FURTHER READING								
Stresses in Chain Links and Proving Ring, Octahedral Shear Stress Theory, Change in direction of neutral axis and simple problems in unsymmetrical bending- Newmark's method of analysis of statically indeterminate beams								
TEXT BOOK(S):								
1. S. Rajput, Strength of Materials, S. Chand & Co., 2006.								
2. R. K. Bansal, A Textbook of Strength of Materials, Laxmi Publications, 2010.								
REFERENCE(S):								
1. D. S. Bedi, Strength of Materials, S. Chand & Co. Ltd., 2012.								
2. C. Punmia, Strength of Materials, Laxmi Publications, 2002.								
3. K.M.Gopalakrishnan, Strength of Materials II, Thakur Publication Pvt. Ltd., 2019								

Exp No.	Name of Experiments
1.	Tension test on mild steel rod
2.	Torsion test on mild steel rod
3.	Compression test on brick and wood
4.	Tests on open coiled helical springs
5.	Tests on closed coiled helical springs
6.	Izod and Charpy impact tests
7.	Determination of Rockwell and Brinell Hardness Number
8.	Shear test on mild steel rod
9.	Static bending test on metal beam
10.	Demonstration on the variation of shear force in a beam
11.	Demonstration on thin cylinders
TEXT BOOK(S):	
1.	S. Rajput, Strength of Materials, S. Chand & Co., 2006.
2.	. Bansal, A Textbook of Strength of Materials, Laxmi Publications, 2010.
REFERENCE(S):	
1.	D. S. Bedi, Strength of Materials, S. Chand & Co. Ltd., 2012.

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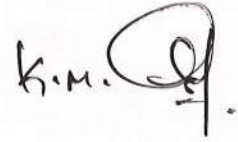
Department	CIVIL ENGINEERING				R 2019	Semester IV	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CE402	SOIL MECHANICS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> • Make the students gain adequate knowledge on the index and engineering properties of soils • Understand the significance of the soil properties 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> • Determine the index properties of soil and classify the type of soil • Determine the permeability and seepage characteristics of soil • Determine the compressibility characteristics and shear strength parameters of soil • Determine the failure analysis of different soil parameters • Analyze the stability of slopes and provide slope protection methods 							
Unit I	INDEX PROPERTIES AND CLASSIFICATION OF SOIL						9
Nature of soils - Phase diagrams - Basic definitions and inter-relationships - Index properties of soils and their determinations: Specific gravity - Water content - Density - Relative density - Sieve analysis - Particle size distribution - Sedimentation analysis - Consistency of soils - Atterberg limits and indices - Classification of soils: Need - Classification based on BIS - Field Identification of Soils							
Unit II	SOIL WATER AND WATER FLOW						9
Soil water - Various forms - Static pressure in water - Capillary flow - Suction - Effective stress concept - Total - Neutral and effective stress distribution in soils - Flow of water through soils - Darcy's law; Assumptions and validity - Permeability - Coefficient of permeability - Laboratory test and Field test - Factors affecting permeability: Permeability of stratified deposits of soils - Seepage - Laplace equation - Introduction to Flow nets.							
Unit III	COMPRESSIBILITY OF SOILS						9
Compaction - Factors affecting compaction - Effect of compaction on soil properties - Proctor and modified Proctor tests - Zero air void lines - Field compaction and its control - Consolidation - Fundamental definitions - Spring analogy - Terzaghi's one dimensional consolidation theory - Pre-consolidation pressure and its determination - Normally, under and over consolidated soils-Time rate of consolidation							
Unit IV	VERTICAL STRESS AND SHEAR STRENGTH						10
Stresses in soils: Boussinesq's and Westergaard's theories of stresses due to concentrated loads - Circular, Rectangular load - Strip load - Newmark's chart - Pressure bulbs - Shear strength - Factors affecting shear strength of soils- Mohr - Coulomb theory - Measurement of shear parameters - Direct shear - Unconfined compression - Triaxial - Drained and un-drained conditions - Vane shear tests							
Unit V	STABILITY OF SLOPES						8
Types of slopes - Failure mechanism of slopes - Total and effective stress analysis - Finite slopes - Stability analysis for purely cohesive and c-phi soils - Method of slices - Friction circle method - Taylor's Stability number - Slope protection methods							
FOR FURTHER READING							
Problems encountered in different types of soils - Collapsible soil - Expansive soil - Quick sand phenomena - Case studies on failure of structures due to settlements - Case studies							
TEXT BOOK(S):							
1. B. N. D. Narasinga Rao, Soil Mechanics and Foundation Engineering, Wiley India Pvt. Ltd., New Delhi, 2015.							
2. B. C. Punmia, Soil Mechanics and Foundations, Laxmi Publications Pvt. Ltd., New Delhi, 2005.							
3. Alam Singh, Soil Engineering in Theory and Practice, Asia Publishing House, Bombay, 2nd Edition,							


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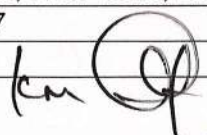
REFERENCE(S):

1. Karl Terzaghi, Soil Mechanics in Engineering Practice, 3rd edition, John Wiley & Sons, Inc, 1995.
2. IS Codes: IS 1498: 1970, IS 2810: 1979, IS 2809: 1972, IS 2720 : Part 1 to Part 41



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Department	CIVIL ENGINEERING					R 2019	Semester IV	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE403	CONCRETE TECHNOLOGY	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Impart a sound Technical knowledge on the ingredients of special and conventional concrete and admixtures Impart basic knowledge on the properties of fresh and hardened concrete and to provide a basic understanding on the usage of admixtures used in concrete 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Acquire knowledge on cost effective admixtures and mix design Demonstrate the properties of concrete in plastic state Demonstrate the properties of concrete in hardened state Acquire knowledge about the application of special concretes Impart knowledge about advance concreting methods 								
Unit I	ADMIXTURES AND MIX DESIGN							9
Chemical admixtures: Accelerators -Retarders- Workability agents-Water reducing agents - Air entraining agents. Mineral admixtures: Flyash- Silica fume-Ground granulated blast furnace slag - Metakaoline- Dosage, Usage, structural properties and their effects on concrete properties. Mix Design: Objective-Factors influencing mix proportion Mix design by ACI method and IS code method-Mix design examples								
Unit II	FRESH CONCRETE							9
Properties of fresh concrete: Workability -Factors affecting workability - Tests for workability of concrete - Slump test and compacting factor test- Segregation and bleeding- Batching and mixing ingredients of concrete- Methods of compaction - Types of curing concrete.								
Unit III	HARDENED CONCRETE							9
Properties of hardened concrete -Determination of compressive, tensile and flexural strength of concrete - Shrinkage and creep- Factors affecting shrinkage and creep Stress- strain curve for concrete- Determination of modulus of elasticity-In situ strength determination-Rebound hammer test								
Unit IV	SPECIAL CONCRETE							9
Light weight concrete- Fibre reinforced concrete-High performance concrete- High strength concrete - Self compacting concrete- Polymer concrete - Shortcrete -Guniting - Aerated Concrete - Vacuum Concrete - Mass concrete Ready mix concrete-properties and applications								
Unit V	CONCRETING METHODS							9
Pumping and its type- Conveyors - Under water concreting - High volume flyash concrete - piling techniques- cofferdam- grouting- -Shoring -Underpinning- Off shore platforms - Launching girders, bridge decks-shells- in-situ pre-stressing in high rise structures - Techniques for heavy decks - Erection of articulated structures, braced domes and space decks								
FOR FURTHER READING								
Mineral additives: reactive and inert- Setting time of concrete-significance and measurements- Durability of concrete: importance of permeability study- Cellular concrete, ferro cement, bendable concrete, light transmitting concrete-Soundness of aggregate, Grading of fine & coarse Aggregates, recycled material as aggregates								
TEXT BOOK(S):								
1. M.S.Shetty, Concrete Technology, S.Chand and Co., Ltd., NewDelhi, 2003								
2. M.L.Gambhir, Concrete Technology, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi, 2007								
3. Dr.S.Christian Johnson, Concrete Technology, Dilipi Press (Pvt.) Ltd, 2017								
REFERENCE(S):								


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1.	P.Kumar Mehta and Paulo J.M. Monteiro, Concrete - Micro structure, Properties and Materials, Indian Concrete Institute, Chennai, 1997
2.	A.R.Santhakumar, Concrete Technology, Oxford University Press, New Delhi, 2007

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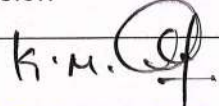
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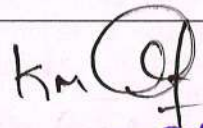
Department	CIVIL ENGINEERING					R 2019	Semester IV	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE404	WATER RESOURCE AND IRRIGATION ENGINEERING	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to								
<ul style="list-style-type: none"> The student is exposed to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices. 								
Course Outcomes: At the end of this course, learners will be able to:								
<ul style="list-style-type: none"> acquire knowledge on source of water resources in India learn operation and management of reservoir system. gain knowledge on different methods of irrigation parameters gain knowledge on application of canal irrigation understand different methods of Irrigation systems 								
Unit I	WATER RESOURCES							9
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.								
Unit II	WATER RESOURCE MANAGEMENT							9
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								
Unit III	IRRIGATION ENGINEERING							9
Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water.								
Unit IV	CANAL IRRIGATION							9
Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady's and Lacey's Regime theory								
Unit V	IRRIGATION METHODS AND MANAGEMENT							9
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.								
TEXT BOOK(S):								
1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.								
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009								
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009								
REFERENCE(S):								
1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005								
2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata-McGraw- Hill Inc., New Delhi, 1997								


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Department	CIVIL ENGINEERING					R 2019	Semester IV	HS
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19HS402	UNIVERSAL HUMAN VALUES 2 : UNDERSTANDING HARMONY	2	1	0	3	45	100	
<p>Course Objective (s): The purpose of learning this course is to</p> <ul style="list-style-type: none"> • Help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. • 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. • 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 								
<p>Course Outcomes: At the end of this course, learners will be able to:</p> <ul style="list-style-type: none"> • Students are expected to become more aware of themselves, and their surroundings (family, society, nature) • Students would become more responsible in life, and in handling problems with sustainable solutions. • Students become sensitive to their commitment towards what they have understood (human values, human relationship and human society). • Students would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. • Students would have better critical ability. 								
Unit I	INTRODUCTION TO VALUE EDUCATION						9	
Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations								
Unit II	HARMONY IN THE HUMAN BEING						9	
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								
Unit III	HARMONY IN THE FAMILY AND SOCIETY						9	
Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship – 'Trust' – the Foundational Value in Relationship - 'Respect' – as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order								
Unit IV	HARMONY IN THE NATURE/EXISTENCE						9	
Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfillments among the Four Orders of Nature – Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence								
Unit V	IMPLICATIONS OF THE HOLISTIC UNDERSTANDING						9	
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								


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REFERENCE(S):	
1	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book)
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
8	Bharat Mein Angreji Raj – PanditSunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
TEXT BOOK(S):	
1.	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
2.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034-53-2


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Department	CIVIL ENGINEERING				R 2019	Semester IV	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19CE405	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C		
		0	0	4	2	60	100

Course Objective (s): The purpose of learning this course is to

- Impart knowledge on flow measurements in pipes and open channels
- Carry out performance studies on hydraulic machineries
- At the end of the course the students will be able to design pipe layouts and design pumps for residential buildings

Course Outcomes: At the end of this course, learners will be able to:


- Measure the flow of water in pipes
- Determine the characteristics of turbines & pumps
- Understand the application of Bernoulli's theorem

Exp No.	Name of Experiments
1.	Determination of Co-efficient of discharge of Orifice meter
2.	Determination of Co-efficient of discharge of Venturimeter
3.	Determination of Co-efficient of discharge of orifice
4.	Determination of Co-efficient of discharge of V- notch
5.	Determination of Co-efficient of Impact Jet
6.	Determination of friction factor in a pipe
7.	Study on Performance Characteristics of Centrifugal pump
8.	Study on Performance Characteristics of Reciprocating pump
9.	Study on performance characteristics of Pelton Wheel Turbine
10.	Study on performance characteristics of Francis Turbine
11.	Study on performance characteristics of Kaplan Turbine

S.NO	Name of Equipments	No of Equipments
1.	Rotameter	01
2.	Venturimeter / Orificemeter	01
3.	Bernoulli's Experiment	01
4.	friction loss apparatus	01
5.	Centrifugal pumps	01
6.	Gear pump	01
7.	Submersible pump	01
8.	Reciprocating pump	01
9.	Pelton wheel turbine	01
10.	Francis turbine/Kaplan turbine	01

TEXT BOOK(S):

1.	Applied hydraulics and hydraulic machinery by Dr.R.K.Rajput.
2.	Subramanya, K., 1991. Flow in open channels, Tata McGraw-Hill New Delhi.

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Department	CIVIL ENGINEERING				R 2019	Semester V	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19CE508	SURVEY CAMP	L	T	P	C		
		0	0	0	1	45	100

Course Objective (s): The purpose of learning this course is to

- The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus).

- Course Outcomes:** At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Course Plan

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

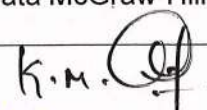
- Traverse - using Total station
- Contouring
 - Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
 - Block Level/ By squares of size at least 100 Meter x 100 Meter atleast 20 Meter interval
 - L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30M and C.S at every 90 M
- Offset of Buildings and Plotting the Location
- Sun observation to determine azimuth (guidelines to be given to the students)
- Use of GPS to determine latitude and longitude and locate the survey camp location
- Traversing using GPS
- Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.

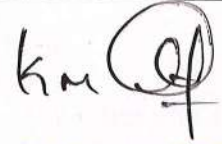
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Department	CIVIL ENGINEERING					R 2019	Semester IV	ESEC
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19TPS04	QUANTITATIVE APTITUDE AND LOGICAL REASONING - II	2	0	0	0	30	100	
Course Objective (s):								
<ul style="list-style-type: none"> • To learn the basic of partnership and chain rule in simplified way. • To solve problems using fast track method by learning profit and loss with percentage. • To teach the angle of elevation and depression. • To know the relationship, direction concepts in easy way. • To know about coding and decoding through logical way. 								
Course Outcomes: At the end of this course, learners will be able to:								
<ol style="list-style-type: none"> 1. Solve problems by using shortcut in partnership and chain rule. 2. Know the tips and tricks of profit and loss with percentage through fast track methods. 3. Understand the concepts of angles. 4. Evaluate critically the real life situations by resorting and analyzing analytical reasoning of key issues and factors. 5. Enhance the logical way of thinking by solving problems codes and rankings concepts. 								
UNIT 1 PARTNERSHIP & CHAIN RULE								6
PARTNERSHIP: Ratio of division of gains: Simple Partnership – Compound Partnership - Working and sleeping partners.								
CHAIN RULE: Definition – Direct proportion and Indirect proportion.								
UNIT 2 PROFIT & LOSS, PERCENTAGE								6
PROFIT AND LOSS: Basic definition and types of profit and loss – Concept of discount and marked price – Concept of true v/s false value – Application in data interpretation problems.								
PERCENTAGE: Percentage – Percentage using shortcuts.								
UNIT 3 HEIGHT AND DISTANCE								6
HEIGHT AND DISTANCES: Line of sight – Angle of elevation – Angle of depression.								
UNIT 4 BLOOD RELATIONSHIP & DIRECTION SENSE TEST								6
BLOOD RELATIONSHIP: Analysis the gender relationship –Relationship diagram - Family tree.								
DIRECTION SENSE TEST: Distance between the starting and ending points - Sense the direction correctly.								
UNIT 5 LOGICAL SEQUENCE OF WORD, CODING AND DECODING, NUMBER RANKING & TIME SEQUENCE TEST								6
LOGICAL SEQUENCE OF WORDS: Sequence of occurrence of events – Sequence of objects in a class or group – Sequence of increasing/decreasing size, value, intensity, etc.								
CODING AND DECODING: Introduction – Description of coding method, Coding patterns – Concepts of coding & decoding – Problems involving coding & decoding method.								
NUMBER RANKINGS & TIME SEQUENCE TEST: Number test – Ranking test – Time sequence test.								
								TOTAL : 30 HOURS
REFERENCES:								
<ol style="list-style-type: none"> 1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012 2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012. 								


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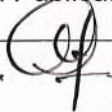
3. R.V.Praveen,"Quantitative Aptitude and Reasoning"Third Edition, PHI Learning ,2016.
4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
5. Arun Sharma "How to Prepare for Quantitative Aptitude"Eight Edition, McGraw Hill Education,2018
6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication,2020.



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Department	CIVIL ENGINEERING				R 2019	Semester V	PC
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CE501	ANALYSIS OF INDETERMINATE STRUCTURES	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To introduce the students to basic theory and concepts of classical methods of structural analysis 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method Analyze the continuous beams and rigid frames by slope deflection method. Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway. Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method. Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames. 							
Unit I	STRAIN ENERGY METHOD						9
Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy).							
Unit II	SLOPE DEFLECTION METHOD						9
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							
Unit III	MOMENT DISTRIBUTION METHOD						9
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.							
Unit IV	FLEXIBILITY METHOD						9
Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin-jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.							
Unit V	STIFFNESS METHOD						9
Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.							
TEXT BOOK(S):							
1.	Bhavikatti, S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014						
2.	Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd., New Delhi-4, 2014						
3.	Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.						
4.	Pandit G.S.and Gupta S.P., Structural Analysis–A Matrix Approach, Tata McGraw Hill Publishing Company Ltd., 2006						
REFERENCE(S):							
1.	Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.						

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2.	William Weaver, Jrand James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi, 1995
3.	Hibbeler, R.C., Structural Analysis, VII Edition, Prentice Hall, 2012


Department	CIVIL ENGINEERING					R 2019	Semester V	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE502	FOUNDATION ENGINEERING	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to								
<ul style="list-style-type: none"> To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls 								
Course Outcomes: At the end of this course, learners will be able to:								
<ul style="list-style-type: none"> Understand the site investigation, methods and sampling. Get knowledge on bearing capacity and testing methods. Design shallow footings. Determine the load carrying capacity, settlement of pile foundation. Determine the earth pressure on retaining walls and analysis for stability 								
Unit I	SITE INVESTIGATION AND SELECTION OF FOUNDATION							9
Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation - Strength parameters - Bore log report and Selection of foundation.								
Unit II	SHALLOW FOUNDATION							9
Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements								
Unit III	FOOTINGS AND RAFTS							9
Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision								
Unit IV	PILE FOUNDATION							9
Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions								
Unit V	RETAINING WALLS							9
Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.								
TEXT BOOK(S):								
1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering" CBS Publishers								

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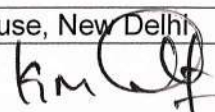
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	Distribution Ltd., New Delhi. 2014
2.	Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint)
REFERENCE(S):	
1.	Braja M Das, "Principles of Foundation Engineering" (Eighth edition), Cengage Learning 2014.
2.	Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014
3.	Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015

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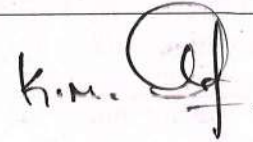
Department	CIVIL ENGINEERING					R 2019	Semester V	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE503	DESIGN OF RCC ELEMENTS	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice. 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Understand the various design methodologies for the design of RC elements. Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion. Design the various types of slabs and staircase by limit state method. Design columns for axial, uniaxial and biaxial eccentric loadings. Design of footing by limit state method. 								
Unit I	INTRODUCTION							9
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 - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.								
Unit II	DESIGN OF BEAMS							9
Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion								
Unit III	DESIGN OF SLABS AND STAIRCASE							9
Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.								
Unit IV	DESIGN OF COLUMNS							9
Types of columns –Axially Loaded columns – Design of short Rectangle, Square and Circular columns – Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves								
Unit V	DESIGN OF FOOTINGS							9
Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.								
TEXT BOOK(S):								
1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.								
2. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006								
3. Subramanian,N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013								
4. Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi								
5. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi								



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REFERENCE(S):

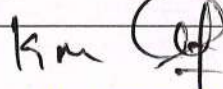
1.	Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
2.	Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007
3.	IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
4.	SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999



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Department	CIVIL ENGINEERING					R 2019	Semester V	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19ES501	WATER SUPPLY ENGINEERING	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to								
<ul style="list-style-type: none"> To equip the students with the principles and design of water treatment units and distribution system 								
Course Outcomes: At the end of this course, learners will be able to:								
<ul style="list-style-type: none"> an insight into the structure of drinking water supply systems, including water transport, treatment and distribution the knowledge in various unit operations and processes in water treatment an ability to design the various functional units in water treatment an understanding of water quality criteria and standards, and their relation to public health the ability to design and evaluate water supply project alternatives on basis of chosen criteria 								
Unit I	SOURCES OF WATER							9
Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.								
Unit II	CONVEYANCE FROM THE SOURCE							9
Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials								
Unit III	WATER TREATMENT							9
Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation –Clarifloccuator-Plate and tube settlers – Pulsator clarifier - sand filters - Disinfection - Residue Management –Construction, Operation and Maintenance aspects.								
Unit IV	ADVANCED WATER TREATMENT							9
Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances - MBR process								
Unit V	WATER DISTRIBUTION AND SUPPLY							9
Requirements of water distribution – Components – Selection of pipe material – Service reservoirs– Functions – Network design – Economics – Analysis of distribution networks -Computer applications – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.								
TEXT BOOK(S):								
1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.								
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010								
3. Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014								
REFERENCE(S):								
1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.								
2. 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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Department	CIVIL ENGINEERING				R 2019	Semester V	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19CE504	SOIL ENGINEERING LABORATORY	L	T	P	C		
		0	0	4	2	60	100

Course Objective (s): The purpose of learning this course is to

- To develop skills to test the soils for their index and engineering properties and to characterize the soil based on their properties

Course Outcomes: At the end of this course, learners will be able to:

- Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties.

Exp No.	Name of Experiments
1.	DETERMINATION OF INDEX PROPERTIES a. Specific gravity of soil solids b. Grain size distribution – Sieve analysis c. Grain size distribution - Hydrometer analysis d. Liquid limit and Plastic limit tests e. Shrinkage limit and Differential free swell tests
2.	DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS a. Field density Test (Sand replacement method and core cutter method) b. Determination of moisture – density relationship using standard Proctor compaction test. c. Determination of relative density (Demonstration only)
3.	DETERMINATION OF ENGINEERING PROPERTIES a. Permeability determination (constant head and falling head methods) b. One dimensional consolidation test (Determination of Co-efficient of consolidation only) c. Direct shear test in cohesionless soil d. Unconfined compression test in cohesive soil e. Laboratory vane shear test in cohesive soil f. Tri-axial compression test in cohesionless soil (Demonstration only) g. California Bearing Ratio Test

Sl. No.	Description of Equipment	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and Plastic limit apparatus	2 sets
4.	Shrinkage limit apparatus	3 sets
5.	Proctor Compaction apparatus	2 sets
6.	UTM of minimum of 20kN capacity	1
7.	Direct Shear apparatus	1
8.	Thermometer	2
9.	Sand replacement method accessories and core cutter method accessories	2
10.	Tri-axial Shear apparatus	1
11.	Three Gang Consolidation test device	1

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12.	Relative Density apparatus	1
13.	Van Shear apparatus	1
14.	Weighing machine – 20kg capacity	1 No
15.	Weighing machine – 1kg capacity	3 No

TEXT BOOK(S):

1. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.

REFERENCE(S):

1. Saibaba Reddy, E.Ramasastri, K. "Measurement of Engineering Properties of Soils" New age International (P) Limited Publishers, New Delhi, 2002.
2. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

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Department	CIVIL ENGINEERING				R 2019	Semester V	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19ES502	ENVIRONMENTAL ENGINEERING LABORATORY	L	T	P	C	60	100
		0	0	4	2		

Course Objective (s): The purpose of learning this course is to

- To analyse the physical, chemical and biological characteristics of water and wastewater
- To quantify the dosage requirement for coagulation process
- To study the growth of micro organism and its quantification
- To quantify the sludge

Course Outcomes: At the end of this course, learners will be able to:

- Quantify the pollutant concentration in water and wastewater
- Suggest the type of treatment required and amount of dosage required for the treatment
- Examine the conditions for the growth of micro-organisms

Exp No.	Name of Experiments
1.	Determination of pH, Turbidity and conductivity
2.	Determination of Hardness
3.	Determination of Alkalinity and Acidity
4.	Determination of Chlorides
5.	Determination of Phosphates and Sulphates
6.	Determination of iron and fluoride
7.	Determination of Optimum Coagulant dosage
8.	Determination of residual chlorine and available chlorine in bleaching powder
9.	Determination of Oil, and Grease
10.	Determination of suspended, settleable, volatile and fixed solids
11.	Determination Dissolved Oxygen and BOD for the given sample
12.	Determination of COD for given sample
13.	Determination of SVI of Biological sludge and microscopic examination
14.	Determination of MPN index of given water sample

TEXT BOOK(S):

1. S. Rajput, Strength of Materials, S. Chand & Co., 2006.
2. R.K.Bansal, A Textbook of Strength of Materials, Laxmi Publications, 2010.

REFERENCE(S):

1. D. S. Bedi, Strength of Materials, S. Chand & Co. Ltd., 2012.

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Department	CIVIL ENGINEERING				R 2019	Semester V	VEEC
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19TPS05	QUANTITATIVE APTITUDE AND LOGICAL REASONING - III	2	0	0	0	30	100

Course Objective (s):

- To design to help people make sense of numerical data.
- To calculate the calendars and series in simplified way.
- To understand the concept of the interest amount in SI and CI.
- To know the procedure to deal with a situation and sufficient to determine the answer.
- To teach seating arrangements in rows or in small groups.

Course Outcomes: At the end of this course, learners will be able to:

1. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken to solve Aptitude Questions.
2. Solve the question based on calendar, odd man out and series by using shortcut methods.
3. Calculate the interest by using shortcut methods instead of traditional methods.
4. Induce their critical thinking by solving the syllogism and course of action.
5. Analyze the conditions and do interpretation.

UNIT 1 DATA INTERPRETATION & CLOCKS

6

DATA INTERPRETATION: Tabulation – Bar graphs – Pie charts – Line graphs.

CLOCKS: Definition – important points – Angular difference between two hands at different timings- Incorrect clock.

UNIT 2 CALENDARS, ODDMAN OUT & SERIES

6

CALENDARS: Odd days – Leap year – Ordinary year – Counting of odd days – Day of the week.

ODDMAN OUT & SERIES: Odd man out – Power series – Number series-Sequence of real numbers.

UNIT 3 SIMPLE & COMPOUND INTEREST

6

SIMPLE INTEREST: Principal – Rate of interest – Number of years – Using formulae and shortcuts methods.

COMPOUND INTEREST: Compounded Annually – Compounded Half-Yearly – Compounded Quarterly – Compounded annually – Rates are different for different years.

UNIT 4 STATEMENT & COURSE OF ACTION, SYLLOGISM

6

STATEMENT AND COURSE OF ACTION: Courses of action - Decision taken - Improvement, Follow-up or further action in regard to the given statement.

SYLLOGISM/ LOGICAL VENN DIAGRAMS: Relationship between the two things or not - Classification of propositions – Immediate deductive inference – Immediate deductive inference.

UNIT 5 SEATING ARRANGEMENTS & DATA SUFFICIENCY

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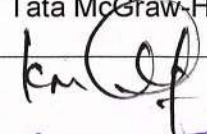
SEATING ARRANGEMENTS: Persons seating in the circular – Rectangular – Square.

DATA SUFFICIENCY: Reasoning ability using a set of directions.


TOTAL : 30 HOURS

REFERENCES:

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.


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3. R.V.Praveen,"Quantitative Aptitude and Reasoning"Third Edition, PHI Learning ,2016.
4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
5. Arun Sharma "How to Prepare for Quantitative Aptitude"Eight Edition, McGraw Hill Education,2018.
6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication,2020.

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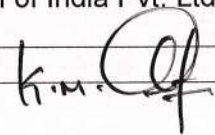


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Department	CIVIL ENGINEERING				R 2019	Semester VI	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CE601	ADVANCED STRUCTURAL ANALYSIS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Impart a thorough knowledge about the matrix methods of structural analysis Impart knowledge on moving loads and influence line diagrams Impart knowledge on finite element analysis and tension co-efficient method Introduce plastic analysis of structures 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Analyze the internal forces in the members of the trusses Analyze a structure by using matrix stiffness and flexibility methods. Emphasis on the importance of Load factor in a design. Analyze the structure for statistical determinacy and indeterminacy 							
Unit I	INFLUENCE LINES FOR FORCES IN PLANE TRUSSES AND STRESS RESULTANTS IN ARCHES						9
N type truss - Pratt truss with parallel chords - Pratt truss with inclined chords - Warren truss with inclined chords. Symmetrical arches: Influence lines for horizontal thrust - Influence lines for B.M - Influence lines for S.F, B.M and normal thrust for moving concentrated loads and UDL.							
Unit II	CABLES AND SUSPENSION BRIDGES						9
Components and their Functions - Analysis of cable under concentrated loads and UDL - Shape of cable under self weight - Anchorage of suspension cables - Bending Moment and Shear Force in suspension bridges with three hinged stiffened girders - Max Bending Moment due to moving single concentrated load and UDL - Influence lines for Bending Moment and Shear Force - Analysis of suspension bridges with two hinged stiffening girders.							
Unit III	MATRIX FLEXIBILITY METHOD						9
Introduction - Computation of flexibility matrices - Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy.							
Unit IV	MATRIX STIFFNESS METHOD						9
Introduction - equilibrium and compatibility - Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of kinematic indeterminacy.							
Unit V	MISCELLANEOUS TOPICS						9
Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy by kani's method. Plastic analysis of structures - Assumptions - Moment redistribution - Analysis of fixed and continuous beams and portal frames by mechanism method.							
FOR FURTHER READING							
Unsymmetrical arches - Influence lines for horizontal thrust.							
TEXT BOOK(S):							
1.	William weaver Jr. James M. Gare , Matrix Analysis Framed Structures, Third edition Tata McGraw Hill publishing company limited, 2007.						
2.	SS Bhavikatti ,Structural Analysis , ,Third edition, Volume I Second Edition Volume II , Vikas Publishing House (p) ltd ,2009.						
3.	Vaidyanathan.R, Perumal.P, Comprehensive Structural Analysis, Vol I & II Laxmi Publications, 2008.						
REFERENCE(S):							
1.	C.K. Wang, Intermediate structural analysis Tata McGraw Hill publishing company limited, 1986.						
2.	Rajasekaran S and Sankarasubramaniyan R Computational structural mechanics, Prentice Hall of India , New Delhi ,2008.						

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Department	CIVIL ENGINEERING					R 2019	Semester VI	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CE602	DESIGN OF RCC STRUCTURES	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart knowledge on the basic design philosophy of R.C.C structures To make students be familiar about the codal provisions for the design of R.C.C structures 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Understand the structural behaviour of footings by analysis and design Analyse a multi-bay multi storied frames with joint detailing and to design deep beams, corbels and stairs Know the importance of lateral soil pressure distribution on retaining walls and able to design it for various loading condition Analyse and Design various types of water tanks using Indian standard codal provisions Analyze and determine the critical loading condition on bridge deck for the economical design 								
Unit I	FOUNDATIONS							09
Isolated footings -Combined footings of rectangular and trapezoidal shape - Strap beam footings - Principles of design of mat foundation. Design of isolated footing subjected to uniaxial and biaxial moments								
Unit II	BUILDING FRAMES							09
Steps involved in the design of multibay, multistoreyed frames - Elastic analysis using suitable substitute frames for gravity loadings - Portal and Cantilever methods of analysis for wind forces - Design of frame components -Design of Deep Beams-Design of Corbels-Design of stairs spanning horizontally - Design of doglegged stair Detailing of joints								
Unit III	EARTH RETAINING STRUCTURES							09
Design of cantilever and counterfort retaining walls for any type of back fill - Stability requirements of retaining walls Effect of surcharge loading in the design of retaining wall								
Unit IV	LIQUID STORAGE STRUCTURES							09
Design of underground and on ground rectangular water tanks- Use of Parts I, II and IV of I.S.3370 Codes - Overhead tanks of rectangular shape and circular shape with domical roof - Design of all components including staging and foundation. Design of underground and on ground circular water tanks								
Unit V	BRIDGES							09
Types of bridges - IRC loadings - Design of single span slab bridge deck for class A loading - Design of the deck of T - beam and slab bridge for class AA loading Design of single span slab bridge deck for class AA loading								
FOR FURTHER READING								
Case studies on foundation design, Presentation on intze type water tank								
TEXT BOOK(S):								
1. N.Krishnaraju, Advanced Reinforced Concrete Design (IS: 456-2000), (Second Edition), CBS Publishers & Distributors, New Delhi, 2013.								
2. B.C.Punmia, Ashok Kumar Jain and Arunkumar Jain, Limit State Design of Reinforced Concrete, Laxmi Publications (P) Ltd., New Delhi, 2015.								
3. Unnikrishna Pillai and Devedas Menon, Reinforced Concrete Design, Tata Mc Graw Hill Publishing Co.Ltd., New Delhi, 2003.								
REFERENCE(S):								
1. M.L.Gambhir, Design of reinforced concrete structures, PHI learning Pvt. Ltd., New Delhi, 2011.								
2. P.C.Varghese, Limit State Design of Reinforced Concrete, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.								
3. IS 456:2000 Plain and reinforced concrete Code of Practice								


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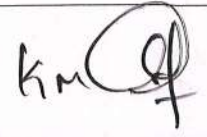
Department	CIVIL ENGINEERING				R 2019	Semester VI	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CE603	BASIC STRUCTURAL DESIGN	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Impart knowledge on Limit State Design Methods for steel Structures Impart knowledge on the codal provisions for the design of steel structures Impart knowledge on the design of connections, tension members, compression members, beams and roof trusses 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Design bolted and welded connections Design tension members, Splices, Lug Angles and Gussets Design compression members, Lacings, Battens and column base Design laterally supported and unsupported Beams, Built-up Beams and Plate Girders. Acquire knowledge about components of industrial structures and Design beam columns, Gantry girders and roof trusses 							
Unit I	INTRODUCTION						9
Introduction to steel structures - Use of relevant Indian standard codes - Comparison of Working stress and Limit state method of design - Properties of steel - Structural steel sections - Types of connections - Design of bolted and welded connections for axial load - Efficiency of joint.							
Unit II	TENSION MEMBERS						9
Introduction to types of Tension Members - Calculation of net area - Net effective sections for angles and Tee in tension - Design of tension members - Design of tension splices, Lug Angles and Gussets							
Unit III	COMPRESSION MEMBERS						9
Introduction to types of compression members - Theory of column: Loads on compression member - Failure modes of an axially loaded column - Influence of Effective length and slenderness ratio on the strength of column - Codal provisions for compression members - Design of Compression Members - Design of lacings and battens - Design of column base: Slab Base - Gussetted Base.							
Unit IV	DESIGN OF BEAMS						9
Introduction to design of flexural members - Design of laterally supported and unsupported beams - Design of Compound beams - Design of plate girders - Intermediate and bearing stiffeners.							
Unit V	MISCELLANEOUS TOPICS						9
Introduction to Beam Columns - Design of Beam Columns - Loading specifications and components of an industrial building - Design of roof trusses and purlins - Introduction to gantry girder - Design of gantry girder.							
FOR FURTHER READING							
Corrosion Protection of Steel Structures - Fire Resistant Design - Steel-Concrete- Composite Constructions							
TEXT BOOK(S):							
1. N. Subramanian, Design of Steel Structures, Oxford University Press 2011							
2. S. K. Duggal, Limit State Design of Steel Structures, Tata , Mc Graw Hill Education Pvt Ltd, New Delhi, 2014.							
3. M. R. Shiyekar, Limit State Design in Structural Steel, PHI Learning Private Limited, New Delhi, 2013							
REFERENCE(S):							
1. K. S. Sai Ram, Design of Steel Structures, Dorling Kindersley (India) Pvt. Ltd, Pearson Education in South Asia.							
2. IS 800 - 2007, IS 800 - 1984 General Construction in Steel - Code of Practice, BIS, New Delhi.							

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3. R. Murugesan and A. P. Arulmanickam, Steel Tables in SI Units, Pratheeba Publishers, Coimbatore, 2009.



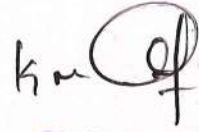
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Department	CIVIL ENGINEERING				R 2019	Semester VI	ES
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19ES601	WASTE WATER ENGINEERING	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> An ability to estimate sewage generation and design sewer system including sewage pumping stations The required understanding on the characteristics and composition of sewage, self purification of streams An ability to perform basic design of the unit operations and processes that are used in sewage treatment Understand the standard methods for disposal of sewage. Gain knowledge on sludge treatment and disposal. 							
Unit I	PLANNING AND DESIGN OF SEWERAGE SYSTEM						9
Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - sewer appurtenances - corrosion in sewers - prevention and control - sewage pumping- drainage in buildings-plumbing systems for drainage - Rain Water ting.							
Unit II	PRIMARY TREATMENT OF SEWAGE						9
Objectives - Unit Operations and Processes - Selection of treatment processes - Onsite sanitation - Septic tank- Grey water harvesting - Primary treatment - Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks - Construction, Operation and Maintenance aspects.							
Unit III	SECONDARY TREATMENT OF SEWAGE						9
Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters- Sequencing Batch Reactor(SBR) - Membrane Bioreactor - UASB - Waste Stabilization Ponds - - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects.							
Unit IV	DISPOSAL OF SEWAGE						9
Standards for- Disposal - Methods - dilution - Mass balance principle - Self purification of river -Oxygen sag curve - deoxygenation and reaeration - Streeter-Phelps model - Land disposal - Sewage farming - sodium hazards - Soil dispersion system.							
Unit V	SLUDGE TREATMENT AND DISPOSAL						9
Objectives - Sludge characterization - Thickening - Design of gravity thickener- Sludge digestion - Standard rate and High rate digester design- Biogas recovery - Sludge Conditioning and Dewatering - Sludge drying beds- ultimate residue disposal - recent advances.							
TEXT BOOK(S):							
1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015. 2. 3,							
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.							
3. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.							
REFERENCE(S):							
1. Metcalf and Eddy- Wastewater Engineering-Treatment and Reuse, Tata Mc. Graw-Hill Company, New Delhi, 2010.							
2. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010.							


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3. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.



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Department	CIVIL ENGINEERING				R 2019	Semester VI	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
19CE604	CONCRETE AND HIGHWAY LABORATORY	L	T	P	C		
		0	0	4	2	60	100

Course Objective (s): The purpose of learning this course is to

- To learn the principles and procedures of testing of highway materials

Course Outcomes: At the end of this course, learners will be able to:

- Student knows the techniques to characterize various pavement materials through relevant tests.

Exp No.	Name of Experiments
1.	Test on aggregates- specific gravity
2.	Test on aggregates- los angeles abrasion test
3.	Test on aggregates- water absorption of aggregates
4.	Test on bitumen-specific gravity of bitumen
5.	Test on bitumen- penetration test
6.	Test on bitumen- viscosity test
7.	Test on bitumen- softening point test
8.	Test on bitumen- ductility test
9.	Tests on bituminous mixes -stripping test
10.	Tests on bituminous mixes- determination of binder content
11.	Tests on bituminous mixes- marshal stability and flow values

Equipments		No of Equipments
1.	Concrete cylinder moulds	10
2.	Concrete Prism moulds	05
3.	Sieves	03
4.	Concrete Mixer	01
5.	Slump cone	03
6.	Flow table	01
7.	Vibrator	01
8.	Trovels and planers	05
9.	UTM – 400 kN capacity	01
10.	Vee Bee Consistometer	01
11.	Aggregate impact testing machine	01
12.	CBR Apparatus	01
13.	Blains Apparatus	01
14.	Los - Angeles abrasion testing machine	01
15.	Marshall Stability Apparatus	01

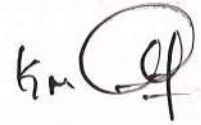
TEXT BOOK(S):

- M.S.Shetty, Concrete Technology, S.Chand and Co., Ltd., NewDelhi, 2003
- M.L.Gambhir, Concrete Technology, Tata Mc Graw Hill Publishing Co., Ltd., New-Delhi, 2007

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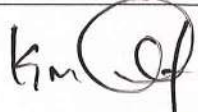
1.	A.M.Neville, Properties of Concrete, Tata Mc Graw Hill publishers, 2003
2.	P.Kumar Mehta and Paulo J.M. Monteiro, Concrete - Micro structure, Properties and Materials, Indian Concrete Institute, Chennai, 1997



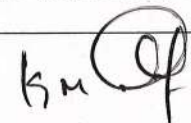
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Department	CIVIL ENGINEERING				R 2019	Semester VII	EE C
Course Code	Course Name	Hours / Week			Credit C	Total Hours	Maximu m Marks
		L	T	P			
19CE605	COMPREHENSIVE REVIEW	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To encourage the comprehend the knowledge acquired from the first semester to fifth semester of B.E Degree through periodic exercise. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Ability to review, prepare and present technological developments. 							
Guidelines for Evaluation: <ul style="list-style-type: none"> The students will be assessed 100%internally through weekly test with objective type questions on all the subject related topics. 							


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Department	COMMON TO ALL BRANCHES					R 2019	Semester VI	EE C
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19TPS06	QUANTITATIVE APTITUDE AND LOGICAL REASONING - IV	0	0	2	0	30	100	
Course Objective (s):								
<ul style="list-style-type: none"> To ascertain the occurrence of an event on the basis of already present information. To use area models to represent the distributive property in mathematical reasoning. To calculate the work capacity by chocolate based method. To work with time, speed and distance by relative speed concepts. To determine how various phenomena are related. 								
Course Outcomes: At the end of this course, learners will be able to								
<ul style="list-style-type: none"> Know the outcome of an event developed the concept of probability. Calculate the area and surface volume in real time application. Understand the concepts of Times and Work and Pipes and Cistern and Correlating the Concepts of both. Know the concepts of Time, Speed and Distance and concepts of Boats and Streams. Analyze the cause and effect of problems by using critical thinking. 								
UNIT 1 PROBABILITY , PERMUTATIONS & COMBINATIONS								6
PROBABILITY: Rolling an unbiased dice – Tossing a fair coin – Drawing a card from a pack of well shuffled cards – Picking up balls of certain color from a bag containing balls of different colors. PERMUTATIONS: Numbers with digits - Words with letters - Arrangements of person in a row - Arrangements of books on a shelf. COMBINATIONS: Formation of committee – Selection of questions from question papers.								
UNIT 2 AREA & VOLUME								6
AREA: Area – Perimeter – Important points about triangle – Quadrilateral – Fast track techniques. VOLUME: Cuboids – Cube – Cylinder – Cone – Frustum of a cone – Sphere – Hemisphere – Pyramid – their formulas.								
UNIT 3 TIME & WORK, PIPE & CISTERNS								6
TIME AND WORK: Introduction – Basic concepts – Leaving and joining – Alternative days – In between days the works starting and ending. PIPES AND CISTERNS: Introduction - Basic concepts – Capacity of the total liters –Water flow in the tank.								
UNIT 4 TIME& DISTANCE, TRAINS, BOATS AND STREAMS								6
TIME AND DISTANCE: Definition – Average speed – Distance covered is same – Distance covered is different – Stoppage time per hour for a train – Time taken with two different modes of transport – Time and distance between two moving bodies. PROBLEMS ON TRAINS: Basic concepts – Basic formulae – Different types of objects –Two trains crossing each other in both directions – Shortcuts. BOATS AND STREAMS: Introduction – Speed of man (boat and streams) - Moving same and opposite directions – important formulae.								
UNIT 5 STATEMENT - CONCLUSION , ARGUMENTS, CAUSE & EFFECT, ASSERTION & REASON								6
STATEMENT AND CONCLUSION: Statement to be true - Two conclusions together - Logically follows. STATEMENT AND ARGUMENTS: Arguments strong with respect to the statement. CAUSE AND EFFECT: Cause and effect relationship between the two statements. ASSERTION AND REASON: Assertion(A) and Reason(R) – Both (A) and (R) are individually true and (R) - (A) is true but (R) is false – (A) is false but (R) is true.								


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TOTAL : 30 HOURS

REFERENCES:

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
3. R.V.Praveen, "Quantitative Aptitude and Reasoning" Third Edition, PHI Learning ,2016.
4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
5. Arun Sharma "How to Prepare for Quantitative Aptitude" Eight Edition, McGraw Hill Education, 2018.
6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

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Department	CIVIL ENGINEERING				R 2019	Semester VII	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks
		L	T	P	C		
19CE701	ESTIMATION AND COSTING	3	0	2	4	60	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart fundamental knowledge on investigation of the site and selection of suitable foundation To make the students understand the methods of estimating the cost of buildings To know about the rate analysis and bill preparations To study about the specification writing To understand the valuation of land and buildings 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Perform rate analysis of materials of construction Apply different types of estimates in different situations Carry out analysis of rates and bill preparation at different locations Demonstrate the concepts of specification writing Estimate the total cost of construction and plan of building and Carry out valuation of assets 							
Unit I	BASICS OF ESTIMATION						12
General items of work in Building - Earthwork - Cement Concrete work - R.C.C. work - Stonework - Brickwork - Wood work - Ironwork - Flooring - Finishing work Standard units- Principles of working out quantities for detailed and abstract estimates - An approximate method of Estimating - Detailed Estimates of Buildings.							
Unit II	COST ESTIMATION OF QUANTITIES OF MATERIALS						12
Earthwork excavation - Sand filling - Lime concrete - Cement concrete - R.C.C work - Cement mortar - Brickwork - Reinforced brickwork - Stone masonry - Plastering - Painting - Flooring - White and colour washing - Distempering - Varnishing - Woodwork - Centering - Shuttering and formwork for R.C.C works - AC sheet roofing, etc.							
Unit III	ESTIMATION OF BUILDINGS						12
Load bearing and framed structures - Calculation of quantities of brickwork, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof - Estimating of a septic tank, soak pit - Sanitary and water supply installations - Water supply pipeline - Sewer line - Tube well - Open well - Estimate of bituminous and cement concrete roads.							
Unit IV	SPECIFICATION AND TENDERS						12
Data - Schedule of rates - Analysis of rates - Specifications - sources - Preparation of detailed and general specifications - Tenders -Tamilnadu Tender Transparency Act - e-tender - Preparation of Tender Notice and Document - Contracts - Types of contracts - Drafting of contract documents - Arbitration and legal requirements.							
Unit V	VALUATION						12
Valuation: Purpose of valuation, types of property- Depreciation, Sinking fund, Leasehold and freehold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase - Rental method of valuations - Typical problems - GST Rate for Construction and Building Materials - GST on Building.							
TEXT BOOK(S):							
1.	B.N. Dutta, "Estimating and Costing in Civil Engineering" Theory and Practice Including Specifications and Valuations, Twenty sixth Revised Edition, UBSPD, 2011.						

2.	Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand& Company Ltd., 2004
REFERENCE(S):	
1	Gurcharan Singh and Jagdish Singh "A Text Book of Estimating, Costing and Valuation", Standard Publishers Distributors, Delhi, 1998
2	K. S. Randwala and K.K. Rangwala "Elements of Estimating and Costing", Chavotar Publishing House, India, 1995

TEXT BOOK(S):	
1.	William weaver Jr. James M. Gare , Matrix Analysis Framed Structures, Third edition Tata McGraw Hill publishing company limited, 2007.
2.	SS Bhavikatti ,Structural Analysis , ,Third edition, Volume I Second Edition Volume II , Vikas Publishing House (p) ltd ,2009.
3.	Vaidyanathan.R, Perumal.P, Comprehensive Structural Analysis, Vol I & II Laxmi Publications, 2008.
REFERENCE(S):	
1.	C.K. Wang, Intermediate structural analysis Tata McGraw Hill publishing company limited, 1986.
2.	Rajasekaran S and Sankarasubramaniyan R Computational structural mechanics, Prentice Hall of India , New Delhi ,2008.

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Department	CIVIL ENGINEERING				R 2019	Semester VII	PC
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks
		L	T	P	C		
19CE702	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To introduce to the student, the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. To imparting rudiments of theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. To understand the codal provisions as well as the aseismic design methodology. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Knowledge in the simulation and mathematical model development. Students will be trained to identify, formulate and solve complicated problem. Students will be able to understand the role of natural calamity in the damage of structures. Students will be able to develop the skill to analyse data and to apply the same in the practical problems. Students will be able to apply the developed methodologies for the safe and stable design of structures 							
Unit I	THEORY OF VIBRATIONS						9
Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.							
Unit II	MULTIPLE DEGREE OF FREEDOM SYSTEM						9
Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods							
Unit III	ELEMENTS OF SEISMOLOGY						9
Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Estimation of earthquake parameters - Magnitude and intensity of earthquakes – Spectral Acceleration.							
Unit IV	RESPONSE OF STRUCTURES TO EARTHQUAKE						9
Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra-Lessons learnt from past earthquakes.							
Unit V	DESIGN METHODOLOGY						9
Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Later load analysis – Design and detailing as per IS:13920 – 1993.							
TEXT BOOK(S):							
1.	Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011						


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2.	Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007
REFERENCE(S):	
1	Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York, 1964
2	Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009
3	Paz, M. and Leigh.W. "Structural Dynamics – Theory & Computation", 4th Edition, CBS Publishers & Distributors, Shahdara, Delhi, 2006.

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Department	CIVIL ENGINEERING				R 2019	Semester VII	PC
Course Code	Course Name	Hours / Week			Credit C	Total Hours	Maximu m Marks
		L	T	P			
19CE703	COMPUTER AIDED DESIGN AND DRAFTING LABORATORY	0	0	4	2	60	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> To experience in design and preparation of structural drawings for concrete in Civil Engineering practice. To experience in design and preparation of structural drawings for steel structures normally encountered in Civil Engineering practice. 							
LIST OF EXPERIMENTS:							
<ol style="list-style-type: none"> Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details Design and drafting of circular and rectangular RCC water tanks Design of plate Girder Bridge - Truss Girder bridges – Detailed Drawings including connections Design of hemispherical bottomed steel tank 							
TEXT BOOK(S):							
1.	Krishnaraju, N. "Structural Design & Drawing, Universities Press, 2009						
2.	Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.						
REFERENCE(S):							
1	Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III, CBS Publishers, 2010.						
2	Shah V L and Veena Gore, "Limit State Design of Steel Structures" IS800-2007, Structures Publications, 2009.						

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Department	CIVIL ENGINEERING					R 2019	Semester VII	EE C
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks	
		L	T	P	C			
19CE704	DESIGN PROJECT	0	0	4	2	60	100	

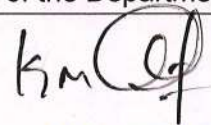
Course Objective (s): The purpose of learning this course is

- To impart and improve the design capability of the student.
- 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 waste water 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. 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.

Course Outcomes: At the end of this course, learners will be able :

- To Formulate a real world problem, identify the requirement and develop the design solutions
- To Express the technical ideas, strategies and methodologies
- To Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
- On completion of the design project students will have a better experience in designing various design problems related to Civil Engineering
- To Prepare report and present the oral demonstrations

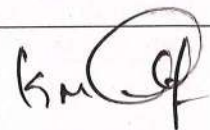
The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of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



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Department	CIVIL ENGINEERING				R 2019	Semester VII	EE C
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks
		L	T	P	C		
19CE705	INDUSTRIAL TRAINING	0	0	0	1	-	100
<p>Course Objective (s): The purpose of learning this course is</p> <ul style="list-style-type: none"> To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems. <p>Course Outcomes: At the end of this course, learners will be able :</p> <ul style="list-style-type: none"> To understand the intricacies of implementation textbook knowledge into practice To understand the concepts of developments and implementation of new techniques <p>STRATEGY: The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.</p>							



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Department	CIVIL ENGINEERING				R 2019	Semester VIII	EE C
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CE801	PROJECT WORK	0	0	12	6	300	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination. 							
Course Outcomes: <ul style="list-style-type: none"> At the end of 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 							
STRATEGY							
<ul style="list-style-type: none"> The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner 							

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Department	CIVIL ENGINEERING				R 2019	Semester VI	OE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEY01	GREEN BUILDINGS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> Impart knowledge on the sustainable construction strategies Introduce the concept of green building 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Identify the requirements of green buildings Explain the green building design process and assessment Select a suitable sustainable landscaping and energy strategies for green building Select a suitable sustainable hydrologic landscaping and energy strategies for green building Illustrate green building commissioning and implementation. 							
Unit I	SUSTAINABLE CONSTRUCTION AND GREEN BUILDING REQUIREMENTS						9
Ethics and sustainability - Increased CO2 trade-Sustainable construction - Major environmental and resource concerns - Green building movement and obstacles - Green building requirements -Perceived use of green building							
Unit II	GREEN BUILDING PROCESS AND ASSESSMENT						9
Life Cycle Impacts of Materials and Product-Conventional versus green building delivery systems - Execution of green building process - Integrated design process - Ecological design -Merits and demerits - Historical perspective - LEED building assessment standard - LEED certification process - International building assessment standards - Building rating system in India and its future - Case study of a green building							
Unit III	SUSTAINABLE LANDSCAPING AND ENERGY						9
Land and landscape approaches for green buildings -sustainable landscapes - Landscaping water efficiency Storm water management - Heat island mitigation - Building energy issues - Building energy design strategies - Building envelope - Active mechanical systems -Innovative energy optimization strategies - Smart buildings and energy management systems-Case study on smart buildings and energy management studies							
Unit IV	BUILDING HYDROLOGIC SYSTEM AND MATERIAL LOOPS						9
High performance building water supply strategy - High performance building wastewater strategy - Green building materials issues and priorities - LCA of building materials and products - Emerging construction materials and products - Construction and demolition waste management Design for deconstruction and disassembly - Closing material loops in practice-Case study on LCA of buildings							
Unit V	GREEN BUILDING IMPLEMENTATION						9
Site protection planning - Health and safety planning - Reducing the footprint of construction operations - Essentials of building commissioning - Costs and benefits of building commissioningThe economics of green buildings - Quantifying green building costs - Future directions in green buildings- Case study for high performance green buildings							
REFERENCE(S):							
1.	Charles. J. Kibert, Sustainable Construction: Green Building Design and Delivery, John Wiley & Sons, Inc., New Jersey, 2008						
2.	M. Bauer, P. Mosle and M. Schwarz, Green Building: Guidebook for Sustainable Architecture, Springer - Verlag Berlin Heidelberg, 2010.						
3.	Jerry Yudelson, Marketing Green Building Services: Strategies for success, Elsevier, 2008						
4.	Jerry Yudelson, Marketing Green Buildings: Guide for Engineering, Construction and Architecture, The Fairmont Press Inc., 2006.						
5.	Angela. M. Dean, Green by Design: Creating a Home for Sustainable Living, Gibbs Smith Publication, 2003.						

Department	CIVIL ENGINEERING				R 2019	Semester VI	OE
Course Code	Course Name	Hours / Week			Credit C	Total Hours	Maximum Marks
		L	T	P			
19CEY02	HAZARDOUS WASTE MANAGEMENT	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is

- To understand the type, nature and treatment of hazardous wastes.

Course Outcomes: At the end of this course, learners will be able :

- An insight into the characterization of hazardous wastes and the role of different stakeholders under the national legal framework
- Ability to plan minimization of hazardous wastes
- Ability to design facilities for the storage, transport, processing and disposal of hazardous wastes

Unit I INTRODUCTION **10**

Hazardous waste definition- Regulatory aspects of Hazardous Waste Management in India – Sources, characterization, categories - Analysis of hazardous waste -Physical and biological routes of transport of hazardous substances

Unit II HAZARDOUS WASTES MANAGEMENT **10**

Handling, collection, storage and transport- TSDF concept -Hazardous waste treatment technologies-Physical, chemical and thermal treatment of hazardous waste–Solidification- Chemical fixation–Encapsulation-Pyrolysis and Incineration–Biological Treatment of Hazardous Waste, Hazardous waste landfills-Site selections-design and operation-HW reduction- Recycling and reuse–Hazardous Site remediation – onsite and offsite Techniques

Unit III BIOMEDICAL WASTE MANAGEMENT **9**

Biomedical waste–Definition– Regulatory aspects of Biomedical Waste. Sources–Classification– Waste Handling and Collection–Segregation and labeling- Treatment – autoclaving, Incineration, Chemical Disinfection - , disposal. Infection control Practices.

Unit IV RADIOACTIVE WASTE MANAGEMENT **9**

Radioactive waste: Definition–Measurement of Radiation -Sources- Effects -Low level and high level radioactive wastes-Transuranic Waste-and their management–Uranium Mine and Tailings, Characterization – Treatment and Control - Radiation standard by ICRP and AERB.

Unit V E-WASTE MANAGEMENT **8**

Regulatory aspects of E-I Waste management, Waste characteristics- Generation— Collection - Material Composition-Transport– Treatment and disposal. Recycling and Recovery – intergraded e-waste management

TEXT BOOKS:

1. Hazardous waste management Charles A.Wentz. Second edition 1995.McGraw Hill International.
2. Hazardous waste management Michael D. La Gerga, PhilipL Buckingham, Jeffrey C. Evans, Second edition 2010.Waveland Press.
3. Criteria for hazardous waste landfills–CPCB guidelines 2000

REFERENCE(S):

1. Basic Hazardous waste management, "William C.Blackman.Jr", Third Edition, 2001, Lewis Publishers ,
2. Integrated solid waste management George Techobanoglous, Hilary Theisen & Samuel A.Vigil.
3. Standard handbook of Hazardous waste treatment and disposal by Harry M. Freeman, McGraw Hill 1997
4. Management of Solidwaste in developing countries by Frank Flint off, WH Oregional publication.


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Department	B.E CIVIL ENGINEERING					R 2019	Semester VI	OE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEY03	DISASTER PREPAREDNESS AND PLANNING	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

- Provide an exposure on the various elements of natural disasters
- Impart knowledge on measurement, effect and management techniques for different disasters

Course Outcomes: At the end of this course, learners will be able to:

- Characterize the various natural and man- made disasters
- Identify the various types of disasters in coastal and marine and techniques to control marine pollution
- Explain the causes, effects of atmospheric pollution and land pollution
- Analyze the inter-relationship between disasters and development
- Interpret the importance of various disaster management cycle and framework

Unit I	INTRODUCTION TO DISASTERS	9
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Definition - Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire, Forest Fire, Industrial and Technological Disasters, Climate Change- Classification, Causes, Impacts - Do's and Don'ts during disaster - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change

Unit II	EARTHQUAKES AND TSUNAMI	9
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Earthquakes - causes of earthquakes – effects - plate tectonics - seismic waves - measures of size of earthquakes - earthquake resistant design concepts. Tsunami – causes – effects – undersea earthquakes – landslides – volcanic eruptions – impact of sea meteorite – remedial measures – precautions – case studies

Unit III	FLOODS AND DROUGHTS	9
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Climatic Hazards – Floods - causes of flooding - regional flood frequency analysis – flood control measures - flood routing - flood forecasting - warning systems. Droughts – causes - types of droughts - effects of drought – mitigation - case studies

Unit IV	LANDSLIDES AND SLOPE STABILITY: MANAGEMENT	9
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Landslides - Causes - principles of stability analysis – remedial and corrective measures for slope stabilization – mitigation – cause studies.

Unit V	DISASTER PREPAREDNESS AND MANAGEMENT	9
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Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and Community Preparedness. NDLA, National Disaster Management.

TEXT BOOK(S):

1.	R. Nishith, Singh AK, — Disaster Management in India: Perspectives, issues and strategies, 1 st Edition, New Royal book Company, 2007.
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REFERENCE(S):

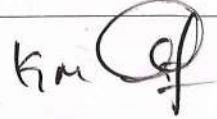
1.	Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi.
2.	J Michael Duncan and Stephan G Wright, Soil Strength and Slope Stability, 2 nd edition, John Wiley & Sons, Inc, 2005.


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Department	CIVIL ENGINEERING					R 2019	Semester VI	OE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks	
		L	T	P	C			
19CEY04	MASS TRANSPORTATION SYSTEMS	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To enhance the knowledge on function of public transit and the role of government units To impart knowledge on mass transportation system 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Analyze the four various modes of mass transportation Understand the Acquisition of skills on mass transportation systems Identify the cost benefit ratios of transport systems by different methods. Better knowledge on planning of transit systems. Knowledge on developments in public transportation 								
Unit I	INTRODUCTION							9
Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems - Demand responsive system - Intermediate public transport								
Unit II	MASS TRANSPORTATION SYSTEM							9
History and role of Transit - Recent Trends Mass Transportation Characteristics - Demand Characteristics - Spatial - Temporal and Behavioral - Characteristics of Transportation Demand. - Urban Mass Transportation Planning - Demand Surveys - Transit oriented land use development.								
Unit III	DESIGN AND EVALUATION OF MASS TRANSPORT							9
Four Stages of Planning - Performance Evaluation of Mass Transport System - Structure of Decision Making, - Evaluation and Selection Methods - Selection Procedures - Economic Evaluation Methods. Terminals and their functions - Design, Typical Characteristics. - Scheduling, Service Analysis, Vehicle Dispatch Policy, Vehicle Requirements, Spacing of Bus Tropos, - Route Spacing and Performance - Operational and Management Issues - Reserved Bus Lanes - Signal Preemption, - Dial- a-Bus								
Unit IV	TRANSIT PLANNING							9
Introduction - Definition - Shuttle systems - Corridors - Two dimensional system - Realistic cases only - Flexible transit - Individual public transportation system -Collective transportation								
Unit V	PUBLIC TRANSIT							9
Introduction to public transit - History - Personal public transit experiences -Public transportation system characteristics - Mass transit definitions and classifications - Route development - stop location and stopping policy - Schedule development.								
TEXT BOOK(S):								
1. Grey G.E. & Hoel, LA, Public Transportation? Prentice Hall, Englewood Cliffs, N.J								
REFERENCE(S):								
1.	C. Jotin Khisty and B. Kent Lall, Transportation Engineering, Prentice Hall of India, New Delhi, 2003							
2.	Hutchinson, B.G., Principles of Urban Transport Systems Planning Mc Graw Hill, New York, 1974							
3.	M. J. Bruton, Introduction to Transportation Planning, Hutchinson, London, 1992							
4.	Vuchic V.R., Urban Public Transportation System and Technology, Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1981.							
5.	Agarwal M.K., Urban Transportation in India, INAE, Allied Publishers Ltd., 1996							

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Begum, S., Rasul, M. G., & Akbar, D, An Investigation on Thermo Chemical Conversions of Solid
3. Waste for Energy Recovery. World Academy of Science, Engineering and Technology, 62, 624-
30.scholar.waset.org/1307-6892/9976, 2012.



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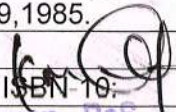
Department	OPEN ELECTIVES					R 2019	Semester VI	OE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEY05	TRANSPORT AND ENVIRONMENT	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society. 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Understood the impact of Transportation projects on the environment. Get knowledge on methods of impact analysis and their applications. Understand environmental Laws on Transportation Projects and the mitigative measures adopted in the planning stage. Predict and assess the impact of transportation projects. 								
Unit I	INTRODUCTION							9
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.								
Unit II	METHODOLOGIES							8
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.								
Unit III	ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT							10
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.								
Unit IV	ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN							9
Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming.								
Unit V	EIA CASE STUDIES							9
EIA Case Studies on Highway, Railway, Airways and Waterways Projects								
TEXTBOOKS:								
1. Canter, L.R., Environmental Impact Assessment, McGraw Hill, New Delhi, 1996.								
2. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi, 1998								
3. P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006								
4. Thirumurthy A.M., Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005								
REFERENCE(S):								
1. John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995								
2. James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000								
3. World Bank, A Handbook on Roads and Environment, Vol.I and II, Washington DC, 1997								
4. Priya Ranjan Trivedi, International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, New Delhi, 1998								


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Department	CIVIL ENGINEERING				R 2019	Semester VI	OE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks
		L	T	P	C		
19CEY06	CONTRACT MANAGEMENT	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To awareness on contracts for construction industry, Impart knowledge on tender preparation, tendering process, arbitration procedure and laws, Legal requirements and Labor Regulations. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Prepare contract documents including standard and international norms. Infer the procedures of bidding and accepting of tenders. Explain the different types of property rights and patents Summarize the duties and powers of arbitrators. Choose the laws related to construction industry 							
Unit I	CONTRACTS						9
Indian Contract Act – Need – Provisions - Scope for modifications / improvement - Contract Specifications - Types of contract documents used for construction - Contract procurement - Selecting a contractor - Introduction to BOT and BOOT projects - EPC contracts.							
Unit II	TENDERS						9
Tender request For Proposals - Bids & Proposals - Bid Evaluation - Contract Conditions & Specifications - Critical /Red Flag conditions - Contract award & Notice to Proceed - Variations & Changes in Contracts - Differing site conditions - Cost escalation - Delays, Suspensions & Terminations - Wrong practices in contracting (Bid shopping, Bid fixing, Cartels).							
Unit III	LEGAL REQUIREMENTS						9
Introduction –Intellectual property - Main forms of IP- Copyright - Trademarks, Patents and designs - Secrets - Law relating to copyright in India – Ownership of copyrights and assignment - Criteria of infringement - Piracy in internet – Remedies and procedures in India - Law relating to patents under patents act - Process of obtaining patent – Application, examination, opposition and sealing of patents							
Unit IV	ARBITRATION						9
Arbitration and litigation procedure - preparation, settlement, evidence - Comparison of Actions and Laws – Agreements – Subject matter violations - Appointment of arbitrators - Conditions of arbitrations - Powers and duties of arbitrator - Enforcement of award – Costs - Arbitration and conciliation act 1996 - Case studies.							
Unit V	LAWS APPLICABLE TO CONSTRUCTION INDUSTRY						9
Industrial Disputes Act - Workmen's Compensation Act - Employer's Liability Act - Payment of Wages Act - Contract Labour Act - Minimum Wages Act - Inter-state Migrant Workmen Act - BOCW Act - other Acts introduced from time to time.							
TEXT BOOK(S):							
1.	Gajaria G.T., —Laws Relating to Building and Engineering Contracts in India, 4th Edition, M.M.Tripathi Pvt. Ltd., Bombay, 2000.						
REFERENCE(S):							
1.	Joseph T. Bockrath, —Contracts and the Legal Environment for Engineers and Architects, 7th Edition, McGraw-Hill, New York, 2010.						
2.	Jimmie Hinze, —Construction Contracts, 3rd Edition, McGraw-Hill, New York, 2010.						


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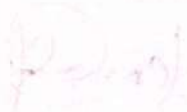
Department	OPEN ELECTIVES				R 2019	Semester VI	OE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEY07	WEALTH FROM WASTE	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To expose the students to the need of reuse and recycling of resources focusing on sustainability To emphasize the significance of energy and resource recovery from waste materials To prepare the students to design and optimize suitable resource utilization system from micro-level to macro-level 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Explain the composition and attributes of wastes and methods of resource recovery Summarize thermo-chemical conversion of energy from RDF and fuel blending Compare aerobic and anaerobic methods of resource recovery from organic wastes Interpret the principles of industrial waste management and economic feasibility for reuse and recycling Outline resource recovery options from disposable materials and disposal sites 							
Unit I	FUNDAMENTALS OF SOLID WASTE MANAGEMENT						8
Classification and sources of wastes - Factors affecting MSW generation - Properties of wastes- Waste characterization methods - Waste collection systems - Unit operations and material flow in MRF with examples - Waste management hierarchy - Waste management policy.							
Unit II	THERMOCHEMICAL CONVERSION						10
Thermo-chemical methods for energy production - Details of incineration, gasification and pyrolysis - Syngas utilization methods - Overview of RDF - Methods of fuel blending - Fuel composition and analysis - Cogeneration for CHP - Methods to improve fuel efficiency - Gas cleanup technologies - Fundamentals of densification - Carbonization for briquettes and pellets – Environmental considerations of mass burn.							
Unit III	BIOCHEMICAL CONVERSION						10
Aerobic composting - Anaerobic digestion - Design aspects of biogas plant - Landfill gas recovery system - Principles of fermentation - Concept of MFC - Trans-esterification process – Biofuel processing - Biomass gasification - Organic waste for hydrogen production.							
Unit IV	INDUSTRIAL WASTE MANAGEMENT						10
Principles of industrial waste management - Types of industrial wastes -Recycling options for plastics, paper, glass, metals, rubber and e-wastes - Partial replacement of materials in cement industry - Reuse of construction wastes - Economics of energy production from waste -Life cycle analysis - Purity of materials and market issues - Pollution control mechanisms in industries.							
Unit V	EFFECTIVE WASTE DISPOSAL						7
Municipal waste as soil conditioner and fertilizer - Wasteland development - Design aspects of landfill - Disposal options for hazardous wastes - Recovery of materials from disposal sites.							
TEXTBOOKS:							
1.	Lal, P.M. Sarma, Priyangshu M, Wealth from Waste: Trends and Technologies, 3rd Edition, The Energy and Resources Institute, New Delhi, ISBN: 9788179934241, 2011.						
2.	W. McDonough, M. Braungart, Cradle to Cradle: Remaking the Way We Make Things, United States: North Point Press, ISBN-10: 0865475873, 2002.						
3.	C. Parker, Roberts, Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, ISBN 0853343527. DOI: https://doi.org/10.1016/0167-7799(86)90131-9 , 1985.						
REFERENCE(S):							
1.	K. Shah, Basics of Solid and Hazardous Waste Management Technology, Prentice Hall, ISBN-10:						


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	0139603786, 2005.
2.	M. Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, ISBN-10: 8173191409, 1997.
3.	Begum, S., Rasul, M. G., & Akbar, D, An Investigation on Thermo Chemical Conversions of Solid Waste for Energy Recovery. World Academy of Science, Engineering and Technology, 62, 624-30. scholar.waset.org/1307-6892/9976, 2012.



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Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximu m Marks
		L	T	P	C		
19CEY08	RISK AND SAFETY MANAGEMENT	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is

- To explore the various risk and safety management for successful completion of Construction projects.

Course Outcomes: At the end of this course, learners will be able to:

- Select the basics risk assessment for industrial safety and health
- Identify hazards and its remedial measures in the construction industry
- Identify the safety measures in handling construction equipments
- Indicate the importance of environmental safety and the role of individual in prevention Of pollution
- Illustrate fire safety installation and maintenance of sprinkler installation

Unit I INTRODUCTION **9**

Risk assessment and control- Legal Basis for Risk Assessment - Hazards, remedial measures – Safety and health policy- Motivation of employees - Workplace Precautions - Management responsibilities, Individual responsibilities - Training for Safety and Health- Insurance coverage of Industrial plant & personnel.

Unit II CONSTRUCTION SAFETY CONSTRUCTION SAFETY **9**

Quality and Safety Concerns in Construction -Organizing for Quality and Safety - Work and Material Specifications - Importance of Safety during project construction - Accidents and their Causes - General precaution to hazardous atmosphere and materials - Safety facilities at construction sites - Training to project staff and operation staff - Emergency rescue equipment - Costs of Construction Injuries - Legal Implications.

Unit III SAFETY MEASURES IN HANDLING CONSTRUCTIONEQUIPMENTS **9**

General requirements of safety in concrete construction Handling of Concrete forms and shoring Safety measures for hoisting and erection of prefabricated elements OSHA (Occupational Safety and Healthy Administration) for Prestressing Operations Risk Assessment for erecting RC & Steel members Electrical safety in construction site.

Unit IV ENVIRONMENTAL SAFETY **9**

Scope and Importance of Environmental safety- Environmental impact assessment (EIA) - Environmental pollution - Sustainable development- Global warming, greenhouse effect, urbanization - Role of Government in environment protection- National Committee on environmental Planning (NCP)- Environmental Appraisal Committee (EAC) - Role of individual in prevention of pollution.

Unit V FIRE SAFETY INSTALLATION **9**

Fire extinguishing appliances -Selection requirements, installation and maintenance – Sprinkler system - Maintenance of sprinkler installation - Pressure gauges, Installation of control valves – Fire protection requirements for buildings and riser system- Fire alarm Systems, Manually operated fire alarms - Smoke detectors, Fire extinguishing appliances in multi storied buildings, hotels etc.

FURTHER READING

Safety Activities of ILO (International Labour Organisation) Job site conditions. Fire Safety installations- Fire Detector Radiation detector- Case studies on fire Hazards in the construction industry

REFERENCE(S):

1.	Risk assessment- A Practical Guide, 1993, Institution of Occupational Safety and Health, United Kingdom
2.	Rao.S and Saluja H.L., Electrical Safety, Fire Safety Engineering and Safety Management, Khanna Publishers, first edition, 1998
3.	Grundy. J. ,Construction Technology, Viva Books Pvt. Ltd., 2006
4.	R.K. Jain & Sunil S. Rao, Industrial safety health and environment Management system, Khanna Publishers, Secondedition, 2008
5.	V.K. Jain, New Age International Publishers, 2nd Edition, First Print 1996 Re-print 2002

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Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEY09	PROJECT FORMULATION AND APPRAISAL	3	0	0	3	45	100
Course Objective (s):							
<ul style="list-style-type: none"> The objective of the course is to make the students familiar with financial planning, analysis, selection, and implementation and review the capital expenditure investments. This also aims to acquaint the students with the application of mathematical and statistical tools for analyzing managerial problems in order to select the projects. 							
Course Outcomes : At the end of the course the student will be able to understand							
<ul style="list-style-type: none"> Students will be in a position to develop computer codes for any physical problems using FE techniques 							
Unit I	INTRODUCTION TO PROJECT FORMULATION, APPRAISAL AND MANAGEMENT						9
The concept of projects, Importance of project formulation, appraisal and management; reasons for shortfall in its performance; scientific management, lifecycle of project; detailed project report, and feasibility studies; techniques of financial appraisal, payback period, IRR, DCF, NPV, CBR.							
Unit II	PROJECT FORMULATIONS						9
Project formulation: definition, objectives; Stages of project formulation and their significance; Methodology for project identification and formulation; Feasibility studies, input analysis, financial cost-benefit analysis, social-cost benefit analysis; Project appraisal and report.							
Unit III	PROJECT RISK APPRAISALS						9
Types and Measures of project risk, sensitivity Analysis, Scenario Analysis, Break Even Analysis, Simulation Analysis, Decision Tree Analysis, UNIDO and little Mireless Approach							
Unit IV	PROJECT IMPLEMENTATION AND MONITORING						9
Project implementation, stages of implementation, Teamwork, actors in project implementation; Project monitoring: meaning objectives and significance; Monitoring techniques: integrated reporting, Milestones, time and cost overrun and under runs, unit index techniques.							
Unit V	PROJECT EVALUATIONS						9
Project evaluation: meaning, objectives, scope, stages, approach and steps, Life of a project; Techniques of project evaluation: input analysis, financial cost-benefit analysis, social-cost benefit analysis; case studies in urban and regional development projects.							
TEXTBOOKS:							
1.	Chandra P., 2009, Projects: Planning, Analysis, Financing, Implementation & Review, 7th Ed. Tata McGraw-Hill Publishing.						
REFERENCE(S):							
1.	Meredith J.R. & Mantel S.J., Jr., 2000, Project Management: A Managerial Approach, 4th Ed. John Wiley & Sons.						
2.	Patel B.M., 2000, Project Management: Strategic Financial Planning Examination & Control, Vikas Publishing House Pvt. Ltd.						
3.	Finnerty J. D., 1996, Project Financing: Asset-Based Financial Engineering, Wiley						
4.	Newbold C.R., 1998, Project Management in the Fast Lane: Applying Theory & Constraints, St. Lucie Press.						
5.	Diwan P., Project Management, Deep & Deep Publications						


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Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEY10	INTEGRATED WATER RESOURCE MANAGEMENT	3	0	0	3	45	100

• **Course Objective (s):**

- Students will be introduced to the role of disciplines of ecology and socio-economics play in management of water resources.
- They will be exposed to global food security and public-private participation issues and legal and regulatory settings, in the context of IWRM

Course Outcomes : At the end of the course the student will be able to understand

- There will be a paradigm shift in attitude of the students towards interdisciplinary research
- The students will gain knowledge about economic aspects of water.
- They will gain a broad understanding of the complexities of dealing with water resources• problems

Unit I | **CONTEXT FOR IWRM** | **9**

Water as a global issue: key challenges and needs – Definition of IWRM within the broader context of development – Complexity of the IWRM process – Examining the key elements of IWRM process

Unit II | **WATER ECONOMICS** | **12**

Economic view of water issues: economic characteristics of water good and services – Nonmarket monetary valuation methods – Water economic instruments, policy options for water conservation and sustainable use – Case studies. Pricing: distinction between values and charges – Private sector involvement in water resources management: PPP objectives, PPP options, PPP processes, PPP experiences through case studies – Links between PPP and IWRM

Unit III | **WATER SUPPLY AND HEALTH WITHIN THE IWRM CONSIDERATION** | **9**

Links between water and human health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Health impact assessment of water resources development.

Unit IV | **AGRICULTURE IN THE CONCEPT OF IWRM** | **10**

Water for food production: „blue“ versus „green“ water debate – Virtual water trade for achieving global water security – Irrigation efficiencies, irrigation methods and current water pricing.

Unit V | **WATER LEGAL AND REGULATORY SETTINGS** | **6**

Basic notion of law and governance: principles of international and national law in the area of water management. Understanding UN law on non-navigable uses of international water courses – Development of IWRM in line with legal and regulatory framework.

REFERENCE(S):

1. Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002
2. Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003
3. Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.
4. Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.
5. Technical Advisory Committee, Water as social and economic good: How to put the principles to practice”. Technical Advisory Committee Background paper No: 2. Global water partnership, Stockholm, Sweden, 1998.
6. Technical Advisory Committee, Effective Water Governance”. Technical Advisory Committee Background paper No: 7. Global water partnership, Stockholm, Sweden, 2003.
7. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.
8. Mollinga .P. etal “ Integrated Water Resources Management”, Water in South Asia Volume II, Sage Publications, 2006

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Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximu m Marks	
		L	T	P	C			
19CEY11	RENEWABLE ENERGY SOURCES	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is

- To get exposure on solar radiation and its environmental impact to power.
- To know about the various collectors used for storing solar energy.
- To know about the various applications in solar energy.
- To learn about the wind energy and biomass and its economic aspects.
- To know about geothermal energy with other energy sources.

Course Outcomes: At the end of this course, learners will be able to:

- Have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

Unit I INTRODUCTION 9

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data

Unit II SOLAR ENERGY COLLECTION 9

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors

Unit III SOLAR ENERGY STORAGE AND APPLICATIONS 9

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion

Unit IV WIND ENERGY 9

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

Unit V GEOTHERMAL ENERGY 9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC

TEXTBOOKS:

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell & Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011.

REFERENCE(S):

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U , "Renewable Energy Technologies", Narosa Publishing House, 2004
3. Mittal K M , "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi, 2010

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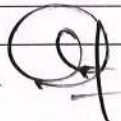
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Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximu m Marks	
		L	T	P	C			
19CEY12	ARCHITECTURE AND URBAN PLANNING	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To provide a knowledge on fundamentals of architecture and urban planning. To impart training on preparation of different types of plans, implementation and management for sustainable development 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Design buildings with respect to architectural point of view Assess and select the best urban layout plan Prepare the Environmental Impact Assessment for any civil project. Assess of the proposals with the knowledge of cost-benefit analysis Assess the management systems for development 								
Unit I	INTRODUCTION							9
Definition and classification of urban areas -Trend of urbanization -Architectural design - Integration of function and aesthetics - Planning process - Various stages of the planning process-Surveys in planning.								
Unit II	CONCEPTS OF URBAN PLANNING							9
Plans - Delineation of planning areas -Regional plan, Master plan, Structure plan, detailed development plan and Transportation Plan-Building types - Application of anthropometry and space standards - Building rules and regulations - Building services. Layout regulations Safety standards.								
Unit III	URBAN PLANNING PROCESS							9
Urban planning - Development plan - Needs, goals, and contents - Factors to be considered in development plan - collection of data - surveys - procedure for preparation - guidelines of development plan - important measures and stages of development plan. Town planning - objects - principles - necessity - forms - stages. Plan implementation - Chandigarh case study								
Unit IV	FINANCING OF PLANS							9
Plan implementation - Project evaluation - Economic evaluation [Benefit cost ratio method, Net present value and Internal rate of return - problems] - Urban Planning agencies and their functions- Financing - Public, private, Non-governmental organizations - Public participation in Planning.								
Unit V	DEVELOPMENT MANAGEMENT SYSTEMS							9
Planning standards - The basic frame work - distribution of land use - Infrastructure - Physical infrastructure - Social infrastructure - Commercial activity - variations in norms and standards by size of settlement - Development control rules - Zoning regulations - Building bye-laws.								
FOR FURTHER READINGS								
Co-ordination between urban local bodies and other functional agencies such as water supply & sewerage boards, housing boards including slum boards and planning authorities								
TEXT BOOK(S):								
1.	B. Givoni , Man Climate and Architecture , Applied Science, Barking ESSEX, 1982							
2.	VRA. Saathappan and K. Yogeshwari, Principles of Architecture, Raamalingaa Publication, 2005							
REFERENCE(S):								
1.	M. Pratap Rao, Urban Planning, CBS Publishers and Distributors, New Delhi, 2005							
2.	Gallian B Arthur and Simon Eisner, The Urban Pattern, City Planning and Design, Affiliated Press Pvt., Ltd., New Delhi, 1995							
3.	Margaret Roberts, An Introduction to Town Planning and Planning Techniques, Hutchinson, London, 1990.							
4.	Francis D.K. Ching, Architecture: Form, Space and Order, VNR, N.Y., 1999							


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Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEY13	MODERN CONSTRUCTION MATERIALS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to							
<ul style="list-style-type: none"> To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials. 							
Course Outcomes: At the end of this course, Students will be able:							
<ul style="list-style-type: none"> To have the knowledge of modern construction materials to be used in the field. 							
Unit I	SPECIAL CONCRETES						9
Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete							
Unit II	METALS						9
Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.							
Unit III	COMPOSITES						9
Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.							
Unit IV	OTHER MATERIALS						9
Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.							
Unit V	SMART AND INTELLIGENT MATERIALS						9
Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.							
TEXT BOOK(S):							
1. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005							
2. Santhakumar.A.R., Concrete Technology, Oxford University press, New Delhi, 2005.							
REFERENCE(S):							
1. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.							
2. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001							
3. ACI Report 440.2R-02, "Guide for the design and construction of externally bonded RPs systems for strengthening concrete structures", American Concrete Institute, 2002.							
4. Ashby, M.F. and Jones.D.R.H.H. "Engineering Materials 1: An introduction to Properties, applications and designs", Elsevier Publications, 2005.							
5. Ganapathy, C., Modern Construction Materials, Eswar Press, 2015							

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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX01	HYDROLOGY	3	0	0	3	45	100

Course Objective (s):

- To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.

Course Outcomes:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flow

Unit I	PRECIPITATION	8
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.		
Unit II	ABSTRACTION FROM PRECIPITATION	10
Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall		
Unit III	HYDROGRAPHS	10
Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph		
Unit IV	FLOODS AND FLOOD ROUTING	9
Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control		
Unit V	GROUND WATER HYDROLOGY	9
Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis Only		
TEXTBOOKS:		
1.	Subramanya, K., "Engineering Hydrology", Tata McGraw Hill Publishing Co., Ltd., 2000	
2.	Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000	
3.	Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 2008.	
4.	Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013.	
REFERENCE(S):		
1.	Chow, V.T. and Maidment D.R. , "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000.	
2.	Singh, V.P., "Hydrology", McGraw Hill Inc., Ltd., 2000.	

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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX02	HIGHWAY ENGINEERING	3	0	0	3	45	100

Course Objective (s):

- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods

Course Outcomes:

- To get knowledge on planning and aligning of highway. Geometric design of highways
- To Design flexible and rigid pavements.
- To Gain knowledge on Highway construction materials, properties, testing methods
- To understand the concept of pavement management system, evaluation of distress and maintenance of pavements.

Unit I	HIGHWAY PLANNING AND ALIGNMENT	8
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Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads

Unit II	GEOMETRIC DESIGN OF HIGHWAYS	10
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Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

Unit III	DESIGN OF FLEXIBLE AND RIGID PAVEMENTS	10
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Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design

Unit IV	HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE	9
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Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures - Highway drainage — Construction machineries.

Unit V	EVALUATION AND MAINTENANCE OF PAVEMENTS	9
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Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation

TEXTBOOKS:

1.	Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014
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REFERENCE(S):

1.	Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010
2.	Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013
3.	Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37-2012


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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX03	TOTAL STATION AND GPS SURVEYING	3	0	0	3	45	100

Course Objective (s):

- To understand the working of Total Station equipment and solve the surveying problems

Course Outcomes: At the end of the course the student will be able to understand

- Working principles of total station and GPS instruments
- Propagation of EMR through atmosphere and corrections for its effects
- The functioning various types total station and GPS equipments and their applications
- Various techniques available for surveying and mapping with total station and GP

Unit I	FUNDAMENTALS OF TOTAL STATION ANDELECTROMAGNETIC WAVES	8
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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 and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient Conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index-Second velocity correction - Total atmospheric correction- Use of temperature - pressure transducers.

Unit II	ELECTRO-OPTICAL AND MICROWAVE SYSTEM	10
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Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments – Traversing and Trilateration-COGO functions, offsets and stake out-land survey applications.

Unit III	SATELLITE SYSTEM	10
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Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler's Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept –GNSS, 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.

Unit IV	GPS DATA PROCESSING	9
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GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules -solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

Unit V	HYDROGRAPHIC, MINE AND CADASTRAL SURVEYING	8
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Reconnaissance – Route surveys for highways, railways and waterways – Hydrographic survey- Tides – MSL – Sounding methods – Three point problem – River surveys – Measurement of current and discharge – Mine surveying Equipment – Weisbach triangle – Tunnel alignment and settingout-Transferofazimuth-GyroTheodolite-Shaftsandaudits-Cadastralsurvey-Legal – Real – Taxcadastre – Land record system – Settlement procedure – deformation studies

TEXTBOOKS:

1.	Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996
2.	SatheeshGopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2007 isbn: 978-81317 00679


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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX04	DISASTER MANAGEMENT	3	0	0	3	45	100

Course Objective (s):

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

Course Outcomes: At the end of the course the student will be able to understand

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management

Unit I	INTRODUCTION TO DISASTERS	9
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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

Unit II	APPROACHES TO DISASTER RISK REDUCTION (DRR)	9
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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 stake- holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

Unit III	INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT	9
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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..

Unit IV	DISASTER RISK MANAGEMENT IN INDIA	9
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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, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Unit V	DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS	9
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Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, 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.

TEXTBOOKS:

- | | |
|----|--|
| 1. | Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13:978-9380386423 |
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2.	Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13:978-1259007361]
3.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4.	KapurAnu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi,2010.
REFERENCE(S):	
1.	Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2.	Government of India, National Disaster ManagementPolicy,2009.

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Department	CIVIL ENGINEERING					R 2019	Semester V	PE
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX05	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

- Exposed to various problems associated with soil deposits and methods to evaluate them.
- The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

Course Outcomes: At the end of this course, learners will be able to:

- Gain knowledge on methods and selection of ground improvement techniques.
- Understand dewatering techniques and design for simple cases.
- Get knowledge on insitu treatment of cohesionless and cohesive soils.
- Understand the concept of earth reinforcement and design of reinforced earth.
- Get to know types of grouts and grouting technique.

Unit I **PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES** **8**

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

Unit II **DEWATERING** **10**

Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

Unit III **INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS** **10**

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction - Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles- Installation techniques – Simple design - Relative merits of above methods and their limitations.

Unit IV **EARTH REINFORCEMENT** **9**

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

Unit V **GROUTING TECHNIQUES** **8**

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil

TEXTBOOKS:

1. Purushothama Raj. P, "Ground Improvement Techniques", Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
3. Nihar Ranjan Patra, "Ground Improvement Techniques", Vikas Publishing House, First Edition, 2012.
4. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, First Edition, 2013.

REFERENCE(S):

1. Moseley, M.P and Kirsch. K., 'Ground Improvement", Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.
2. Moseley, M.P and Kirsch. K., 'Ground Improvement", Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.
3. Jones C.J.F.P. "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 1996.
4. Winterkorn, H.F. and Fang, H.Y. "Foundation Engineering Hand Book". Van Nostrand Reinhold, 1994.


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5.	Das, B.M., "Principles of Foundation Engineering" (seventh edition), Cengage learning, 2010.
6.	Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2011.
7.	Koerner, R.M., "Designing with Geosynthetics" (Sixth Edition), Xlibris Corporation, U.S.A, 2012.
8.	IS Code 9759 : 1981 (Reaffirmed 1998) "Guidelines for Dewatering During Construction", Bureau of Indian Standards, New Delhi
9.	IS Code 15284 (Part 1): 2003 "Design and Construction for Ground Improvement – Guidelines" (Stone Column), Bureau of Indian Standards, New Delhi.

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Department	CIVIL ENGINEERING					R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX06	TRAFFIC ENGINEERING AND MANAGEMENT	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well. 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Analyze traffic problems and plan for traffic systems various uses Design Channels, Intersections, signals and parking arrangements Develop Traffic management Systems 								
Unit I	TRAFFIC PLANNING AND CHARACTERISTICS							9
Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.								
Unit II	TRAFFIC SURVEYS							10
Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.								
Unit III	TRAFFIC DESIGN AND VISUAL AIDS							10
Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals – Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.								
Unit IV	TRAFFIC SAFETY AND ENVIRONMENT							8
Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport								
Unit V	TRAFFIC MANAGEMENT							8
Area Traffic Management System - Traffic System Management (TSM) with IRC standards – Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies Intelligent Transport System for traffic management, enforcement and education.								
TEXTBOOKS:								
1.	Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013							
2.	Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.							
3.	Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. 1996.							
REFERENCE(S):								
1.	Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011							
2.	arber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010							
3.	SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994							
4.	John E Tyworth, "Traffic Management Planning, Operations and control", Addison Westy Publishing							


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	Company, 1996
5.	Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005
6.	Taylor MAP and Young W, "Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.

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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX07	REMOTE SENSING AND GIS	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is to

- To deliver the fundamental principles of Remote Sensing and its limitations'
- To impart training on the image Interpretation and Analysis
- To develop the GIS modeling techniques and application.

Course Outcomes: At the end of this course, learners will be able to:

- Identify the properties of sun energy radiations, its interactions with the atmosphere and with the objects on earth surface
- Interpret the data from Images through acquisition, storage, manipulation, analysis and display of satellite data
- Integrate Remote Sensing and GIS to perform raster and vector data analysis.
- Extrapolate the database concepts of GIS for the development of design specifications for developing and improving the imagery by selecting suitable data models
- Apply the principles and concepts of remote sensing and GIS techniques for some important application

Unit I	FUNDAMENTALS OF REMOTE SENSING	9
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Definition and History of remote sensing - Indian Space Programs - Elements of remote sensing - Electromagnetic spectrum - Wavelength regions important to remote sensing - Particle and Wave theory - Stefan-Boltzman and Wein's Laws - Atmospheric scattering and absorption - Atmospheric windows-Concept of Spectral Response and Spectral Signature - Spectral reflectance of EMR with earth surface - water, vegetation and soil - Platforms and Sensors.

Unit II	IMAGE INTERPRETATION AND ANALYSIS	9
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Concept and types of image interpretation - Basic elements of image interpretation - Visual interpretation keys - Types of Data Products - Digital Image Processing - Pre-processing - Image compression and enhancement techniques - Multispectral Image classification - Supervised and unsupervised

Unit III	GEOGRAPHICAL INFORMATION SYSTEM AND ITS ANALYSIS	9
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GIS definition - Basic components of GIS - Data types - Spatial and non-spatial data - Raster and Vector Data - Analysis and structure of Raster and Vector data - Maps - Map projections - Types of map projections-Concept of GPS and its advantages.

Unit IV	DATA INPUT, EDITING AND ANALYSIS	9
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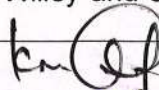
Input methods - Data stream - Data Retrieval - Query Building - Simple Spatial Analysis - Overlay Technique - Topological analysis - Modeling surfaces-TIN -DEM - DTM - Slope Model - Integration of Remote Sensing and GIS.

Unit V	MAJOR APPLICATIONS OF REMOTE SENSING AND GIS	9
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Natural Resources Management - Land Cover and Land Use - Water Resources and Watershed management - Irrigation and Agriculture - Environmental studies - Ground Water exploration - Wasteland Management-Forest Resources- Natural Disaster Management- Land Slides, Flood Routing, Forest Fires, Earth Quakes

REFERENCE(S):

1.	M. Anji Reddy, Remote sensing and Geographical Information Systems, Third Edition, BS Publications, India, 2006.
2.	Basudeb Bhatta, Remote Sensing and GIS, Second Edition, Oxford University Press, New Delhi, 2017.
3.	Kali Charan Sahu, A Text Book of Remote Sensing and Geographical Information Systems, Kindle Edition, Atlantic Publishers and Distributers (P) Ltd, New Delhi, 2008.
4.	T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image interpretation, John Willey and sons, inc. New York, 2002.


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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/ Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX08	AIR POLLUTION AND CONTROL ENGINEERING	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is to

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends

Course Outcomes: At the end of this course, learners will be able to:

- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures..

Unit I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants

Unit II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

Unit III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

Unit IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

Unit V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures

TEXTBOOKS:

- Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004
- Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017
- Anjaneyulu. Y, "Air Pollution and Control Technologies" , Allied Publishers (P) Ltd., India 2002.

REFERENCE(S):

- David H.F. Liu, Bela G. Liptak, "Air Pollution", Lewis Publishers, 2000.
- Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
- Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000
- M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.
- C.S.Rao, "Environmental Pollution Control Engineering", New Age International(P) Limited Publishers,2006


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Department	CIVIL ENGINEERING				R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit C	Total Hours	Maximum Marks
		L	T	P			
19CEX09	RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING	3	0	0	3	45	100

Course Objective (s):

To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and harbor

Course Outcomes: Students who successfully complete this course will be able to:

- Understand the methods of route alignment and design elements in Railway Planning and Constructions.
- Understand the Construction techniques and Maintenance of Track laying and Railway stations.
- Gain an insight on the planning and site selection of Airport Planning and design.
- Analyze and design the elements for orientation of runways and passenger facility systems.
- Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted

Unit I	RAILWAY PLANNING AND CONSTRUCTION	9
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Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves-Level Crossings.

Unit II	RAILWAY CONSTRUCTION AND MAINTENANCE	9
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Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities-Signalling

Unit III	AIRPORT PLANNING	9
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Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

Unit IV	AIRPORT DESIGN	9
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Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings

Unit V	HARBOUR ENGINEERING	9
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Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011

TEXTBOOKS:

1.	Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications (India), Chennai, 2010
2.	Saxena Subhash, C. and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998
3.	Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 1994

REFERENCE(S):

1.	Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015.
2.	Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013


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Department	CIVIL ENGINEERING					R 2019	Semester V	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX10	MUNICIPAL SOLID WASTE MANAGEMENT	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> • Make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste. 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> • Understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management. • Reduction, reuse and recycling of waste. • Ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste. • Knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context. • Design and operation of sanitary landfill 								
Unit I	SOURCES AND CHARACTERISTICS						9	
Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) – Role of public and NGO"s- Public Private participation – Elements of Municipal Solid Waste Management Plan.								
Unit II	SOURCE REDUCTION , WASTE STORAGE AND RECYCLING						8	
Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes								
Unit III	COLLECTION AND TRANSFER OF WASTES						8	
Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.								
Unit IV	PROCESSING OF WASTES						12	
Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions								
Unit V	WASTE DISPOSAL						8	
Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation								
TEXTBOOKS:								
1.	William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.							
2.	John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York							
REFERENCE(S):								
1.	CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi.							
2.	George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste management, McGraw Hill, New York.							


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Department	CIVIL ENGINEERING					R 2019	Semester VI	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX11	SUSTAINABLE CONSTRUCTION METHODS	3	0	0	3	45	100	

Course Objective (s): The purpose of learning this course is to

- To understand the concept of Energy.
- To study the building materials and its impact on environment.
- To provide an insight into various Energy Efficient Materials and Sustainable Construction Technology.

Course Outcomes: At the end of this course, learners will be able to:

- To Insight on environmental impact of building materials.
- To Understanding of building materials and construction techniques that are sustainable and energy efficient

Unit I ENVIRONMENTAL IMPACT OF BUILDING MATERIALS 8

Measuring the impact of building materials; calculating embodied energy, recycling and embodied energy, processing and embodied energy, time and embodied energy, embodied energy of different building materials, low energy building and masonry materials, life cycle and analysis (life cycle analysis can be after embodied energy); Case studies and analysis.

Unit II RECYCLABLE AND RENEWABLE MATERIALS 10

Concept of Recyclable materials – Sustainable Building Materials – Life Cycle Design of Materials – Biodegradable & Non-Biodegradable Materials – Green rating and Building Materials — Concept of Resource reuse, Recycled content, Regional materials, Rapidly renewable materials – Fly ash bricks, Cement – Recycled Steel, Bamboo based products .

Unit III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 10

Indoor environmental quality – issues and causes, components of integrated design – emissions from building materials. Construction operations – site planning, indoor air quality during construction – materials management – Construction and Demolition – waste management – building commissioning – LEED credits for different aspects. Green building economics – quantifying benefits. Recent advances in sustainable construction.

Unit IV SUSTAINABLE CONSTRUCTION 9

Design issues relating to sustainable development including site and ecology, community and culture, health, materials, energy, and water- Domestic and Community buildings using self-help techniques of construction; adaptation, repair and management.-.portable architecture

Unit V ENERGY EFFICIENT TECHNOLOGIES 9

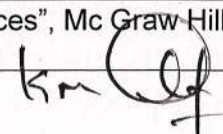
Energy Efficient Construction Technology – Filler Slab – Rat trap Bond – Technologies developed by CBRI Traditional Building Construction Technologies – Introduction to other Technological interventions to save Energy – Intelligent Buildings – Energy Conservation through Technological intervention – Saving Energy used for lighting by design innovation – Case studies.

TEXTBOOKS:

1. Bansal Naveendra K., Hauser Gerd and Minke Gernot, "Passive Buildings Designs : Handbook of Natural Climatic Control", Elsevier Science, Amsterdam, 1997.

REFERENCE(S):

1. Koenigsberger O.H, T.G. Inger Soll, "Manual of tropical Housing and Building" Longman Group United Kingdom, 2012.
 2. Givonji B., "Man, Climate and Architecture", Elsevier, Amsterdam, 1986.
 3. Watson Donald, 'Climatic Design: Energy Efficient Building Principles & Practices", Mc Graw Hill Book company, New York, 1993.



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Department	CIVIL ENGINEERING				R 2019	Semester VI	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX12	INDUSTRIAL STRUCTURES	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To impart knowledge on classification of industries and their functional requirements To familiarise the students on the design of silos, bunkers and chimneys To impart knowledge on the transmission structures 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> To impart knowledge on the transmission structures Demonstrate the functional requirements for any industry Design of industrial RC and steel structures Design Foundation for industries Analyze the materials in pre-engineered concept 							
Unit I	PLANNING						7
Classification of Industries and Industrial Structures -Specific requirements for Industries like Engineering, Textiles, Chemicals, steel and cement. Site layout and external facilities required.							
Unit II	FUNCTIONAL REQUIREMENTS						8
Natural and artificial lighting - Electrical wiring fixtures - Electrical installations - substations - Effluent disposal - Fire expanse and chutes - fire alarm, extinguishers and hydrants - Guidelines from factories act. Heating and Ventilation - Air conditioning							
Unit III	INDUSTRIAL BUILDINGS						12
Design and detailing of bunkers, silos, chimneys, Gantry Girders-principles of folded plates and shell roofs							
Unit IV	FOUNDATION FOR INDUSTRIAL STRUCTURES						10
Types of Machine Foundations and their design-Foundations for RC and steel chimneys							
Unit V	PRE ENGINEERED BUILDINGS						8
Introduction-Advantages and Disadvantages-Primary and secondary structural elements-foundation wall materials- metal roofing.							
TEXT BOOK(S):							
1. N. Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers and Distributors,2008							
2. P. Dayaratnam, Deign of steel structures, A.H. Wheeler & Co., Ltd., Allahabad, 2008							
REFERENCE(S):							
1. IS :4998 (part 1)'Indian Standard Practice for Design of Reinforced Concrete Chimneys IS: 4995 (part 1 and part 2)criteria for design of reinforced concrete bins for storage of granular and powdery materials							
2. IS: 3483 code of practice for noise Reduction in industrial buildings.							
3. IS: 6060 code of practice for daylighting of factory buildings SP32-1986, Hand book on Functional requirements of Industrial Buildings. 1995							
4. Henn W, Buildings for Industry, Vol I & II, London Hill							
5. S. N. Manokar, Tall Chimneys, Design and Construction, Tata McGraw Hill, 1986							

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Department	CIVIL ENGINEERING				R 2019	Semester VI	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX13	PRESTRESSED CONCRETE STRUCTURES	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear. 							
Course Outcomes: At the end of the course the student will be able to understand <ul style="list-style-type: none"> Student shall have a knowledge on methods of prestressing and able to design various prestressed concrete structural elements. 							
Unit I	INTRODUCTION – THEORY AND BEHAVIOUR						9
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 – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of prestress – Estimation of crack width.							
Unit II	DESIGN FOR FLEXURE AND SHEAR						9
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.							
Unit III	DEFLECTION AND DESIGN OF ANCHORAGE ZONE						9
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.							
Unit IV	COMPOSITE BEAMS AND CONTINUOUS BEAMS						9
Analysis and design 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.							
Unit V	MISCELLANEOUS STRUCTURES						9
Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.							
TEXTBOOKS:							
1.	Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012						
2.	Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributors Pvt. Ltd, 2012..						
REFERENCE(S):							
1.	Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.						
2.	Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013						
3.	Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013						
4.	IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012						


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Department	CIVIL ENGINEERING				R 2019	Semester VI	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX14	CONSTRUCTION PLANNING AND SCHEDULING	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is to

- Learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

Course Outcomes: At the end of this course, learners will be able to:

- Understand basic concepts of construction planning.
- Schedule the construction activities.
- Forecast and control the cost in a construction.
- Understand the quality control and safety during construction.
- Organize information in Centralized database Management systems

Unit I	CONSTRUCTION PLANNING	6
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Basic concepts in the development of construction plans-Choice of Technology and Construction method-Defining Work Tasks- Work breakdown structure- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems.

Unit II	SCHEDULING PROCEDURES AND TECHNIQUES	12
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Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads,lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations- Crashing and time/cost tradeoffs -Improving the Scheduling process – Introduction to application software.

Unit III	COST CONTROL MONITORING AND ACCOUNTING	9
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The cost control problem-The project budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

Unit IV	QUALITY CONTROL AND SAFETY DURING CONSTRUCTION	9
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Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

Unit V	ORGANIZATION AND USE OF PROJECT INFORMATION	9
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Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow

TEXTBOOKS:

1.	Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2.	Srinath,L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

REFERENCE(S):

1.	Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh,2000.
2.	Moder.J., Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
3.	Willis., E.M., "Scheduling Construction projects", John Wiley and Sons, 1986.
4.	Halpin,D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.


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Department	CIVIL ENGINEERING				R 2019	Semester VI	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX15	BUILDING SERVICES	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is

- To understand how a building can be made comfortable and safe with the services designed and installed
- To impart knowledge on basics of electrical wiring system
- To recognize the importance of fire detection and protection

Course Outcomes: At the end of this course, learners will be able to:

- Analyze the features of service machineries required for a building
- Identify suitable electrical system and accessories to be installed during the construction of a building.
- Identify the principles of illumination and Artificial light sources
- Illustrate the working principle of Refrigerants and Air conditioning systems
- Analyze the characteristics of fire safety equipments for different type of buildings

Unit I MACHINERIES **9**

Lifts and Escalators -Special features required for physically handicapped and elderly -DC/AC motors-Generators -Single / Three phase supply- Solar panels their installation and applications- Conveyors-Vibrators-Hot water boilers

Unit II ELECTRICAL SYSTEMS IN BUILDINGS **9**

Basics of electricity - Protective devices in electrical installations - Lightning arrester - Earthing- Types of earthing - ISI specifications - Types of wires, wiring systems - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears.

Unit III PRINCIPLES OF ILLUMINATION **9**

Visual tasks - Factors affecting visual tasks - Synthesis of light - Additive and subtractive synthesis of colour - Luminous flux - Candela - Solid angle illumination - Utilisation factor - Depreciation factor - MSCP - MHCP - Laws of illumination - Classification of lighting - Artificial light sources – LED lightings - Daylight factor- Luminous efficiency - Colour temperature - Colour rendering - Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types - Specifications of National Building Code of India

Unit IV REFRIGERATION PRINCIPLES **9**

Thermodynamics - Heat - Temperature - Change of state -Sensible heat - Latent heat of fusion, evaporation, sublimation - Saturation temperature - Super heated vapour - Subcooled liquid - Refrigerants - Vapour compression cycle - Starters - Air handling units -Water piping - Window type and packaged air-conditioners - Chilled water plant- Vapour Absorption Machine(VAM) – Air conditioning systems for different types of buildings

Unit V FIRE SAFETY INSTALLATION **9**

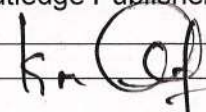
Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like noncombustible materials, construction, staircases and lift lobbies, fire escapes systems - Special features required for physically handicapped and elderly in building types - Heat and smoke detectors – Fire Fighting pump and water storage - Dry and wet risers - Automatic sprinklers-Fire fighting layout

TEXT BOOK(S):

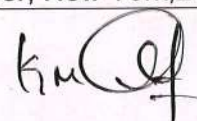
1. J. Killinger and L. Killinger, Heating and Cooling Essentials, Goodheart-Wilcox Publishers, 2003.
2. Electrical Safety, Fire Safety Engineering and Safety Management, Reprint, 2016, S.Rao & Prof. H.L.Saluja
3. ASHRAE, Fundamentals and Equipment, ASHRAE Inc., 2005

REFERENCE(S):

1. SP 7 (2005): National Building Code of India 2005.
2. Roger Greeno and Fred Hall, Building Services Handbook (8th edition), Routledge Publishers, 2015.
3. G. Steffy, Architectural Lighting Design, John Wiley and Sons, 2008


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Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX16	SAFETY IN CONSTRUCTION PRACTICES	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> The students will be well-versed with the latest safety and health regulations and the Indian Standards Also applicable to the construction Industry. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Explain the role of safety in construction site Illustrate the causes and effects of construction accidents Make use of site safety programs at construction site Identify the hazards in construction projects Apply construction safety management at site 							
Unit I	INTRODUCTION TO CONSTRUCTION SAFETY						9
History of safety in construction – Safety thinking and Practices – Terminologies used in safety-types of injuries- safety pyramid- Accident patterns-theories of accidents -Role of top management and workers in construction safety.							
Unit II	PLANNING FOR SAFETY						9
Introduction to OSHA regulations – causes and effects of accidents at site - Safety personnel -safety budget - safety culture –planning for PPE - Role of stakeholders in safety- Workers' compensation Act.							
Unit III	SITE SAFETY PROGRAMS						9
SOP (Safe Operating Procedures) – Construction equipment- materials handling-disposal - hand tools- Safety during construction - alteration - demolition works							
Unit IV	HAZARDS IN CONSTRUCTION PROJECTS						9
Job Safety Analysis(JSA)-Job hazard analysis(JHA)—Health hazards—Fatalities and Injuries Hazard and Prevention Act—Precautionary Measures-Hazard Management-Accident investigation-Accident indices—Violation—Penalty							
Unit V	CONSTRUCTION SAFETY MANAGEMENT						9
Introduction- Safety in construction operations -Project coordination and safety procedures Ergonomics – MSD (Musculoskeletal Disorders) – Causes and Remedies – preventive methods – Role of BIM in safety							
TEXT BOOK(S):							
1.	S.K.Bhatta charjee, "Safety Management in Construction",1st Edition, Khanna Publishers, New Delhi,2011						
REFERENCE(S):							
1.	Stefan Mordue & Roland Finch, —BIM for Construction Health and Safety ll 1st Edition, NBS Publications, Philippines,2014						
2.	Rita Yi Man Li & Sun Wah Poon, —Construction Safety ll ,1st Edition, Springer, New York,2013						

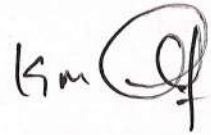


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Department	CIVIL ENGINEERING					R 2019	Semester VII	PE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX17	HOUSING PLANNING AND MANAGEMENT	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To train the students to have a comprehensive knowledge of housing projects. To give awareness about the existing housing programmes. To train the students to do the planning and design of housing projects To give exposure on cost effective construction materials and methods. To train the students to perform the project appraisal of housing projects. 								
Course Outcomes: At the end of this course, Students will be able to: <ul style="list-style-type: none"> Plan and design the housing projects as per regulations Design the various housing programme with sustainability concepts Formulate and design the housing layouts by conducting site analysis Evaluate the suitability of various cost-effective construction materials. Perform the economic analysis-based project appraisal of housing projects. 								
Unit I	INTRODUCTION TO HOUSING							9
Definition of Basic Terms - House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing- Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.								
Unit II	HOUSING PROGRAMMES							9
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 - Use of GIS and MIS in Slum Housing Projects, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing - Role of Non - Government Organizations in slum housing.								
Unit III	PLANNING AND DESIGN OF HOUSING PROJECTS							9
Formulation of Housing Projects - Land Use and Soil suitability analysis - Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Designs of Housing Units (Design Problems) - Housing Project Formulation.								
Unit IV	CONSTRUCTION TECHNIQUES AND COST EFFECTIVE MATERIALS							9
New Constructions Techniques - Cost Effective Modern Materials and methods of Construction - Green building concept- Building Centers - Concept, Functions and Performance Evaluation.								
Unit V	HOUSING FINANCE AND PROJECT APPRAISAL							9
Evaluation of Housing Projects for sustainable principles - Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy - Public Private Partnership Projects - Viability Gap Funding - Pricing of Housing Units (Problems).								
TEXT BOOK(S):								
1.	Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 2000.							
2.	Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 2001.							
REFERENCE(S):								
1.	Wiley- Blackwell, "Neufert Architects" Data, 4th ed., Blackwell Publishing Ltd, 2012							
2.	Donald Watson and Michael J. Crosbie, "Time Saver Standards for Architectural Design", 8th ed., Tata McGraw Hill ed., 2011							
3.	Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd ed., USA 2010							


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4.	Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004
5.	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994



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Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX18	PUBLIC TRANSPORTATION SYSTEMS	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is to

- To impart knowledge on public transportation systems and planning

Course Outcomes: At the end of this course, learners will be able to:

- To summarize different modes of public transport and its characteristics
- To explain the types of rail transit system and its development in India
- To illustrate rail transit planning system, routing and scheduling
- To infer the transit management techniques and finance
- To interpret the coordination of public transport system and financing

Unit I	INTRODUCTION	8
Modes of public transport and comparison - Public transport travel characteristics - Prioritization of public transport -Technology of bus, rail, rapid transit systems – Transit classification – Right of way – Transit system performance – Transit capacity – Quality of service		
Unit II	RAIL TRANSIT SYSTEM	10
Rail transport – Types of rail transit - Suburban commuter rail - rapid rail transit – Light rail transit – Monorail system – Growth of rail based transit systems – Rail transit system development in Indian cities		
Unit III	RAIL TRANSIT PLANNING	10
Transit system operations – Para-Transit systems – Street transit systems – Rapid transit systems – Estimation of transit demand - Route development – Properties of routing stop location and stopping policy – Schedule		
Unit IV	BUS TRANSIT MANAGEMENT	9
Bus transport –Characteristics – Types of buses –Bus transit management – Estimation of the required fleet strength – Bus route planning - Expansion/Curtailment of services – Performance indicators – Fleet management – Methods of financing		
Unit V	COORDINATION OF PUBLIC TRANSPORT & PARKING	9
Need for coordination – Selection of transit mode – Public transport financing – Transit fare structures – Transit marketing - Intermodal transfer – Parking problems – Impact of parking – Parking space requirements – Parking standards		

TEXTBOOKS:

- L. R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna Publishers, 9th Edition, 2018

REFERENCE(S):

- G.V.Rao "Principles of Transportation and Highway Engineering" Tata McGraw-Hill Publishing Co. Ltd, 5th Edition, 2012
- P.Chakroborty & A. Das, Principles of Transportation Engineering , 6th Edition Prentice Hall India Learning Private Limited, 2nd Edition 2003


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Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX19	BRIDGE ENGINEERING	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To learn the components of bridges, classification of bridges, importance of bridges. 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> To be familiar with the components of bridges, classification of bridges, importance of bridges. To identify the specification of road bridges, loads to be considered. To be familiar with various types of bridges such as slab-bridge, T-beam bridge, pre-stressed concrete bridge, continuous bridge, arch bridge, box girder bridge decks. To analysis the various bridges-piers and abutments. To get exposed to evaluation of sub structures, type of foundations, importance of bearings, lessons from bridge failures. 							
Unit I	INTRODUCTION						8
Components of Bridges - Classification - Importance of Bridges - Investigation for Bridges - Selection of Bridge site - Economical span - Location of piers and abutments - Subsoil exploration - Scour depth - Traffic projection - Choice of bridge type							
Unit II	SPECIFICATION OF BRIDGES						9
Specification of road bridges - width of carriageway - loads to be considered - dead load – IRC standard live load - Impact effect.							
Unit III	DESIGN OF BRIDGES						10
General design considerations - Slab Bridge - Design of T-beam bridge - Prestressed concrete bridge - continuous bridge - Arch Bridge - Box girder bridge decks.							
Unit IV	ANALYSIS OF BRIDGES						9
Evaluation of sub structures - Pier and abutments caps - Design of pier - Abutments - Type of foundations.							
Unit V	BEARING AND JOINTS OF BRIDGES						9
Importance of Bearings - Bearings for slab bridges - Bearings for girder bridges – Electrometric bearing - Joints - Expansion joints. Construction and Maintenance of bridges - Lessons from bridge failures.							
FOR FURTHER READING							
Bridge failures and rehabilitation process							
TEXT BOOK(S):							
1. Ponnuswamy, S., Bridge Engineering, Tata McGraw-Hill, New Delhi, 1997.							
2. Victor, D. J., Essentials of Bridge Engineering, Oxford and IBH Publishers Co., New Delhi, 1980							
REFERENCE(S):							
1. N. Rajagopalan, Bridge Superstructure, Narosa Publishing House, New Delhi, 2006.							
2. Jagadeesh. T. R. and Jayaram. M. A., Design of Bridge Structures, Prentice Hall of India Pvt. Ltd., 2004.							
3. Raina. V. K., Concrete Bridge Practice, Tata McGraw Hill Publishing Company, New Delhi, 1991.							

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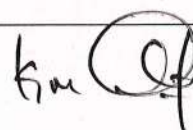
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19CEX19 - 19CEX19

Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX20	DESIGN OF TIMBER, MASONRY AND STEEL ELEMENTS	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is <ul style="list-style-type: none"> To impart basic knowledge on the application and maintenance of timber structures To outline the design aspects of timber and masonry structures To illustrate the need of timber and masonry structures 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Identify the choice of materials for structural elements Estimate the strength and connections of timber beams Design of masonry column and analyse the stability Analyse and Design of different types of masonry wall Analyse and Design of different types of concrete block wall 							
Unit I	CONCEPTS OF TIMBER STRUCTURES						9
General - Factors affecting strength of timber - Permissible stresses - Bearing stress - Live load for design - Code of practice - Choice between different structural materials - Masonry, timber, concrete and steel - Types of loads - Dead load - Live load - Wind load - earthquake load - Maintenance of Timber Structure.							
Unit II	DESIGN OF TIMBER STRUCTURES						9
Design of beams for strength and stiffness as per BIS code - Design of rectangular beams - Design of tension members - Design of compression members of solid and box sections - Design of bolted and nailed connections - Design of timber joists - Allowable stresses in tension, compression and flexure - Types of joints with nails and bolts.							
Unit III	DESIGN OF BRICK MASONRY COLUMN						9
Mix proportions - compressive strength of mortars - basic compressive stress - shape factor for masonry units - stability of piers and walls - design as per IS Codes - Design of permissible compressive stresses in masonry - Design of masonry column subjected to axial and eccentric loading.							
Unit IV	DESIGN OF MASONRY WALL						9
Types of walls - Design of solid load bearing wall for axial loads - Design of solid load bearing wall for eccentric loads - Design of wall with opening - Design of cavity wall - Design of stiffened and unstiffened wall							
Unit V	DESIGN OF CONCRETE BLOCK MASONRY						9
Materials Concrete blocks - Light weight blocks - AAC Blocks - Hollow Blocks as per IS 2185 - Size of the Hollow blocks - Methods of Manufacturing Hollow Blocks - Tests on Hollow Blocks - Design and Construction of Hollow Block Masonry Walls.							
TEXT BOOK(S):							
1.	A.S. Arya, Design of Masonry and Timber Structures, Nemchand and Bros. Publishing, 2007						
2.	P. Dayaratnam, Brick and Reinforced Brick Structures, Oxford & IBH Publishing Co. Pvt. Ltd, 1997						
3.	B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Design of steel structures, Laxmi Publications (P) Ltd, 2007						
REFERENCE(S):							
1.	W. M. C McKenzie, Design of Structural Elements, Macmillan Publishers, 2010						
2.	IS: 1905 - 1980, Indian Standard Code of Practice for Structural Safety of Buildings, Masonry Walls, Indian Standards Institution, 1981						
3.	IS: 883 - 1994, Code of Practice for Design of Structural Timber in Buildings, BIS New Delhi						


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Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX21	INDUSTRIAL WASTEWATER MANAGEMENT	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> An insight into the pollution from major industries including the sources and characteristics of pollutants Ability to plan minimization of industrial wastes Ability to design facilities for the processing and reclamation of industrial wastewater 							
Unit I	INTRODUCTION						8
Sources and characteristics of various industrial, process and wastes – Population equivalent – Effects of industrial effluents on streams, sewer, land, sewage treatment plants and on human health – Environmental legislations and standards related to prevention and control of industrial pollution and hazardous wastes.							
Unit II	CLEANER PRODUCTION						8
Volume reduction - Strength reduction - Material and process modifications - Recycle, reuse and byproduct recovery – Applications – Waste minimization							
Unit III	TREATMENT TECHNOLOGIES						11
Equalisation - Neutralisation - Removal of suspended, floating and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganic - Combined treatment of industrial and municipal wastes - Residue management - Dewatering – Disposal.							
Unit IV	POLLUTION FROM MAJOR INDUSTRIES						9
Sources - Characteristics - Waste treatment flow charts for selected industries such as Textiles - Tanneries - Pharmaceuticals - Electroplating industries - Dairy - Sugar - Paper - distilleries - Steel plants – Refineries – Fertilizer - thermal power plants - Wastewater reclamation and reuse concepts.							
Unit V	HAZARDOUS WASTE MANAGEMENT						9
Hazardous wastes – Types – Sources - Collection - Physico chemical treatment – Solidification –Incineration – Secured landfills.							
TEXTBOOKS:							
1.	M.N. Rao & A. K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.						
2.	Eckenfelder W.W. Jr., "Industrial Water Pollution Control", McGraw Hill Book Company, New Delhi, 2000.						
3.	Patwardhan. A.D., "Industrial Wastewater Treatment", Prentice Hall of India, 2010						
REFERENCE(S):							
1.	Shen T.T., "Industrial Pollution Prevention", Springer, 1999.						
2.	Stephenson R.L and Blackburn J.B, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New York, 1998						
3.	Freeman H.M., "Industrial Pollution Prevention Hand Book", McGraw Hill Inc., New Delhi, 1995.						
4.	Bishop P.L., "Pollution Prevention: Fundamental & Practice", McGraw Hill, 2000.						
5.	Pandey, "Environmental Management" Vikas Publications, 2010.						
6.	Industrial Wastewater Management, Treatment and Disposal", (WEF Manual of practice - FD3) McGraw Hill, 2008.						



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Department	CIVIL ENGINEERING					R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX22	PREFABRICATED STRUCTURES	3	0	0	3	45	100	

Course Objective (s):

- This course enhances the knowledge among the students to understand the principles, components and design of various prefabricated structural elements.

Course Outcomes:

- To explain the principles, manufacture and erection of prefabricated components
- To illustrate the production, erection and loading process
- To summarize the behaviour of the components of prefabricated structures and different joints
- To apply the design procedure to prefabricated beams
- To apply the design procedure to the prefabricated slab and column

Unit I	DESIGN PRINCIPLES	8
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General principles of fabrication – need for prefabrication – general principles of prefabrication – comparison with monolithic construction, types of prefabrication, site and plant prefabrication, economy of prefabrication, modular coordination, standardization – materials – modular coordination – systems – production – transportation – erection

Unit II	PREFABRICATED COMPONENTS AND JOINTS	10
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Planning for components of prefabricated structures, Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls, disuniting of structures. Joints – joints for different structural connections, effective sealing of joints for water proofing, provisions for non-structural fastenings, expansion joints in precast construction

Unit III	PRODUCTION AND FABRICATION	10
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Production technology – Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting Technology – equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.

Unit IV	DESIGN OF PREFABRICATED BEAMS	9
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Prefabricated load carrying members – Types of beams – design of simple rectangular beams and I-beams, handling and erection stresses, elimination of erection stresses – beams, columns, symmetric frames.

Unit V	DESIGN OF PREFABRICATED ELEMENTS	9
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Types of Slabs - construction of roof and floor slabs - Design of hollow core slab. Columns – construction and design principles of column

TEXTBOOKS:

1. Ramachandra Murthy D.S., —Design and Construction of Precast Concrete StructuresII, 1st Edition, Dipti Press OPC Private Limited, Chennai; 2017

REFERENCE(S):

1. Kim S. Elliott, "Precast Concrete Structures", 2nd Edition, CRC Press, United States, 2016.
2. "PCI Design Hand Book", 6th Edition, Precast / Prestressed Concrete Institute, ACI, Chicago, 2004.

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Department	CIVIL ENGINEERING					R 2019	Semester VII	PE
Course Code	Course Name	Hours / Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX23	ECOLOGICAL ENGINEERING	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart knowledge on the principles of ecological engineering that strengthen the functions of ecosystems, restore devastated ecosystems. To utilize the functions of ecosystems to develop ecological engineering designs for environmental management. 								
Course Outcomes: At the end of this course: <ul style="list-style-type: none"> The students will be able to determine sustainable loadings of ecosystems. 								
Unit I	ECOSYSTEMS & ECOTECHNOLOGY							9
Aim, scope and applications of ecology – Development and evolution of ecosystems – Principles and concepts pertaining to communities in ecosystem – Energy flow and material cycling in ecosystems – productivity in ecosystems.								
Unit II	SYSTEMS APPROACH IN ECOLOGICAL ENGINEERING							9
Principles, components and characteristics of systems – Classification of systems – Structural and functional interactions of environmental systems – Environmental systems as energy systems – Mechanisms of steady-state maintenance in open and closed systems – Modelling and ecotechnology – Element's modeling – Modelling procedure – Classification of ecological model s- Applications of models in ecotechnology – Ecological economics								
Unit III	ECOLOGICAL ENGINEERING PROCESSES							9
Self-organizing design and processes – Multi seeded microcosms – Interface coupling in ecological systems – Concept of energy – Determination of sustainable loading of ecosystems.								
Unit IV	ECOTECHNOLOGY FOR WASTE TREATMENT							9
Ecological engineering and ecotechnology – Classification of ecotechnology – Principles of ecological engineering. Ecosanitation-Principles and operation of soil infiltration systems – Wetlands and ponds – source separation systems – Aquacultural systems – Agro ecosystems – Detritus based treatment for solid wastes – Applications of ecological engineering for marine systems.								
Unit V	CASE STUDIES							9
Case studies of Integrated Ecological Engineering Systems and their commercial prospects.								
TEXT BOOK(S):								
1. Jorgensen, S.E. Ecological Engineering: Principles and Practice. CRC Press, 2003								
2. Mitsch, J.W. and Jorgensen, S.E. Ecological Engineering – An Introduction to								
REFERENCE(S):								
1. Mitsch, W.J. Ecological Engineering and Ecosystem Restoration, Wiley 2nd Ed., 2003								
2. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004								
3. White I.D., Mottershed, D.N. and Harisson, S.J. Environmental systems – An Introductory text, Chapman Hall, London, 1994								

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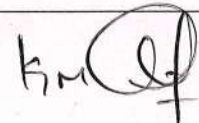
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Department	CIVIL ENGINEERING					R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX24	FUNDAMENTALS OF NANOSCIENCE	3	0	0	3	45	100	
Course Objective (s):								
<ul style="list-style-type: none"> To learn about basis of nano material science, preparation method, types and application 								
Course Outcomes: At the end of the course the student will be able to understand								
<ul style="list-style-type: none"> Will familiarize about the science of nanomaterials Will demonstrate the preparation of nanomaterials Will develop knowledge in characteristic nanomaterial 								
Unit I	INTRODUCTION						9	
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires- ultra-thinfilms- multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).								
Unit II	GENERAL METHODS OF PREPARATION						9	
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.								
Unit III	NANOMATERIALS						12	
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc- growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO ₂ , MgO, ZrO ₂ , NiO, nanoalumina, CaO, AgTiO ₂ , Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications								
Unit IV	CHARACTERIZATION TECHNIQUES						9	
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.								
Unit V	APPLICATIONS						7	
NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.								
TEXTBOOKS:								
1.	A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.							
2.	N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.							
REFERENCE(S):								
1.	G Timp, "Nanotechnology", AIP press/Springer, 1999.							
2.	Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.							

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Department	CIVIL ENGINEERING				R 2019	Semester VII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX25	INTELLIGENT TRANSPORTATION SYSTEM	3	0	0	3	45	100
Course Objective (s):							
<ul style="list-style-type: none"> • This course imparts knowledge about the importance of Intelligent Transportation System in transportation engineering 							
Course Outcomes:							
<ul style="list-style-type: none"> • To explain the common techniques and benefits of ITS, AVL and GIS • To interpret the concepts of telecommunication in ITS • To implement the various advanced ITS methodologies in transportation system • To infer various public services and their usage • To make use of automated highway system 							
Unit I	INTRODUCTION						8
Definition of ITS and Identification of ITS objectives – ITS user services - Historical background – Benefits of ITS - ITS data collection techniques – Detectors – Automatic vehicle location (AVL) – Automatic vehicle identification (AVI) – Geographic Information Systems (GIS)							
Unit II	TELECOMMUNICATIONS IN ITS						10
Importance of telecommunications in the ITS system, Information management, Traffic management centers (TMC). Vehicle – Road side communication – Vehicle positioning System							
Unit III	ITS FUNCTIONAL AREAS						10
Advanced Traffic Management Systems (ATMS) – Advanced traveler information systems (ATIS) – Commercial vehicle operations (CVO) – Advanced vehicle control systems (AVCS) – Advanced public transportation systems (APTS) – Advanced rural transportation systems (ARTS)							
Unit IV	ITS USER NEEDS AND SERVICES						9
Travel and traffic management – Public transportation management – Electronic Payment – Commercial vehicle operations – Emergency management – Advanced vehicle safety systems – Information Management							
Unit V	AUTOMATED HIGHWAY SYSTEMS						9
Critical ITS Issues - Vehicles in Platoons – Integration of automated highway systems – ITS Programs – Overview of ITS implementations in developed countries – ITS in developing countries – Smart car – Smart road							
TEXTBOOKS:							
1.	Pradip Kumar, Amit Kumar Jain, —Intelligent Transport SystemsII, 1st Edition ,PHI Learning Pvt Ltd, New Delhi,2017.						
REFERENCE(S):							
1.	Ignacio Julio, Enrique Onieva , —Intelligent Transport SystemsII, 1st Edition, Wiley India PvtLtd,Noida, 2015.						
2.	Mashrur A. Chowdhury, and Adel Sadek, —Fundamentals of Intelligent Transportation Systems PlanningII, 1st Edition, Artech House, Inc., 2003.						



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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX26	GROUND WATER ENGINEERING	3	0	0	3	45	100

Course Objective (s):

- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
- To understand the techniques of development and management of groundwater

Course Outcomes: At the end of the course the student will be able to understand

- Understand aquifer properties and its dynamics
- Get an exposure towards well design and practical problems
- Develop a model for groundwater management.
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts
- Gain knowledge on conservation of groundwater.

Unit I | HYDROGEOLOGICAL PARAMETERS | 9

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation – G norms - Steady state flow - Darcy's Law - Groundwater Velocity – Dupuit Forchheimer assumption – Steady Radial Flow into a Well

Unit II | WELL HYDRAULICS | 9

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

Unit III | GROUNDWATER MANAGEMENT | 9

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model.

Unit IV | GROUNDWATER QUALITY | 9

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water
Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirement

Unit V | GROUNDWATER CONSERVATION | 9

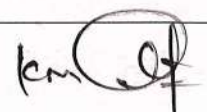
Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

TEXTBOOKS:

- Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010
- Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCE(S):

- Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
- Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.



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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX27	REPAIR AND REHABILITATION OF STRUCTURES	3	0	0	3	45	100

Course Objective (s): The purpose of learning this course is

- To emphasize the importance of maintenance and in section of structures
- To impart fundamental knowledge on various repairing strategies

Course Outcomes: At the end of this course, learners will be able to:

- Diagnosis the damage of distress structures
- Investigate the Corrosion factors and control methods
- Identify the Serviceability and Durability of Concrete Structures
- Select the proper repair materials and its application
- Select the method to strengthen the distressed structures

Unit I MAINTENANCE AND REPAIR STRATEGIES **9**

Maintenance, repair and rehabilitation -Facets of maintenance - Importance of maintenance – Causes of deterioration -inspection- Preventive measures - Diagnosis of distress Assessment of damaged structure

Unit II CORROSION PROTECTION **9**

Corrosion damage of reinforced concrete - Methods of corrosion protection - Causes, Effects and Remedial measures- Design and construction errors - Corrosion mechanism - Effects of cover thickness and cracking - Corrosion inhibitors - Corrosion resistant steels - Coatings – Cathodic protection - Causes of deterioration of concrete, steel, masonry and timber structures, surface deterioration, efflorescence, causes, prevention and protection.

Unit III SERVICEABILITY AND DURABILITY OF CONCRETE STRUCTURES **9**

Durability of concrete in seawater - Thermal properties of concrete - Fire resistance - Resistance to freezing and thawing - Permeability of concrete - Sulphate attack - Methods of control- Quality assurance - Need - Components - Conceptual bases for quality assurance schemes.

Unit IV MATERIALS AND TECHNIQUES FOR REPAIR **9**

Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro-cement - Fibre reinforced concrete - Rust eliminators and polymer coating for rebars during repair - Foamed concrete – Vacuum concrete - Guniting or shotcrete - Epoxy injection, mortar repair for cracks.

Unit V REPAIRS TO STRUCTURES AND DEMOLITION OF STRUCTURES **9**

Various aspects of inspection - structural and economic appraisal - Effects due to climate, temperature, chemicals, wear and erosion - Special concretes and mortars -Special cements for accelerated strength gain - Strengthening of existing structures - repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering, wear, fire, leakage, marine exposure, coatings for set concrete and steel reinforcement.

TEXT BOOK(S):

1. Raiker .R.N,"Learning from Failures, Deficiencies in Design, Construction and Service, - R&D Centre (SDCPL), Raikar Bhavan, Bombay 1987.
2. Repair & Rehabilitation, Compilation from The Indian Concrete Journal,ACC-RCD Publication 2001.
3. Allen .R.T, and Edwards.S.C, Shaw D.N Repair of Concrete Structures, Chapman and Hall,2005

REFERENCE(S):

1. M.S.Shetty, Concrete Technology Theory and Practice, S.Chand & Co., NewDelhi, 2005
2. Dension Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical Publications, UK, 1991
3. PeterH.Emmons, Concrete Repair and Maintenance Illustrated Problem Analysis, Repair Strategy, Techniques, Galgotia Publication, 2001

Department	CIVIL ENGINEERING					R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX28	CONSTRUCTION MANAGEMENT	3	0	0	3	45	100	

Course Objective (s):

- This course imparts knowledge on Construction Engineering and Management principles necessary for execution of projects efficiently which deals with quality, cost control and safety aspects in construction industry.

Course Outcomes:

- To interpret the importance of planning and scheduling in construction projects
- To estimate the resource requirement for construction projects
- To assess quality elements and its importance for construction materials
- To prepare schedule and budgeted cost associated with construction activities
- To apply the safety codes and standards to improve the safety culture at job site

Unit I	PLANNING, SCHEDULING AND ORGANIZING	8
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Planning for Construction projects – objectives - principles – stages of planning, Scheduling - Methods - Project management through networks – CPM & PERT - Job lay-out-Work breakdown structure –Types of Construction organization.

Unit II	RESOURCE MANAGEMENT	10
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Types of resources- Estimating resource requirements- Material management-Effective utilization of resources -Depreciation of construction equipment -Manpower planning- Resource levelling- Resource smoothing.

Unit III	QUALITY CONTROL	10
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Quality control in construction-Importance-Elements-Quality control methods- ISO 9000 family of standards-Statistical methods- Sampling by attributes-Sampling by variables-Techniques and needs of QC.

Unit IV	SCHEDULE, COST CONTROL AND MANAGEMENT	9
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Schedule variance – Cost variance – Cost and schedule relationship – Budgeted cost - Cost control in construction – Objectives - Cost control systems - Direct and indirect cost control – Time-cost trade off - Cost management.- Risk Management

Unit V	SAFETY MANAGEMENT	9
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Safety in construction projects – Importance of safety - Elements of safety programme – Jobsite safety assessment – Site accidents – Causes – Classification - Safety measures - Approaches to improve safety in construction - Safety codes and OSHA standards.

TEXTBOOKS:

1.	Seetharaman. S, "Construction Engineering and Management", 5th Edition, Umesh Publishing, 2019
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REFERENCE(S):

1.	S.C. Sharma, S.V. Deodhar —Construction Engineering and ManagementII, 1st Edition, Khanna Publishing House, 2017.
2.	Garold D. Oberlender,"Project Management for Engineering and Construction", 3rd Edition, McGraw-Hill Education, 2014.

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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P			
19CEX29	ENTREPRENEURSHIP DEVELOPMENT	3	0	0	3	45	100
Course Objective (s):							
<ul style="list-style-type: none"> To give an opportunity to assess their own strengths and identify gaps that need to be addressed to become a successful entrepreneur. 							
Course Outcomes:							
At the end of the course, the students will:							
<ul style="list-style-type: none"> Develop awareness about entrepreneurship and successful entrepreneurs. Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication. Understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective. 							
Unit I	INTRODUCTION TO ENTREPRENEURSHIP						8
Introduction, Concept of Entrepreneur, Entrepreneurship and Enterprise, Definition of Entrepreneurship, Objectives of Entrepreneurship Development, Phases of Entrepreneurship Development, Role of Entrepreneurship, The Entrepreneurial Mindset, Characteristics of Entrepreneurship, Traits of Entrepreneurship, Introduction to Entrepreneurship Skills							
Unit II	ENTREPRENEURSHIP DEVELOPMENT SKILLS						10
Meaning of Entrepreneurship skill, Types of Entrepreneurship Skills: Business management skills, Teamwork and leadership skills, Communication and listening, Customer service skills, Financial skills, Analytical and problem-solving skills, Critical thinking skills, Strategic thinking and planning skills, Technical skills, Time management and organizational skills, Branding, marketing and networking skills, How to improve entrepreneurial skills, Entrepreneurial skills in the workplace, Entrepreneurial Imagination And Creativity							
TEXTBOOKS:							
1.	Vasant Desai, Dynamics of Entrepreneurship Development, Himalaya Publication house						
REFERENCE(S):							
1.	David holt Entrepreneurship, New Venture Creation, Prentice Hall India.						
2.	S.S. Khanka, Entrepreneurial Development S.Chand & Company Ltd. New Delhi						
3.	Peter F. Drucker, Innovation and Entrepreneurship						

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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX30	INSTRUMENTATION AND SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING	3	0	0	3	45	100

Course Objective (s):

- To understand how a building can be made comfortable and safe with the services provided and installed
- To impart knowledge on basics of sensor technology
- To recognize the importance of fire detection and protection using sensor

Course Outcomes:

- To Understand the features and installation of sensor
- To Identify the functions and properties of smart materials
- To Enumerate the applications of strain gauges in strain measurements
- To Explain the methods of crack detection and prevention techniques.
- To Analyze the characteristics of fire safety equipments in buildings

Unit I	INTRODUCTION TO SENSORS	8
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Definition - Measurement and instrumentation- Physical variables- Functions of sensors -Common types of sensors: Temperature sensors, Force and Pressure sensors, Gas sensors, Optical radiation sensors- Structural properties- Electric and magnetic properties of sensors - Sensor selection - Sensor siting - Sensor Configuration & Specification - Permanent installations - Temporary installations

Unit II	SMART MATERIALS	10
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Introduction to Smart Materials and Structures-Functions and response - Sensing systems-- Piezoelectric Materials - Piezoelectric properties - Actuation of structural components - Shape Memory Alloys-Applications of shape memory alloys -Electro rheological and magneto rheological fluids - Applications of ER and MR fluids - Fiber Optics - Fiber characteristics - Fiber optic strain sensors - Applications of optical fibers

Unit III	STRAIN MEASUREMENT	10
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Methods of Measurement - Mechanical, Optical and Acoustical extensometers -Strain measurement- Mechanical & Electrical resistance strain gauges- Applications- Strain Rosettes- Measurement of loads using proving rings - Measurement of deflections by dial gauges and LVDT -Wheatstone bridge configuration

Unit IV	DISTRESS MEASUREMENT	9
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Diagnosis of distress in structures- Types & Characterization of cracks- Causes of cracks- Crack measurement- Monitoring - Crack detection using Thermo grams- Ultrasonic sensors - Magnetic particle inspection - Dye penetrant inspection and ultrasound- Corrosion of reinforcement in RCC- Corrosion detection using half cell potentiometer- Fibre optic AE (Acoustic emission) sensor.

Unit V	FIRE SAFETY INSTALLATIONS IN BUILDING	9
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Safety Against fire in buildings- Fire safety considerations in building as per NBC - Dry risers and wet risers - Heat and smoke detectors-Automatic sprinklers -Fire Extinguishers - Capacity determination of Under Ground Tanks (UGT) and Over Head Tanks (OHT) for firefighting needs - Safety and security systems: FAS (Fire Alarm System), PASS device (Personal Alert Safety System) - CCTV surveillance system -IBMS (Intelligent Building Management System).

TEXTBOOKS:

1.	Jon Wilson Sensor Technology Handbook.,2004
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REFERENCE(S):

1.	Fraden, Jacob, "Handbook of modern sensors: physics, designs, and applications" 3rd ed., 2004, Springer Verlag New York
2.	Gandhi.M.V and Thompson.B.S, "Smart Materials and Structures", Chapman and Hall, NewYork, 1992
3.	Sadhu Singh, Experimental Stress Analysis, Khanna Publishers, New Delhi, 2006


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Department	CIVIL ENGINEERING					R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX31	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	0	3	45	100	
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart knowledge on Environmental management and Environmental Impact Assessment 								
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Carry out scoping and screening of developmental projects for environmental and social assessments Explain different methodologies for environmental impact prediction and assessment Plan environmental impact assessments and environmental management plan Evaluate environmental impact assessment reports 								
Unit I	INTRODUCTION						9	
Impact of development projects–EIA Notifications–Urbanization–Meaning– Activities involved– Effects on environment–Environmental Impact Assessment(EIA)–Environmental Impact Statement(EIS)								
Unit II	METHODOLOGIES						9	
Methods of EIA–Checklists–Matrices–Networks–Cost-benefit analysis–Analysis of alternatives – Uncertainty in EIA								
Unit III	PREDICTION ANDASSESSMENT						9	
Assessment of Impact on land, water, air, social & cultural activities and on flora& Fauna- Mathematical models–Public participation–SIA Judgment authorities–Rapid EIA.								
Unit IV	ENVIRONMENTAL MANAGEMENT PLAN						9	
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.								
Unit V	CASESTUDIES						9	
EIA for infrastructure projects–Dams–Highways–Multi-storey Buildings–Water Supply and Drainage Projects–Waste water treatment plants, STP								
TEXTBOOKS:								
1.	Canter, R.L., "Environmental Impact Assessment", McGraw-Hill Inc., New Delhi, 1996.							
2.	Richard K. Morgan., "Environmental Impact Assessment" Kluwer Academic Publications, London, 2002							
REFERENCE(S):								
1.	John G. Rauand David C Hooten (Ed)., "Environmental Impact Analysis Handbook", McGraw-Hill BookCompany, 1990.							
2.	"Environmental Assessment Sourcebook", Vol.I, II&III. The World Bank, Washington, D.C., 1991.							
3.	Judith Petts, "Handbook of Environmental Impact Assessment Vol.I&II", Blackwell Science, 1999.							

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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX32	FINITE ELEMENT ANALYSIS	3	0	0	3	45	100

Course Objective (s):

- To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications.

Course Outcomes: At the end of the course the student will be able to understand

- Students will be in a position to develop computer codes for any physical problems using FE techniques

Unit I	INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FINITE ELEMENT FORMULATION TECHNIQUES	9
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Introduction - Basic Concepts of Finite Element Analysis - Introduction to Elasticity - Steps in Finite Element Analysis - Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach - Stiffness Matrix and Boundary Conditions.

Unit II	ELEMENT PROPERTIES	9
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Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements -Isoparametric Formulation - Stiffness Matrix of Isoparametric Elements Numerical Integration: One, Two and Three Dimensional

Unit III	ANALYSIS OF FRAME STRUCTURES	9
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Stiffness of Truss Members - Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam - Plane Frame Analysis - Analysis of Grid and Space Frame.

Unit IV	FEM FOR TWO AND THREE DIMENSIONAL SOLIDS	9
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Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements -Numerical Evaluation of Element Stiffness -Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element -Finite Element Formulation of Axis symmetric Element -Finite Element Formulation for 3 Dimensional Elements

Unit V	APPLICATIONS OF FEM	9
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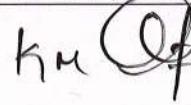
Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics - Dynamic Analysis

TEXTBOOKS:

1.	Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2003.
2.	Krishnamoorthy C. S. ,"Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994
3.	David V. Hutton,"Fundamentals of Finite Element Analysis", Tata McGraw Hill, 2004
4.	Daryl L.Logan, "A First Course in Finite Element Method", Cengage Learning, 2012

REFERENCE(S):

1.	Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 1985.
2.	Zienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4 th Edition, McGraw-Hill, Book Co., 1987.
3.	Rao S.S, "The Finite Element Method in Engineering", Pergaman Press, 2003
4.	Desai C.S. and. Abel J.F, "Introduction to the Finite Element Method", Affiliated East West Press, 1972.
5.	Cook R. D., "Concepts and Applications of Finite Element Analysis", Wiley and Sons, 1989


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Department	CIVIL ENGINEERING					R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks	
		L	T	P	C			
19CEX33	COASTAL ENGINEERING	3	0	0	3	45	100	
Course Objective (s):								
<ul style="list-style-type: none"> The main purpose of coastal engineering is to protect harbors and improve navigation. The students to the diverse topics as wave mechanics, wave climate, shoreline protection methods and laboratory investigations using model studies 								
Course Outcomes: At the end of the course the student will be able to understand								
<ul style="list-style-type: none"> Understand coastal engineering aspects of harbors methods to improve navigation Understand the wave properties and analysis of wave. Understand the concepts of sediment transport. Design of shore defense structures. Gain knowledge in modeling in coastal engineering. 								
Unit I	INTRODUCTION TO COASTAL ENGINEERING						9	
Indian Scenario - Classification of Harbours. Introduction - wind and waves - Sea and Swell - Introduction to small amplitude wave theory - use of wave tables- Mechanics of water waves - Linear (Airy) wave theory, Introduction to Tsunami								
Unit II	WAVE PROPERTIES AND ANALYSIS						9	
Behaviour of waves in shallow waters, Introduction to non-linear waves and their properties - Waves in shallow waters - Wave Refraction, Diffraction and Shoaling -Hindcast wave generation models, wave shoaling; wave refraction; wave breaking; wave diffraction random and 3D waves- Short term wave analysis - wave spectra and its utilities - Long term wave analysis- Statistics analysis of grouped wave data.								
Unit III	COASTAL SEDIMENT TRANSPORT						9	
Dynamic beach profile; cross-shore transport; along shore transport (Littoral transport), sediment movement								
Unit IV	COASTAL DEFENSE						9	
Field measurement; models, groins, sea walls, offshore breakwaters, artificial nourishment - planning of coast protection works - Design of shore defense structures								
Unit V	MODELING IN COASTAL ENGINEERING						9	
Physical modeling in Coastal Engineering - Limitations and advantages - Role of physical modeling in coastal engineering - Numerical modeling - Modeling aspects - limitations - Tsunami mitigation measures								
REFERENCE(S):								
1.	Mani J.S., Coastal Hydrodynamics. PHI Pvt. Ltd. New Delhi - 2012.							
2.	Dean, R.G. and Dalrymple, R.A., Water wave mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1994.							
3.	Ippen, A.T., Estuary and Coastline Hydrodynamics, McGraw-Hill, Inc., New York, 1978.							
4.	Sorenson, R.M., Basic Coastal Engineering, A Wiley-Interscience Pub. New York, 1978.							
5.	Coastal Engineering Manual, Vol. I-VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC, 2006.							

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Department	CIVIL ENGINEERING				R 2019	Semester VIII	PE
Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX34	GEOENVIRONMENTAL ENGINEERING	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To impart knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Identify the soil-pollutant interaction and assess the modification of soil properties Categorize the process of contaminant transport and characterize the contaminated sites Classify different techniques for the remediation of contaminated Sites Design the cover system by identifying the suitable components of landfill Analyze the possible utilization of waste based on their characteristics 							
Unit I	SOIL POLLUTANT INTERACTION						8
Role of Geo-environmental Engineering - sources, generation and classification of wastes- causes and consequences of soil pollution -factors influencing soil-pollutant interaction-modification of indexphysical, chemical and engineering properties							
Unit II	CONTAMINANT TRANSPORT AND SITE CHARACTERISATION						9
Transport of contaminant in subsurface - advection, diffusion, dispersion - chemical process in subsurface - sorption, desorption, precipitation, dissolution, oxidation, complexation, ion exchange, volatization - biological process in subsurface - characterization of contaminated sites.							
Unit III	WASTE CONTAINMENT AND REMEDIATION OF CONTAMINATED SITES						9
In situ containment - vertical and horizontal barrier - soil remediation - soil vapour extraction, electro kinetic remediation, soil heating, vitrification, bioremediation, phyto remediation - ground water remediation -pump and treat, In situ flushing, permeable reacting barrier							
Unit IV	LAND FILLS AND SURFACE IMPOUNDMENTS						9
Site selection for landfills - Components of landfills - liner system - soil, geomembrane, geosynthetic clay, geocomposite liner system - leachate collection-construction and operation of landfill-landfill cover -disposal of slurry waste in ponds and impoundments							
Unit V	UTILIZATION OF WASTE						9
Evaluation of waste materials- flyash, municipal sludge, plastics, scrap tire, blast furnace slag - physical, chemical and biological characteristics-geotechnical reuse of waste materials							
REFERENCE(S):							
1.	Daniel B.E, Geotechnical Practice for waste disposal, Chapman & Hall, London, 2012						
2.	Hari D. Sharma and Krishna R.Reddy, Geo-Environmental Engineering - John Wiley and Sons, INC, USA, 2004.						
3.	Sharma H D and Reddy K R, Geoenvironmental Engineering: Site remediation, Waste containment and Emerging Waste Management Technologies, John Wiley & Sons, Inc. Hoboken, New Jersey, 2004.						
4.	Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1995.						
5.	Westlake, K., Landfill Waste pollution and Control, Albion Publishing Ltd., England, 2014. 6. Bagchi A, Design of landfills and integrated solid waste management, John Wiley & Sons, Inc., USA 2004						

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Course Code	Course Name	Hours/Week			Credit	Total Hours	Maximum Marks
		L	T	P	C		
19CEX35	CONCEPTS OF ENGINEERING DESIGN	3	0	0	3	45	100
Course Objective (s): The purpose of learning this course is to <ul style="list-style-type: none"> To attain knowledge on design process To attain knowledge on tools used in design methods To create an understanding on the process of material selection and design To develop in depth knowledge on engineering statistic and reliability To create awareness on legal and ethical issues in design an quality engineering 							
Course Outcomes: At the end of this course, learners will be able to: <ul style="list-style-type: none"> Get clear understanding on CAE / concurrent engineering and system engineering Attain problem solving skills through modeling /simulation and optimize design Ability to do material selection based on economy and value analysis. develop understanding on DFM/DFA Have a good understanding on DOE, reliability theory and reliability centered maintenance Exposed to law, codes of ethics, quality concepts and FMEA 							
Unit I	DESIGN PROCESS						9
The design process – Morphology of Design – Design Drawings – Computer Aided Engineering – Designing of standards – Concurrent Engineering – Product life cycle – Technological Forecasting – Market Identification– Competition Bench marking – Systems Engineering – Life Cycle Engineering – Human Factors in Design – Industrial Design.							
Unit II	DESIGN METHODS						9
Creativity and Problem Solving – Product Design Specifications– Conceptual design – Decision Theory – Decision Tree – Embodiment Design – Detail Design – Mathematical Modeling – Simulation – Geometric Modeling – Finite Element Modeling – Optimization – Search Methods – Geometric Programming – Structural and Shape Optimization.							
Unit III	MATERIAL SELECTION PROCESSING AND DESIGN						9
Material Selection Process – Economics – Cost Vs Performance – Weighted property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design for Manufacture – Design for Assembly –Designing for castings, Forging, Metal Forming, Machining and Welding – Residual Stresses – Fatigue, Fracture and Failure.							
Unit IV	ENGINEERING STATISTICS AND RELIABILITY						9
Probability – Distributions – Test of Hypothesis – Design of Experiments – Reliability Theory – Design for Reliability – Reliability centered Maintenance							
Unit V	LEGAL AND ETHICAL ISSUES IN DESIGN AND QUALITY ENGINEERING						9
Introduction – The origin of laws – Contracts – Liability – Tort law – Product liability – Protecting intellectual property – Legal and ethical domains – Codes of ethics – Solving ethical conflicts– case studies Total Quality Concept – Quality Assurance – Statistics Process Control – Taguchi Methods – Robust Design – Failure Model Effect Analysis.							
TEXTBOOKS:							
1.	Dieter, George E., Engineering Design - "A Materials and Processing Approach", McGraw Hill International Editions, Singapore,3rd Edition, 2000.						
2.	Karl T. Ulrich and Steven D. Eppinger "Product Design and Development" McGraw Hill Edition 4th edition 2009.						
REFERENCE(S):							
1.	Pahl, G, and Beitz, W., " Engineering Design", Springer – Verlag, NY. 1984						
2.	Ray, M.S., "Elements of Engg. Design", Prentice Hall Inc. 1985. Suh, N.P., "The principles of Design", Oxford University Press, NY.1990						


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