

**HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY,
COIMBATORE 641 032**

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

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

- To provide academic excellence in technical education through novel teaching methods.
- To empower students with creative skills and leadership qualities
- To produce dedicated professionals with social responsibility

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

To produce well-informed graduates with scientific and technical knowledge and excellent engineering skills for professional practice, advanced study and research.

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

To interact with industries and address issues related to infrastructure, public health and environmental protection for sustainable development.

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Dr. K. KARUNAKARAN

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PROGRAMME EDUCATIONAL OBJECTIVES

To produce graduates with the ability to

- Excel as practicing engineers, academicians and researchers
- Play a vital role in the nation's infrastructural and sustainable development
- Hold professional and ethical responsibilities as engineers, consultants, entrepreneurs and pioneers while addressing the challenges of the society

PROGRAMME OUTCOMES

- a) **Engineering Knowledge:** Apply the knowledge of Mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex civil engineering problems.
- b) **Problem Analysis:** Identify, formulate, review research literature, and analyze complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c) **Design / Development of Solutions:** Design solutions for complex civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural societal, and environmental considerations.
- d) **Conduct Investigations of Complex Problems:** use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- e) **Modern Tool Usage:** create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- f) **The Engineer and Society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional civil engineering practice.

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- g) **Environment and Sustainability:** Understand the impact of the professional civil engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the civil engineering practice.
- i) **Individual and Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- j) **Communication:** Communicate effectively on complex civil engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage civil engineering projects and in multidisciplinary environments.
- l) **Lifelong Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

The graduates will be able to:

- Apply their engineering knowledge, communication skills, professional and ethical principles to solve problems in civil engineering and contribute to the infrastructural development in a sustainable way
- Use their engineering background to excel in competitive exams for advanced study, research and professional career

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REGULATION – 2019

CURRICULUM AND SYLLABI

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

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	2	1	0	3	25	75	100
2	19MA1102	Calculus and Linear Algebra	BS	3	1	0	4	25	75	100
THEORY WITH PRACTICAL COMPONENT										
3	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	19CS1151	Problem Solving and Python Programming	ES	2	0	2	3	50	50	100
6	19ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	19HE1071	Language Competency Enhancement Course - I	HS	1	0	0	1	100	-	100
MANDATORY COURSE										
8	19MC1191	Induction Programme	MC	-	-	-	-	-	-	-
Total				13	2	10	20	350	350	700

SEMESTER II

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	2	1	0	3	25	75	100
2	19MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	19EE2103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
4	19ME2101	Engineering Mechanics	ES	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19PH2151	Material Science	BS	2	0	2	3	50	50	100
6	19CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICAL										
8	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
9	19HE2071	Language Competency Enhancement Course -II	HS	1	0	0	1	100	-	100
Total				16	2	8	22	350	450	800

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SEMESTER III

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3103	Fourier Analysis and Numerical Methods	BS	3	1	0	4	25	75	100
2	19CE3201	Mechanics of Fluids	PC	3	0	0	3	25	75	100
3	19CE3202	Geology and Construction Materials	PC	3	0	0	3	25	75	100
4	19CE3203	Surveying	PC	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19CE3251	Mechanics of Solids	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19CE3001	Survey Lab	PC	0	0	4	2	50	50	100
7	19CE3002	Computer Aided Building Drawing	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	19MC3191	Indian Constitution	MC	2	0	0	0	-	-	-
Total				16	1	10	20	250	450	700

SEMESTER IV

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA4103	Probability and Statistics	BS	3	1	0	4	25	75	100
2	19CE4201	Strength of Materials	PC	3	1	0	4	25	75	100
3	19CE4202	Applied Hydraulics and Hydraulic Machinery	PC	3	0	0	3	25	75	100
4	19CE4203	Soil Mechanics	PC	3	0	0	3	25	75	100
THEORY WITH PRACTICAL COMPONENT										
5	19CE4251	Concrete Technology	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19CE4001	Soil Mechanics Lab	PC	0	0	4	2	50	50	100
7	19CE4002	Fluid Mechanics and Hydraulic Machinery Lab	PC	0	0	4	2	50	50	100
MANDATORY COURSE										
8	19MC4191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	-	-	-
Total				16	2	10	21	250	450	700

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SEMESTER V

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE5201	Structural Analysis - I	PC	3	0	0	3	25	75	100
2	19CE5202	Design of RC Elements	PC	3	1	0	4	25	75	100
3	19CE5203	Water Supply Engineering	PC	3	0	0	3	25	75	100
4	19CE5204	Foundation Engineering	PC	3	0	0	3	25	75	100
5	19CE5205	Highway and Railway Engineering	PC	3	0	0	3	25	75	100
6	19CE53XX	Professional Elective - I	PE	3	0	0	3	25	75	100
PRACTICAL										
7	19CE5001	Concrete and Highway Engineering Lab	PC	0	0	4	2	50	50	100
8	19CE5002	Survey Camp*	PC	0	0	0	1	50	50	100
Total				18	1	4	22	250	550	800

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

SEMESTER VI

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE6181	Construction Management	HS	3	0	0	3	25	75	100
2	19CE6201	Structural Analysis - II	PC	3	0	0	3	25	75	100
3	19CE6202	Design of Steel Structural Elements	PC	3	0	0	3	25	75	100
4	19CE6203	Wastewater Engineering	PC	3	0	0	3	25	75	100
5	19CE63XX	Professional Elective - II	PE	3	0	0	3	25	75	100
6	19XX64XX	Open Elective - I	OE	3	0	0	3	25	75	100
PRACTICAL										
7	19CE6001	Water and Wastewater Testing Lab	PC	0	0	3	1.5	50	50	100
8	19CE6002	Design and Drawing of RC Structures	PC	0	0	3	1.5	50	50	100
9	19CE6701	Internship / Industrial Training*	EEC	0	0	0	1	0	100	100
Total				18	0	6	22	250	650	900

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

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SEMESTER VII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE7201	Water Resources and Irrigation Engineering	PC	3	0	0	3	25	75	100
2	19CE7202	Structural Dynamics and Earthquake Engineering	PC	3	0	0	3	25	75	100
3	19CE7203	Estimation, Costing and Valuation	PC	3	1	0	4	25	75	100
4	19CE73XX	Professional Elective - III	PE	3	0	0	3	25	75	100
5	19XX74XX	Open Elective - II	OE	3	0	0	3	25	75	100
PRACTICAL										
6	19CE7001	Design and Drawing of Steel Structures	PC	0	0	4	2	50	50	100
7	19CE7901	Project I - Design Project	EEC	0	0	4	2	100	100	200
Total				15	1	8	20	275	525	800

SEMESTER VIII

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19CE83XX	Professional Elective - IV	PE	3	0	0	3	25	75	100
2	19CE83XX	Professional Elective - V	PE	3	0	0	3	25	75	100
PRACTICAL										
3	19CE8901	Project II – Main Project	EEC	0	0	24	12	100	100	200
Total				6	0	24	18	150	250	400

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	22	22	20	18	165

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LIST OF ELECTIVES

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE - I										
1	19CE5301	Advanced Surveying Techniques	PE	3	0	0	3	25	75	100
2	19CE5302	Traffic Engineering	PE	3	0	0	3	25	75	100
3	19CE5303	Housing Planning and Management	PE	3	0	0	3	25	75	100
4	19CE5304	Construction Techniques, Equipment and Safety	PE	3	0	0	3	25	75	100
5	19CE5305	Hydrology	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE - II										
1	19CE6301	Building Services	PE	3	0	0	3	25	75	100
2	19CE6302	Airports, Docks and Harbour Engineering	PE	3	0	0	3	25	75	100
3	19CE6303	Subsurface Investigation and Field Testing	PE	3	0	0	3	25	75	100
4	19CE6304	Groundwater Engineering	PE	3	0	0	3	25	75	100
5	19CE6305	Principles of Architecture	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE - III										
1	19CE7301	Prestressed Concrete Structures	PE	3	0	0	3	25	75	100
2	19CE7302	Air Pollution Management	PE	3	0	0	3	25	75	100
3	19CE7303	Industrial Wastewater Treatment	PE	3	0	0	3	25	75	100
4	19CE7304	Composite Structures	PE	3	0	0	3	25	75	100
5	19CE7305	Finite Element Analysis	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE - IV										
1	19CE8301	Ground Improvement Techniques	PE	3	0	0	3	25	75	100
2	19CE8302	Prefabricated Structures	PE	3	0	0	3	25	75	100
3	19CE8303	Valuation of Land and Buildings	PE	3	0	0	3	25	75	100
4	19CE8304	Municipal Solid Waste Management	PE	3	0	0	3	25	75	100
5	19CE8305	Design of Formwork	PE	3	0	0	3	25	75	100

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PROFESSIONAL ELECTIVE - V

1	19CE8306	Non Destructive Testing of Structures	PE	3	0	0	3	25	75	100
2	19CE8307	Construction Economics and Finance	PE	3	0	0	3	25	75	100
3	19CE8308	Repair and Rehabilitation of Structures	PE	3	0	0	3	25	75	100
4	19CE8309	Disaster Resistant Structures	PE	3	0	0	3	25	75	100
5	19CE8310	Environmental Impact Assessment	PE	3	0	0	3	25	75	100

OPEN ELECTIVES

S.No.	Course Code	Course Title	Course Category	L	T	P	C	CIA	ESE	TOTAL
1	19CE6401	Remote Sensing and GIS	OE	3	0	0	3	25	75	100
2	19CE7402	Interior Design	OE	3	0	0	3	25	75	100

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19HE1101	TECHNICAL ENGLISH (Common to All Branches)	2	1	0	3

- Course Objective**
1. Train to maintain coherence in formal communication.
 2. Provide Practice to create and interpret descriptive communication.
 3. Introduce the professional protocol.
 4. Acquire different types of communication and professional etiquette.
 5. Educate to improve interpersonal and intrapersonal skills.

Unit	Description	Instructional Hours
I	Listening and Speaking – Opening a conversation, maintaining coherence, turn taking, closing a conversation (excuse, general wishes, positive comments and thanks) Reading –Reading articles from newspaper, Reading comprehension Writing Chart analysis, process description, Writing instructions Grammar and Vocabulary - Tenses, Regular and irregular verb, technical vocabulary.	9
II	Listening and Speaking - listening to product description, equipment & work place (purpose, appearance, function) Reading - Reading technical articles Writing - Letter phrases, writing personal letters, Grammar and Vocabulary -articles, Cause & effect, Prepositions.	9
III	Listening and Speaking - - listening to announcements Reading - Reading about technical inventions, research and development Writing - Letter inviting a candidate for interview, Job application and resume preparation Grammar and Vocabulary - Homophones and Homonyms.	9
IV	Listening and Speaking - - Practice telephone skills and telephone etiquette (listening and responding, asking questions). Reading - Reading short texts and memos Writing - invitation letters, accepting an invitation and declining an invitation Grammar and Vocabulary - Modal verbs, Collocation, Conditionals, Subject verb agreement and Pronoun-Antecedent agreement.	9
V	Listening and Speaking - listening to technical group discussions and participating in GDs Reading - reading biographical writing - Writing - Proposal writing, Writing definitions, Grammar and Vocabulary - Abbreviation and Acronym, Prefixes & suffixes, phrasal verbs.	9
Total Instructional Hours		45

- Course Outcome**
- CO1: To gain knowledge about basic grammar and elements of professional communication.
 CO2: To understand formal and technical communication.
 CO3: To apply the basic elements of grammar and communication in professional situation.
 CO4: To analyze and interpret different styles of correspondence.
 CO5: To compose official letters and technical proposals and make presentations.

TEXT BOOKS:

- T1- Norman Whitby, “Business Benchmark-Pre-intermediate to Intermediate”,Cambridge University Press, 2016.
 T2-Raymond Murphy, “Essential English Grammar”, Cambridge University Press, 2019.

REFERENCE BOOKS :

- R1- Meenakshi Raman and Sangeetha Sharma. “Technical Communication-Principles and Practice”, Oxford University Press, 2009.
 R2- Raymond Murphy, “English Grammar in Use”-4th editionCambridge University Press, 2004.
 R3- KamaleshSadanan “A Foundation Course for the Speakers of Tamil-Part-I &II”, Orient Blackswan,2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19MA1102	CALCULUS AND LINEAR ALGEBRA (Common to AERO, AGRI, AUTO, CIVIL, FOOD, MECH, MECHT)	3	1	0	4

Course Objective
1. Understand the concept of differentiation 2. Evaluate the functions of several variables which are needed in many branches of engineering 3. Understand the concept of double integrals 4. Understand the concept of triple integrals 5. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications

Unit	Description	Instructional Hours
DIFFERENTIAL CALCULUS		
I	Rolle's Theorem – Lagrange's Mean Value Theorem- Maxima and Minima – Taylor's and Maclaurin's Theorem.	12
MULTIVARIABLE CALCULUS (DIFFERENTIATION)		
II	Total derivatives - Jacobians – Maxima, Minima and Saddle points - Lagrange's method of undetermined multipliers – Gradient, divergence, curl and derivatives.	12
DOUBLE INTEGRATION		
III	Double integrals in Cartesian coordinates – Area enclosed by the plane curves (excluding surface area) – Green's Theorem (Simple Application) - Stoke's Theorem – Simple Application involving cubes and rectangular parallelepiped.	12
TRIPLE INTEGRATION		
IV	Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates. Gauss Divergence Theorem – Simple Application involving cubes and rectangular parallelepiped.	12
MATRICES		
V	Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
Total Instructional Hours		60

Course Outcome
CO1: Apply the concept of differentiation in any curve CO2: Identify the maximum and minimum values of surfaces CO3: Apply double integrals to compute area of plane curves CO4: Evaluation of triple integrals to compute volume of solids CO5: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes

TEXT BOOKS:

- T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018.
 T2 - Veerarajan T., "Engineering Mathematics", McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2016.

REFERENCE BOOKS:

- R1 - Thomas & Finney "Calculus and Analytic Geometry", Sixth Edition, Narosa Publishing House, New Delhi.
 R2 - Weir, M.D and Joel Hass, 'Thomas Calculus' 12th Edition, Pearson India 2016.
 R3 - Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19PH1151	APPLIED PHYSICS (Common to All Branches)	2	0	2	3
Course Objective	1. Enhance the fundamental knowledge in properties of matter 2. Analysis the oscillatory motions of particles 3. Extend the knowledge about wave optics 4. Gain knowledge about laser and their applications 5. Conversant with principles of optical fiber, types and applications of optical fiber					
Unit	Description					Instructional Hours
	PROPERTIES OF MATTER					
I	Elasticity – Hooke’s law – Stress-strain diagram - Poisson’s ratio – Bending moment – Depression of a cantilever – Derivation of Young’s modulus of the material of the beam by Uniform bending theory and experiment.					6+3(P)
	Determination of Young’s modulus by uniform bending method					
	OSCILLATIONS					
II	Translation motion –Vibration motion – Simple Harmonic motion – Differential Equation of SHM and its solution – Damped harmonic oscillation - Torsion stress and deformations – Torsion pendulum: theory and experiment.					6+3(P)
	Determination of Rigidity modulus – Torsion pendulum					
	WAVE OPTICS					
III	Conditions for sustained Interference – air wedge and it’s applications - Diffraction of light – Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh’s criterion of resolution power - resolving power of grating.					6+6(P)
	Determination of wavelength of mercury spectrum – spectrometer grating Determination of thickness of a thin wire – Air wedge method					
	LASER AND APPLICATIONS					
IV	Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein’s coefficients (A&B) – Type of lasers – Nd:YAG laser and CO ₂ laser- Laser Applications – Holography – Construction and reconstruction of images.					6+3(P)
	Determination of Wavelength and particle size using Laser					
	FIBER OPTICS AND APPLICATIONS					
V	Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Fiber optical communication link – Fiber optic sensors – Temperature and displacement sensors.					6
	Total Instructional Hours					45
Course Outcome	After completion of the course the learner will be able to CO1: Illustrate the fundamental properties of matter CO2: Discuss the Oscillatory motions of particles CO3: Analyze the wavelength of different colors CO4: Understand the advanced technology of LASER in the field of Engineering CO5: Develop the technology of fiber optical communication in engineering field					

TEXT BOOKS:

T1 - Rajendran V., "Applied Physics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2 - Gaur R.K. and Gupta S.L., "Engineering Physics", 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - Arthur Beiser "Concepts of Modern Physics", Tata McGraw Hill, New Delhi, 2015.

R2 – M.N Avadhanulu and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand and Company Ltd., New Delhi, 2016

R3 – Senthilkumar G., "Engineering Physics – I", VRB publishers Pvt. Ltd., 2016.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19CY1151	CHEMISTRY FOR ENGINEERS (Common to All Branches)	2	0	2	3
Course Objective	1. The boiler feed water requirements, related problems and water treatment techniques 2. The principles of polymer chemistry and engineering applications of polymers and composites 3. The principles of electrochemistry and with the mechanism of corrosion and its control 4. The principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells 5. The important concepts of spectroscopy and its applications					
Unit	Description					Instructional Hours
WATER TECHNOLOGY						
I	Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, simple calculations, estimation of hardness of water – EDTA method – Boiler troubles - Conditioning methods of hard water – External conditioning - demineralization process - desalination: definition, reverse osmosis – Potable water treatment – breakpoint chlorination. <i>Estimation of total, permanent and temporary hardness of water by EDTA.</i>					6+3(P)
POLYMER & COMPOSITES						
II	Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Bakelite – moulding of plastics (extrusion and compression); Composites: definition, types of composites – polymer matrix composites (PMC) –FRP					6
ELECTROCHEMISTRY AND CORROSION						
III	Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods - protective coatings – paints – constituents and functions. <i>Conductometric titration of strong acid vs strong base (HCl vs NaOH). Conductometric precipitation titration using BaCl₂ and Na₂SO₄. Estimation of Ferrous iron by Potentiometry.</i>					6+9(P)
ENERGY SOURCES AND STORAGE DEVICES						
IV	Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium battery- fuel cell H ₂ -O ₂ fuel cell applications.					6
ANALYTICAL TECHNIQUES						
V	Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy. <i>Determination of iron content of the water sample using spectrophotometer.(1,10 phenanthroline / thiocyanate method).</i>					6+3(P)
Total Instructional Hours						45

Course Outcome	CO1: Differentiate hard and soft water and to solve the related problems on water purification and its significance in industries and daily life
	CO2: Acquire the basic knowledge of polymers, composites and FRP and their significance.
	CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design.
	CO4: Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities.
	CO5: Identify the structure and characteristics of unknown/new compound with the help of spectroscopy.

TEXT BOOKS:

- T1 - P. N. Madudeswaran and B.Jeyagowri, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, Chennai (2019).
T2 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2018).

REFERENCES

- R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2012).
R2 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand & Co. Ltd., New Delhi (2017).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19CS1151	PROBLEM SOLVING AND PYTHON PROGRAMMING	2	0	2	3

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

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

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

TEXT BOOKS:

T1 – Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.6.2”, Shroff Publishers, First Edition, 2017.

T2 - Annadurai S., Shankar S, Jasmine J., Revathi M., “Fundamentals of Python Programming”, McGraw Hill Education (India) Private Ltd., 2019.

REFERENCE BOOKS:

R1 - Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.

R2 - Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.

R3 - Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	19ME1152	ENGINEERING DRAWING	1	0	4	3

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

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

- Course Outcome**
- Upon Completion of the course students will be able to
- CO1: Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves
- CO2: Draw the orthogonal projections of straight lines and planes
- CO3: Interpret the projections of simple solid objects in plan and elevation
- CO4: Interpret the projections of simple solid objects in plan and elevation
- CO5: Draw the isometric projections and the perspective views of different objects

TEXT BOOKS:

- T1 – K.Venugopal , Prabu Raja V., “Engineering Drawing, AutoCAD, Building Drawings”, 5th edition New Age International Publishers, New Delhi 2016.
- T2 – K.V. Natarajan, “A textbook of Engineering Graphics”, Dhanlaxmi Publishers, Chennai, 2009,

REFERENCE BOOKS:

- R1 - Basant Agrawal and C. M .Agrawal, “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi 2008.
- R2 – N.S.Parthasarathy., Vela Murali, “Engineering Drawing”, Oxford University Press, India 2015.

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Dr. P. N. MAGUDESWARAN

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Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. / B.Tech.	19HE1071	LANGUAGE COMPETENCY ENHANCEMENT COURSE- I (Common to All Branches)	1	0	0	1

Course Objective
1. To enhance student language competency 2. To identify individual students level of communication skills 3. To develop English Vocabulary and spoken communication skills. 4. To revive the fundamentals of English Grammar.

Unit	Description	Instructional Hours
	Listening	
I	Language of Communication- English listening- Hearing Vs Listening- Verbal and Non-verbal communication – Listening strategies-Sounds of English.	3
	Reading	
II	English Language Enhancement – Indianism in English – Role of Reading in effective communication – Techniques for good reading (skimming and scanning) Reading articles from newspaper, magazine. Reading and interpreting a passage.	3
	Speaking	
III	Common errors in Pronunciation – Signposts in English (Role play) – Public Speaking skills – Social Phobia – Eliminating fear – Common etiquette of speaking - Debate and Discuss.	3
	Writing	
IV	Writing genre – Enhancement of basic English Vocabulary; Parts of Speech, Noun, Verbs, and Tenses – combining sentences, sentence formation and completion.	3
	Art of Communication	
V	Communication process – Word building and roleplay – Exercise on English Language for various situations through online and offline activities.	3
Total Instructional Hours		15

Course Outcome
CO1: Trained to maintain coherence and communicate effectively. CO2: Practiced to create and interpret descriptive communication. CO3: Introduced to gain information of the professional world. CO4: acquired various types of communication and etiquette. CO5: Taught to improve interpersonal and intrapersonal skills

REFERENCE BOOKS:

- R1 - Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc graw Hill
R2 - Word Power Made Easy by Norman Lewis, – Print, 1 June 2011.
R3 - High School English Grammar by Wren and Martin, S.CHAND Publications, 1 January 2017.
R4 - Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19HE2101	BUSINESS ENGLISH FOR ENGINEERS (Common to All Branches)	2	1	0	3

- Course Objective**
1. Introduce business communication.
 2. Train to respond different professional situations.
 3. Make the learners familiar with the managerial skills
 4. Empower the trainee in business writing skills.
 5. Educate to interpret and expertise different business content.

Unit	Description	Instructional Hours
I	Listening and Speaking – listening and discussing about programme and conference arrangement Reading –reading auto biographies of successful personalities Writing Formal & informal email writing, Recommendations Grammar and Vocabulary- Business vocabulary, Adjectives & adverbs.	9
II	Listening and Speaking- listening to TED talks Reading- Making and interpretation of posters Writing- Business letters: letters giving good and bad news, Thank you letter, Congratulating someone on a success” Grammar and Vocabulary- Active & passive voice, Spotting errors (Tenses, Preposition, Articles).	9
III	Listening and Speaking- travel arrangements and experience Reading- travel reviews Writing- Business letters (Placing an order, making clarification & complaint letters). Grammar and Vocabulary- Direct and Indirect speech..	9
IV	Listening and Speaking- Role play- Reading- Sequencing of sentence Writing- Business report writing (marketing, investigating) Grammar and Vocabulary- Connectors, Gerund & infinitive.	9
V	Listening and Speaking- Listen to Interviews & mock interview Reading- Reading short stories, reading profile of a company - Writing- Descriptive writing (describing one’s own experience) Grammar and Vocabulary- Editing a passage(punctuation, spelling& number rules).	9
Total Instructional Hours		45

- Course Outcome**
- CO1:To know different modes of business communication
 CO2: To understand managerial techniques.
 CO3: To apply the rules of grammar and vocabulary in effective business communication.
 CO4: To analyze and interpret business documents.
 CO5:To draft business reports

TEXT BOOKS:

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

REFERENCE BOOKS :

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

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Dr. P. N. MAGUDESWARAN
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Dr. K. KARUNAKARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E. /B.Tech.	19MA2101	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES (Common to AERO, AGRI, AUTO, CIVIL, FOOD, MECH, MECH)	3	1	0	4

Course Objective

1. Describe some methods to solve different types of first order differential equations.
2. Use the effective mathematical tools for the solutions of partial differential equations.
3. Describe the construction of analytic functions and conformal mapping.
4. Illustrate Cauchy's integral theorem and calculus of residues
5. Solve ordinary differential equations of certain types using Wronskian technique

Unit	Description	Instructional Hours
FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS		
I	Solutions of Equations of the first order and of the first degree – Variable separable method- Homogeneous equations – Exact differential equations (Excluding non Exact differential Equations) – Linear equations – Equations reducible to the linear form – Bernoulli's equation	12
PARTIAL DIFFERENTIAL EQUATIONS		
II	Formation of partial differential equations by the elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations of the form $f(p,q)=0$, Clairaut's type : $z = px+qy +f(p,q)$ – Lagrange's linear equation.	12
COMPLEX DIFFERENTIATION		
III	Functions of complex variables – Analytic functions – Cauchy's – Riemann's equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping $w = A+z$, Az , $1/z$ and bilinear transformations.	12
COMPLEX INTEGRATION		
IV	Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem.	12
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER		
V	Second order linear differential equations with constant and variable co-efficients – Cauchy – Euler equations – Cauchy – Legendre equation – Method of variation of paramers.	12
Total Instructional Hours		45 + 15 = 60

Course Outcome

- CO1: Apply few methods to solve different types of first order differential equations.
 CO2: Solve Partial Differential Equations using various methods.
 CO3: Infer the knowledge of construction of analytic functions and conformal mapping.
 CO4: Evaluate real and complex integrals over suitable closed paths or contours.
 CO5: Develop sound knowledge of techniques in solving ordinary differential equations

TEXT BOOKS:

- T1- Ravish R Singh, Mukul Bhatt, "Engineering Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
 T2- Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018.

REFERENCE BOOKS :

- R1- Veerarajan T, "Engineering Mathematics", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016
 R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
 R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EE2103	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	3

Course Objective	Description
	1. To understand the basic laws and apply them in Electrical circuits and understand different measuring instruments
	2. To impart knowledge on construction and working of DC and AC machines
	3. To create awareness on the methods for electrical safety, load protection basics
	4. To provide knowledge on the fundamentals of semiconductor devices and their applications
	5. To impart knowledge on digital electronics and its principles

Unit	Description	Instructional Hours
ELECTRICAL CIRCUITS AND MEASUREMENTS		
I	Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase circuits - Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments - Ammeters and Voltmeters, Dynamometer type Watt meters and Energy meters.	9
ELECTRICAL MACHINES		
II	Construction, Principle of Operation of DC Generators - EMF Equation - Construction, Principle of Operation of DC shunt and series Motors, Single Phase Transformer - EMF Equation, Single phase capacitor start - capacitor run – Construction, Principle of Operation of Three Phase Induction Motor – Applications (Qualitative Approach only).	9
ELECTRICAL WIRING AND SAFETY		
III	Wiring types and applications: Service mains, meter board and distribution board - Brief discussion on concealed conduit wiring. One way and two way control. Elementary discussion on Circuit protective devices: fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock, Objectives for Neutral and Earthing, types of earthing; pipe and plate earthing, Residual current circuit breaker.	9
SEMICONDUCTOR DEVICES AND APPLICATIONS		
IV	Characteristics of PN Junction Diode – Zener Diode and its Characteristics – Zener Effect – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurations and Characteristics – FET – Characteristics.	9
DIGITAL ELECTRONICS		
V	Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops (RS, JK, T & D), A/D and D/A Conversion (Dual Slope, SAR, Binary-weighted and R-2R).	9
Total Instructional Hours		45

Course Outcome	Description
	Upon successful completion of the course, students shall have ability to
	CO1: Apply the KVL and KCL in Electrical circuits.
	CO2: Explain the constructional features of AC and DC machines
	CO3: Develop awareness on the methods for electrical safety, load protection basics
	CO4: Identify electronics components and use them to design circuits
	CO5: Develop combinational and sequential logic circuits

TEXT BOOKS:

T1 - Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Eighteenth Reprint, 2014.

T2 - Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.

REFERENCE BOOKS:

R1 - Premkumar N, "Basic Electrical and Electronics Engineering", Anuradha Publishers, 2018.

R2 - Mehta V K, "Principles of Electronics", S. Chand & Company Ltd, 1994.

R3 - Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.

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Dr. P. N. MAGUDESWARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19ME2101	ENGINEERING MECHANICS	3	0	0	3

Course Objective

1. To understand basic concepts and force systems in a real world environment.
2. To understand the static equilibrium of particles and rigid bodies both in two dimensions.
3. To understand the moment of surfaces and solids.
4. To understand the effect of static friction on equilibrium.
5. To understand the dynamic equilibrium equation.

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

Course Outcome

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

TEXT BOOKS:

- T1. F.P.Beer, and Jr. E.R.Johnston., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 11th Edition, Tata McGraw-Hill Publishing company, New Delhi (2018).
 T2. NH.Dubey, “Engineering Mechanics”, Tata Mcraw Hill, New Delhi, 2016.

REFERENCE BOOKS:

1. R.C.Hibbeler, and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education 2010.
2. S.S.Bhavikatti, and K.G.Rajashekarappa, “Engineering Mechanics”, New Age International (P) Limited Publishers, 2015.
3. P. Jagat Babu, “Engineering Mechanics”, Pearson Education, India Ltd, 2016.

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Dr. P. N. MAGUDESWARAN
Signature of the Dean

Dr. K. KARUNAKARAN
Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19PH2151	MATERIAL SCIENCE (Common to All Branches)	2	0	2	3

Course Objective
1. Acquire fundamental knowledge of semiconducting materials which is related to the engineering program 2. Extend the knowledge about the magnetic materials 3. Explore the behavior of super conducting materials 4. Gain knowledge about Crystal systems 5. Understand the importance of ultrasonic waves

Unit	Description	Instructional Hours
SEMICONDUCTING MATERIALS		
I	Introduction – Intrinsic semiconductor – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination. Optical properties of semiconductor – Light through optical fiber(Qualitative). <i>Determination of band gap of a semiconductor</i> <i>Determination of acceptance angle and numerical aperture in an optical fibre</i>	6+6(P)
MAGNETIC MATERIALS		
II	Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. <i>B – H curve by Magnetic hysteresis experiment</i>	6+3(P)
SUPERCONDUCTING MATERIALS		
III	Superconductivity : properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – High Tc superconductors – Applications of superconductors –Cryotron and magnetic levitation.	6
CRYSTAL PHYSICS		
IV	Crystal systems - Bravais lattice - Lattice planes - Miller indices - Interplanar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
ULTRASONICS		
V	Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Cavitations – Viscous force – co-efficient of viscosity. Industrial applications – Drilling and welding – Non destructive testing – Ultrasonic pulse echo system. <i>Determination of velocity of sound and compressibility of liquid – Ultrasonic wave</i> <i>Determination of co-efficient of viscosity of a liquid – Piseuille’s method</i>	6+6(P)
Total Instructional Hours		45

Course Outcome
CO1: Understand the purpose of acceptor or donor levels and the band gap of a semiconductor CO2: Interpret the basic idea behind the process of magnetism and its applications in everyday CO3: Discuss the behavior of super conducting materials CO4: Illustrate the types and importance of crystal systems CO5: Evaluate the production of ultrasonics and its applications in NDT

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - Arthur Beiser “Concepts of Modern Physics” Tata McGraw Hill, New Delhi – 2015

R2 - M.N Avadhanulu and PG Kshirsagar “A Text Book of Engineering physics” S. Chand and Company ltd.,
New Delhi 2016

R3 - Dr. G. Senthilkumar “Engineering Physics – II” VRB publishers Pvt Ltd., 2016.

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19CY2151	ENVIRONMENTAL STUDIES (Common to All Branches)	2	0	2	3

Course Objective
1.The importance of environmental education, ecosystem and biodiversity. 2.The knowledge about environmental pollution – sources, effects and control measures of environmental pollution. 3.The natural resources, exploitation and its conservation 4. Scientific, technological, economic and political solutions to environmental problems. 5. An awareness of the national and international concern for environment and its protection.

Unit	Description	Instructional Hours
	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	
I	Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity	6
	NATURAL RESOURCES	
II	Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources	6
	ENVIRONMENTAL POLLUTION	
III	Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution. <i>Determination of Dissolved Oxygen in sewage water by Winkler's method.</i> <i>Estimation of alkalinity of water sample by indicator method.</i> <i>Determination of chloride content of water sample by argentometric method.</i>	6+9(P)
	SOCIAL ISSUES AND THE ENVIRONMENT	
IV	From unsustainable to sustainable development – urban problems related to energy- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones. <i>Determination of pH in beverages.</i>	6+3(P)
	HUMAN POPULATION AND THE ENVIRONMENT	
V	Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health. <i>Estimation of heavy metal ion (Copper) in effluents by EDTA.</i>	6+3(P)
	Total Instructional Hours	45

Course Outcome

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

TEXT BOOKS:

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

REFERENCES:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. / B.Tech.	19ME2001	ENGINEERING PRACTICES	0	0	4	2

Course Objective To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering

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

GROUP A (CIVIL AND MECHANICAL ENGINEERING PRACTICES)

1. Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows
2. Arrangement of bricks using English Bond for 1 brick thick wall for right angle corner junction and T- junction
3. Arrangement of bricks using English Bond for 1 1/2 brick thick wall for right angle corner and T- junction
4. Preparation of arc welding of Butt joints, Lap joints and Tee joints
5. Practice on sheet metal Models– Trays and funnels
6. Hands-on-exercise in wood work, joints by sawing, planning and cutting
7. Practice on simple step turning, taper turning and drilling
8. Practice on Drilling
9. Demonstration on Foundry operation
10. Demonstration on Power tools

GROUP B (ELECTRICAL ENGINEERING PRACTICES)

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter
2. Fluorescent lamp wiring
3. Stair case wiring
4. Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits
5. Measurement of energy using single phase energy meter
6. Soldering practice using general purpose PCB
7. Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator
8. Study of Energy Efficient Equipments and Measuring Instruments

Total Practical Hours: 45

Course Outcome At the end of the course the students shall be able to

- Fabricate wooden components and pipe connections including plumbing works
- Fabricate simple weld joints
- Fabricate different electrical wiring circuits and understand the AC Circuits

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Programme	Course Code	Name of the Course	L	T	P	C
B.E. / B.Tech.	19HE2071	LANGUAGE COMPETENCY ENHANCEMENT COURSE- II (Common to All Branches)	1	0	0	1

Course Objective	Description
	1. To improve communication skills and Professional Grooming. 2. To impart deeper knowledge of English Language and its practical application in different facets of life. 3. To equip the techniques of GD, Public Speaking, debate etc.

Unit	Description	Instructional Hours
	Listening	
I	Listening for gist and respond – Listen for detail using key words to extract specific meaning – listen for phonological detail – Listen and identify the main points for short explanations and presentation.	3
	Reading	
II	Strategies for effective reading – read and recognize different text types – Genre and Organization of Ideas – Quantifying reading – reading to comprehend – Interpreting sentences – contrasting, summarizing or approximating	3
	Speaking	
III	Speak to communicate – Make requests and ask questions to obtain personal information – use stress and intonation – articulate the sounds of English to make the meaning understood – speaking to present & Interact – opening and closing of speech.	3
	Writing	
IV	Plan before writing – develop a paragraph: topic sentences, supporting sentences – write a descriptive paragraph – elements of good essay – descriptive, narrative, argumentative – writing emails – drafting resumes – project writing – convincing proposals.	3
	Language Development	
V	Demonstration at level understanding of application of grammar rules – revision of common errors : preposition, tenses, conditional sentences –reference words – pronouns and conjunctions.	3
Total Instructional Hours		15

Course Outcome	Description
	CO1: Introduced to different modes and types of communication. CO2: Practiced to face and react to various professional situations efficiently. CO3: learnt to practice managerial skills. CO4: Familiarized with proper guidance to writing. CO5: Trained to analyze and respond to different types of communication.

REFERENCE BOOKS:

- R1 - Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc graw Hill
R2 - Word Power Made Easy by Norman Lewis, – Print, 1 June 2011.
R3 - High School English Grammar by Wren and Martin, S.CHAND Publications, 1 January 2017.
R4 - Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19MA3103	FOURIER ANALYSIS AND NUMERICAL METHODS	3	1	0	4

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

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

Course Outcome
CO1: Understand the function in terms of sine and cosine terms in fourier series and also to get knowledge in fourier transforms CO2: Demonstrate the application of Fourier series in solving the heat and wave equations CO3: Understand the mathematical principles on Fourier transforms and able to solve some of the physical problems of engineering CO4: Understand and apply the concepts of interpolation, numerical differentiation and integration CO5: Understand the concept of solving ordinary differential equations using single and multi step methods

TEXT BOOKS:

- T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018
 T2 - Grewal.B.S. "Higher Engineering Mathematics", 44th Edition, Khanna Publications, New Delhi, 2012.

REFERENCE BOOKS :

- R1 - Kreyszig.E. "Advanced Engineering Mathematics", Eight Edition, John Wiley & sons (Asia) ltd 2010.
 R2 - Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
 R3- S.K.Gupta, Numerical Methods for Engineers", New Age International Pvt.Ltd Publishers,2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3201	MECHANICS OF FLUIDS	3	0	0	3

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

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

Course Outcome
Upon successful completion of the course, students shall have ability to CO1: Comprehend the properties of fluids CO2: Understand the working of pressure measuring devices and measure fluid pressure CO3: Distinguish between various types of fluid flows and find the fluid velocity and discharge using principles of Kinematics and Dynamics CO4: Identify the laminar and turbulent flow through pipes and compute the energy losses in pipe flow CO5: Select appropriate model to provide solution to a real time problem related to hydraulics

TEXT BOOKS:

T1 – Streeter V.L., Wylie E. B. and Bedford K. W., “Fluid Mechanics”, Tata McGraw Hill Publishing Co. Ltd., 2017.
 T2 - Modi P. N. and Seth S M., “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House, New Delhi, 2013.

REFERENCE BOOKS:

R1 - Bansal R.K., “Fluid Mechanics & Hydraulic Machines”, Laxmi Publications, 2015.
 R2 - Kumar .K.L, “Engineering Fluid Mechanics”, Eurasia Publishing House, 2002.
 R3 - Pani B.S., “Fluid Mechanics: A concise introduction” PHI Learning EEE 2016.
 R4 - Narayana Pillai N. “Principles of Fluid Mechanics and Fluid Machines”, 3rd. Ed. University Press (India) Pvt. Ltd. 2009.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3202	GEOLOGY AND CONSTRUCTION MATERIALS	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3203	SURVEYING	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

- R1 - Alak De, “Plane Surveying”, S. Chand & Company Ltd., 2000.
 R2 - Bannister, A., Raymond, S., Baker, R., "Surveying", Pearson Education Ltd., 7th Edition, 2009.
 R3 - Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.
 R4 - Arora, K. R., “Surveying Vol I & II”, Standard Book House, Twelfth Edition, 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3251	MECHANICS OF SOLIDS	2	0	2	3
Course Objective	1. To study the state of stresses and strains in structural components subjected to different loading conditions 2. To gain knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and loading 3. To learn the concepts of internal stress in beams of various cross sections 4. To analyze the members under complex state of stress by means of analytical and graphical methods 5. To understand the behaviour of members subjected to pure torsion and shear					

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

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Realize the state of stresses and strains in structural components under tension, compression and shear CO2: Plot the Shear force and bending moment diagrams for all the statically determinate beams CO3: Analyse the beam for bending and shear stresses CO4: Evaluate the elements subjected to complex state of stress by means of analytical and graphical methods. CO5: Comprehend the behaviour of members under pure torsion and shear
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TEXT BOOKS:

- T1 - Bansal R.K. "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, 2018
 T2 - Rajput R K., "A Textbook of Strength of Materials", S. Chand Publishing, New Delhi, 2018

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3001	SURVEY LAB	0	0	4	2

Course Objective

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

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

11. Aligning, Ranging and Chaining
12. Chain Traversing
13. Compass Traversing
14. Fly Levelling using Dumpy Level (Height of Instrument and Rise & Fall Method)
15. Study of Theodolite
16. Horizontal Angles using Theodolite (Method of Repetition and Reiteration)
17. Vertical Angles using Theodolite
18. Stadia and Tangential Tacheometry
19. Setting Out of Structures using Total Station
20. Area of the Plot using Total Station
21. Introduction to GPS (Demonstration Only)

Total Practical Hours 45

Course Outcome

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

REFERENCE BOOKS:

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

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Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE3002	COMPUTER AIDED BUILDING DRAWING	0	0	4	2

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

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

Total Practical Hours 45

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19MC3191	INDIAN CONSTITUTION	2	0	0	0

Course Objective

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

Unit	Description	Instructional Hours
BASIC FEATURES AND FUNDAMENTAL PRINCIPLES		
I	Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India.	4
FUNDAMENTAL RIGHTS		
II	Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy – its importance and implementation - Federal structure and distribution of legislative and financial powers between the union and states.	4
PARLIAMENTARY FORM OF GOVERNMENT		
III	The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – The historical perspective of the constitutional amendment of India – Emergency provisions: National emergency, President rule, Financial emergency.	4
LOCAL GOVERNANCE		
IV	Local self government - constitutional scheme of India – Scheme of fundamental right to equality – scheme of fundamental right to certain freedom under article 19 – scope of the right to life and personal liberty under article 21	4
INDIAN SOCIETY		
V	Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	4
Total Instructional Hours		20

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

- R1 - Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
 R2 - Gahai U R., "Indian Political System", New Academic Publishing House, Jalaendhar.
 R3 - Sharma R N., "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.

Dr. K. AKIL

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19MA4103	PROBABILITY AND STATISTICS	3	1	0	4

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS :

- R1- O.C. Ibe, “Fundamentals of Applied Probability and Random Processes”, Elsevier, First Indian Reprint, 2010.
 R2 - **Applied statistics and Probability for Engineers by C.Mont Gomery ,6th Edition, Wiley Publications.**
 R3 - Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4201	STRENGTH OF MATERIALS	3	1	0	4

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4202	APPLIED HYDRAULICS AND HYDRAULIC MACHINERY	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4203	SOIL MECHANICS	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

- T1 - Murthy, V.N.S., “Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi. 2011.
- T2 - Arora K.R. “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 2015.

REFERENCE BOOKS:

- R1 - Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
- R2 - Gopal Ranjan and Rao. P. “Basic and Applied Soil Mechanics”, New Age International Pvt, Ltd, New Delhi, 2014.
- R3 - Braja M. Das, “Fundamentals of Geotechnical Engineering”, Thomson Asia Pvt. Ltd., Singapore, 2010.
- R4 - McCarthy, D.F., “Essentials of Soil Mechanics and Foundations”. Prentice-Hall, 2006.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4251	CONCRETE TECHNOLOGY	2	0	2	3

Course Objective
6. To understand the properties of ingredients of concrete
7. To learn the properties and applications of chemical and mineral admixtures
8. To gain knowledge on concrete design mix
9. To study the behaviour of concrete at its fresh and hardened state
10. To understand special concrete and their use

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

Course Outcome
Upon successful completion of the course, students shall have ability to
CO1: Understand the various requirements of cement, aggregates and water for making concrete.
CO2: Understand the effect of admixtures on properties of concrete
CO3: Design the concrete mix using ACI and IS code methods.
CO4: Determine the properties of fresh and hardened of concrete.
CO5: Understand the importance and application of special concretes.

TEXT BOOKS:

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

REFERENCE BOOKS:

- R1 - Bhavikatti.S.S, “ Concrete Technology”, I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
R2 - Neville, A. M., “Properties of Concrete”, Pearson India, fifth edition, 2002.
R3 - Kumar P Mehta., Paulo J M Monterio., “Concrete - Microstructure, Properties and Materials”, McGraw Hill Education (India) Private Limited, New Delhi, 2016.
R4 - Santhakumar, A. R., “Concrete Technology”, Oxford University Press India, New Delhi 2006.

CODE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4251	CONCRETE TECHNOLOGY	2	0	2	3

Course Objective	
11.	To understand the properties of ingredients of concrete
12.	To learn the properties and applications of chemical and mineral admixtures
13.	To gain knowledge on concrete design mix
14.	To study the behaviour of concrete at its fresh and hardened state
15.	To understand special concrete and their use

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

Course Outcome	
	Upon successful completion of the course, students shall have ability to
	CO1: Understand the various requirements of cement, aggregates and water for making concrete.
	CO2: Understand the effect of admixtures on properties of concrete
	CO3: Design the concrete mix using ACI and IS code methods.
	CO4: Determine the properties of fresh and hardened of concrete.
	CO5: Understand the importance and application of special concretes.

TEXT BOOKS:

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

REFERENCE BOOKS:

- R1 - Bhavikatti.S.S, “ Concrete Technology”, I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
R2 - Neville, A. M., “Properties of Concrete”, Pearson India, fifth edition, 2002.
R3 - Kumar P Mehta., Paulo J M Monterio., “Concrete - Microstructure, Properties and Materials”, McGraw Hill Education (India) Private Limited, New Delhi, 2016.
R4 - Santhakumar, A. R., “Concrete Technology”, Oxford University Press India, New Delhi 2006.

CODE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4001	SOIL MECHANICS LAB	0	0	4	2

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

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

Total Instructional Hours 45

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE4002	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	0	0	4	2

Course Objective	<ol style="list-style-type: none"> 1. To understand the theories and principles governing the flow using experimental methods. 2. To learn how to determine the losses occurring in pipes. 3. To study the characteristics of pumps and turbines.
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Expt . No.	Description of the Experiment
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- | | |
|-----|-------------------------------|
| 1. | Major and minor losses |
| 2. | Venturimeter and Orificemeter |
| 3. | Bernoulli's Experiment |
| 4. | Orifice (CHM & VHM) |
| 5. | Rectangular Notch |
| 6. | Reciprocating pump |
| 7. | Submersible pump |
| 8. | Centrifugal pump |
| 9. | Gear pump |
| 10. | Pelton wheel turbine |
| 11. | Francis turbine |
| 12. | Kaplan turbine |

Total Practical Hours 45

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19MC4191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

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

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

Course Outcome	CO1: Ability to understand the structure of Indian system of life. CO2: Connect up and explain basics of Indian Traditional knowledge in modern scientific perspective
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REFERENCE BOOKS:

- R1 - V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
- R2 - Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
- R3 - Fritzo Capra, Tao of Physics
- R4 - Fritzo Capra, The wave of Life
- R5 - V N Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Amakum
- R6 - Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
- R7 - GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
- R8 - RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
- R9 - P R Sharma (English translation), Shodashang Hridayam

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Dr. P. N. MAGUDESWARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5201	STRUCTURAL ANALYSIS I	3	0	0	3

Course Objective
6. To gain the knowledge on computing slopes and deflections using energy methods.
7. To analyze arched structures
8. To analyze the determinate structures for internal forces by slope deflection method.
9. To calculate the internal forces on determinate structures by moment distribution method.
10. To learn about basic concepts in influence lines for statically determinate structures

Unit	Description	Instructional Hours
DEFLECTION OF DETERMINATE STRUCTURES		
I	Definition and Determination of Static and Kinematic Indeterminacies in Beams, plane and space Trusses and Frames - Degree of Freedom - Analysis of plane trusses by method of joints, method of sections and method of tension coefficient – Castigliano’s First and Second Theorems - Deflection of statically determinate beams, pin jointed trusses and rigid jointed frames by energy method and unit load method – Betti’s Law and Maxwell reciprocal theorem.	9
ARCHES		
II	Arches as structural forms – Types of arches (definitions based on shape and number of centers) – Analysis of three hinged and two hinged parabolic and circular arches- Settlement and temperature effects.	9
SLOPE DEFLECTION METHOD		
III	Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements - Symmetric frames with symmetric and skew-symmetric loadings	9
MOMENT DISTRIBUTION METHOD		
IV	Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - Symmetric frames with symmetric and skew-symmetric loadings	9
MOVING LOADS AND INFLUENCE LINES		
V	Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.	9
Total Instructional Hours		45

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
Signature of the Dean

Dr. K. KARUNAKARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5202	DESIGN OF RC ELEMENTS	3	1	0	4

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

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

Course Outcome
Upon successful completion of the course, students shall have ability to
CO1: Illustrate the various design philosophies and design RC beam by working stress method
CO2: Design beams using limit state method under different loading and end conditions
CO3: Design slabs and staircases using limit state method
CO4: Design RC columns with different end conditions using limit state method
CO5: Select and design RC footing under various site conditions using limit state method

TEXT BOOKS:

T1 - Punmia, B. C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publications (P) Ltd., New Delhi, 2007.

T2 - Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2016.

REFERENCE BOOKS:

R1 - Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2017.

R2 - Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2008.

R3 - Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers & Distributors, New Delhi, 2019.

R4- Krishna Raju, N., Pranesh R N., “ Reinforced Concrete Design – Principles and Practice”, New Age International Publishers, 2018.

CODE BOOKS:

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5203	WATER SUPPLY ENGINEERING	3	0	0	3
Course Objective	1. Gain knowledge on the characteristics of water, water quality standards and plan water supply system based on demand and rate of consumption 2. Acquire adequate knowledge on the conveyance system and its components 3. Learn the unit operations and understand the design of various components of water treatment plants. 4. Understand the various advanced water treatment methods. 5. Get conversant with the methods of water distribution, systems of plumbing and house service connections.					

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

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Understand the importance of water quality standards and forecast population to determine the rate of consumption CO2: Interpret the various conveyance systems and its components CO3: Classify and design the various components of the water treatment plant CO4: Compare various advanced water treatment methods CO5: Analyze distribution networks and assess the various systems of plumbing
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TEXT BOOKS:

T1 - Punmia, B. C. , Ashok K. Jain, and Arun K. Jain, “Water Supply Engineering”, Laxmi Publications, Pvt. Ltd., New Delhi, 2017.

T2 - Garg, S. K, “Environmental Engineering” Vol. I, Khanna Publishers, New Delhi, 2010.

REFERENCE BOOKS:

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

R2 - Modi, P. N, “Water Supply Engineering” Vol. I, Standard Book House, New Delhi, 2010.

R3 - Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.

R4 - Syed R. Qasim and Edward M. Motley Guang Zhu, “Water Works Engineering Planning, Design and Operation”, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5204	FOUNDATION ENGINEERING	3	0	0	3

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

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

- Course Outcome**
- Upon successful completion of the course, students will have ability to
- CO1: Select the suitable method of site investigation based on the soil condition
- CO2: Calculate the bearing capacity and settlement of shallow foundation
- CO3: Comprehend the types and proportioning of footing
- CO4: Estimate the pile load capacity
- CO5: Understand retaining wall failure mechanisms and stability of retaining walls

TEXT BOOKS:

- T1 - Arora K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 2017.
- T2 - Murthy, V.N.S., “Soil Mechanics and Foundation Engineering”, CBS Publishers and Distributors Ltd., New Delhi, 2014

REFERENCE BOOKS:

- R1 – Punmia, B.C. “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd., New Delhi, 2017.
- R2 - Purushothama Raj. P., “Soil Mechanics and Foundation Engineering”, Pearson Education, 2nd Edition, 2013.
- R3 - Gopal Ranjan and Rao A.S.R. “Basic and Applied Soil Mechanics”, New Age International (P) Ltd, New Delhi, 2006.
- R4 - Varghese, P.C., “Foundation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2005.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5205	HIGHWAY AND RAILWAY ENGINEERING	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

CODE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5001	CONCRETE AND HIGHWAY ENGINEERING LAB	0	0	4	2
Course Objective	1. To study the properties of constituent materials of concrete 2. To gain knowledge on the tests on fresh concrete 3. To learn the tests on hardened concrete and how the different materials shall modify the performance of concrete 4. To know the properties of bitumen and to study the various tests carried out on aggregates 5. To understand the techniques to characterize the materials in concrete and highway					

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

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5002	SURVEY CAMP	0	0	0	1

Course Objective

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

Expt . No.**Description of the Experiment****2. Setting out work**

Setting out simple road curve by linear method

Setting out simple railway curve by Instrument method

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

3. Preparation of topographic map

Measurement of Area using Total Station

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

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

Total Practical Hours**1 week****Course Outcome**

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN

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Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6181	CONSTRUCTION MANAGEMENT	3	0	0	3
Course Objective	1. To study the necessity of planning in the diverse construction projects 2. To know the appropriate techniques used for scheduling the resources 3. To have exposure on various costs, control methods and departmental procedure for accounting 4. To study the quality control and monitoring techniques and the necessity of training to personnel 5. To provide awareness on construction safety and management information system					
Unit	Description					Instructional Hours
	CONSTRUCTION PLANNING					
I	Necessity - Basic concepts - Steps involved in planning - Phases and stages of project plan - Types of construction plans and construction projects - Planning for materials, labour and equipment - Defining work tasks - Precedence relationships among activities - Estimating activity durations - Estimating resource requirements for work activities - Program for progress of work and control - Bar chart - Milestone chart - Uses and drawbacks - Terminology - Coding systems.					9
	MANAGEMENT TECHNIQUES					
II	Evolution of networks - Inter-relationship of events and activities - Fundamental rules for network construction - Critical path method - Program Evaluation and Review Technique - Probability of project completion time - Precedence networks - Scheduling for activity-on-node networks - Resource oriented scheduling - Scheduling with resource constraints - Improving scheduling process - Time-cost relationships - Crashing and time / cost trade- offs - Introduction to application software.					9
	CONTROL, FINANCING AND DEPARTMENTAL ACCOUNTING PROCEDURE					
III	Costs and estimates associated with construction - Means of financing - Financial assistance - Project budget - Cost control system and codes - Cost accounts - Financial control and financial accounting systems - Project cash flows - Elements and control mechanism - Time value of money - Capital investment decision - Organization of PWD - Duties and responsibilities - Accounting procedure – Administrative and technical sanction - Payment of bills - Temporary advance account - Cash book - Work register - M-book - accounting for consumables - Record for tools and plants - Work charged establishment – Nominal Muster Roll - Daily Labour Reports.					9
	QUALITY CONTROL, TRAINING AND DOCUMENTATION					
IV	Importance and elements of quality - Organization for quality control - Total quality control - Quality control circles - Material specifications - Quality assurance techniques - Quality control by statistical methods -Statistical quality control with sampling by attributes and variables - Methods of training - on job and in-plant training - Performance appraisal – Documentation – Definition of tender and contract – Deposits - Earnest Money Deposit and Security deposit – Legal implications – Penalties and Arbitration.					9
	CONSTRUCTION SAFETY AND MANAGEMENT INFORMATION SYSTEM					
V	Construction accidents - Construction Safety Management: Importance - Causes of accident, Safety measures- Environmental issues in construction-Construction industry related laws. Human factors in safety – Legal and financial aspects of accidents in construction – Occupational and safety hazard assessment - Personal Protective Equipment (PPE) - Organizational Information Components - Construction Information Components - Construction - Applications - Web based Construction Management.					9
Total Instructional Hours					45	
Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Learn the requirement of planning techniques exercised in the construction projects CO2: Choose suitable scheduling technique for the particular project CO3: Interpret the modern cost account systems and control techniques adopted in the construction projects CO4: Make use of advanced management tools for quality control and monitoring techniques towards speedy and guaranteed projects CO5: Comprehend the aspects of construction safety and management information system					
TEXT BOOKS:						
T1 - Chitkara, K.K., “Construction Project Management - Planning, Scheduling and Controlling”, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2012.						
T2 - Jimmie W.Hinze, “Construction Planning and Scheduling”, Prentice Hall Publication, 4 th Edition, 2011.						
REFERENCE BOOKS:						
R1 - Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York, 2014.						
R2 - Willis, E.M., “Scheduling Construction projects”, John Wiley and Sons, 2011.						
R3 - Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pittsburgh, 2000.						
R4 - Moder. J., Phillips. C. and Davis E, “Project Management with CPM, PERT and Precedence Diagramming”, Van Nostrand Reinhold Co., 3 rd Edition, 2004.						
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6201	STRUCTURAL ANALYSIS II	3	0	0	3
Course Objective	1. To gain the knowledge on the analysis by flexibility method. 2. To gain knowledge on the analysis by stiffness matrix method. 3. To analyze the elements by finite element method. 4. To calculate the forces on indeterminate structures by plastic analysis. 5. To learn about basic concepts in space and cable structures.					
Unit	Description					Instructional Hours
	FLEXIBILITY METHOD					
I	Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Formation of flexibility matrices - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).					9
	STIFFNESS METHOD					
II	Restrained structure –Formation of stiffness matrices - Equilibrium condition - Analysis of Continuous Beams - Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of Pin-jointed plane frames and rigid frames (with redundancy limited to two) by direct stiffness method.					9
	FINITE ELEMENT METHOD					
III	Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements					9
	PLASTIC ANALYSIS OF STRUCTURES					
IV	Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge - Mechanism and collapse load - Static and kinematic methods – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.					9
	SPACE AND CABLE STRUCTURES					
V	Analysis of Space trusses using method of tension coefficients – Suspension cables – Equilibrium, Length and Anchorage of suspension cables - Suspension bridges with two and three hinged stiffening girders - Influence lines for three hinged stiffening girders.					9
Total Instructional Hours						45
Course Outcome	Upon successful completion of the course, students will have ability to CO1: Determine the member forces and displacements for trusses and analyse beams and frames by flexibility method CO2: Analyse beams and frames by stiffness matrix method CO3: Understand the different elements of a structure using finite element method CO4: Analyse the beams and frames by plastic analysis CO5: Appraise the structural behavior of cable and space structures					
TEXT BOOKS:						
T1 – Vaidyanathan, R. and Perumal, P., “Structural Analysis – Vol.I& II”, Laxmi Publications, New Delhi, 4 th Edition 2018.						
T2 - Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, “Theory of structures”, Laxmi Publications Pvt. Ltd., New Delhi, 13 th Edition 2017						
REFERENCE BOOKS:						
R1 – Devadas Menon, “Structural Analysis”, Narosa Publishing House, 2 nd Edition 2018						
R2 – Pandit G.S. & Gupta S.P. "Structural Analysis – A Matrix Approach", Tata McGraw Hill, 2008.						
R3 – William Weaver Jr. & James M. Gere, “Matrix Analysis of Framed Structures”, CBS Publishers and Distributors, Delhi, 2004.						
R4 – Hibbeler, R.C., “Structural Analysis”, Pearson Education, 10 th Edition, 2018.						
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6202	DESIGN OF STEEL STRUCTURAL ELEMENTS	3	0	0	3
Course Objective	1. To understand the concept of limit state design and design of connections 2. To gain knowledge on the design of tension members 3. To gain knowledge on the design of compression members 4. To get familiar with the design of beams, plate girders, stiffeners and web splices 5. To learn the design of industrial structures					

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

CODE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6203	WASTEWATER ENGINEERING	3	0	0	3
Course Objective	1. To understand the systems of sewerage and estimate the quantity of wastewater 2. To acquire knowledge on hydraulics and design of sewers 3. To study the characteristics and composition of sewage and understand the principles of primary sewage treatment 4. To learn the principles, components and working of various biological treatment processes 5. To explore the methods of sewage disposal and sludge management					

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 - Manual on Sewerage and Sewage Treatment Systems Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
 R2 - Mark J. Hammer, Mark J. Hammer Jr, “Water and Wastewater Technology”, Prentice Hall of India, 2012.
 R3 - Metcalf and Eddy, “Wastewater Engineering–Treatment and Reuse”, Tata Mc.Graw-Hill Company, New Delhi, 2010.
 R4 - Shah.C. S., “Water Supply and Sanitation”, Galgotia Publishing Company, New Delhi, 1998.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6001	WATER AND WASTEWATER TESTING LAB	0	0	3	1.5
Course Objective	1. Gain insight on sampling, preservation methods and the significance of characterization of water and wastewater 2. Study the characterization of water and wastewater samples as per BIS water quality and effluent standards 3. Learn to analyze and measure the various physical, chemical and biological parameters of water and wastewater 4. Understand the principles and operational procedures of modern instrumentation methods adopted in water quality testing 5. Get conversant with the water and wastewater specifications of IS / WHO					

Expt . No.	Description of the Experiment
1.	Sampling, preservation methods and significance of characterization of water and wastewater
2.	Determination of pH and Turbidity in water
3.	Determination of Available Chlorine in Bleaching Powder solution
4.	Determination of Residual Chlorine in water
5.	Determination of Total, Fixed, Volatile and Settleable solids in wastewater
6.	Coagulation and Precipitation process for treating wastewater
7.	Determination of Biological Oxygen Demand in wastewater
8.	Determination of Chemical Oxygen Demand in wastewater
9.	Determination of Sulphate in wastewater
10.	Determination of Nitrate in wastewater
11.	Determination of Ammonia Nitrogen in wastewater
12.	Determination of Phosphate in wastewater
13.	Determination of Calcium, Potassium and Sodium
14.	Heavy metals determination – Chromium, Lead and Zinc (Demonstration Only)
15.	Bacteriological Analysis (Demonstration Only)

Total Practical Hours 45

Course Outcome	Upon successful completion of the course, students will have ability to CO1: Collect, store, preserve and characterize water and wastewater samples based on requirements CO2: Illustrate the significance of characterization of water, wastewater and BIS water quality and effluent standards CO3: Conduct experiments to determine the various physical, chemical and biological characteristics of water and wastewater samples CO4: Demonstrate, analyze and measure the required water quality parameters using advanced instrumentation methods CO5: Compare and check the determined results with IS / WHO standards
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REFERENCE BOOKS

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

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

Course Objective

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

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

1. Design and Drawing of Cantilever retaining wall
2. Design and Drawing of Counter-fort Retaining wall
3. Design and Drawing of T beam Bridge for IRC loading
4. Design and Drawing of Circular water tank with Dome
5. Design and Drawing of Underground water tank

Total Practical Hours 45**Course Outcome**

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

REFERENCE BOOKS:

- R1- Krishnaraju N., "Structural Design & Drawing: Reinforced Concrete and Steel", Universities Press, 2013.
 R2- Punmia B C., Ashok Kumar Jain, Arun Kumar Jain., "Comprehensive Design of Steel Structures", Laxmi Publication Pvt. Ltd., 2015.
 R3 -Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2002.
 R4 -Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2005.

CODE BOOKS:

- C1- IS 456:2000 (R2016), "Plain and Reinforced Concrete - Code of Practice", BIS, New Delhi, 2016.
 C2- SP16:1980, "Design Aids for Reinforced Concrete to IS456:1978", BIS, New Delhi, 1999.
 C3- IS 875 (Part 1, 2, 3):2015, "Indian Standard Specification for Design Loads for Buildings", BIS, New Delhi, 2015.
 C4- IS 3370 (Part 1, 2, 4):1967 (R2008), "Code of Practice for Concrete Structures for the Storage of Liquids", BIS, New Delhi, 2008.

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Dr. P. N. MAGUDESWARAN

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Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7201	WATER RESOURCES AND IRRIGATION ENGINEERING	3	0	0	3

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

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

Course Outcome
Upon successful completion of the course, students shall have ability to CO1: Understand the concepts of planning and estimation of water resources for irrigation and drinking CO2: Comprehend the significance of economics of water resource planning, water quality and water budget CO3: Encompass the fundamentals of irrigation engineering to calculate irrigation efficiencies and crop water requirements CO4: Illustrate the types of impounding structures, canal drops and cross drainage work CO5: Classify the different methods of irrigation and interpret participatory irrigation management

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

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

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7202	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	3	0	0	3

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

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

Course Outcome
Upon successful completion of the course, students shall have ability to CO1: Apply the knowledge of science and engineering fundamentals to idealize and formulate the equations of motion for SDOF system CO2: Develop the equations of motion for MDOF system and to evaluate the natural frequencies and mode shapes CO3: Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation CO4: To identify the various causes and effects of earthquakes on structures due to past earthquakes CO5: To analyze the structures subjected to dynamic loading and to design for seismic loading as per codal provisions

TEXT BOOKS:

- T1- Mario Paz, "Structural Dynamics – Theory and Computations", CBS Publishers, 5th Edition, 2006.
 T2 – Agarwal, P. and Shrikhande, M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd., 2011.

REFERENCE BOOKS:

- R1 - Minoru Wakabayashi, "Design of Earthquake Resistant Buildings", McGraw Hill Book Company, 1986.
 R2 - Moorthy, C.V.R., "Earthquake Tips", NICEE, IIT Kanpur, 2002.
 R3 – Clough, R.W. and Penzien, J., "Dynamics of Structures", McGraw Hill International Edition, 2nd Edition, 1995.
 R4 – Chopra A.K., "Dynamics of Structures -Theory and Applications to Earthquake Engineering", Pearson Education, 5th Edition, 2016.

CODE BOOKS:

- C1- IS 1893(Part- I):2016 "Criteria for Earthquake Resistant Structures – General Provisions and Buildings", Bureau of Indian Standards, New Delhi.
 C2-IS 13920:2016 "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice", Bureau of Indian Standards, New Delhi.
 C3-IS 4326:2013 "Earthquake Resistant Design and Construction of Buildings - Code of Practice", Bureau of Indian Standards, New Delhi.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7203	ESTIMATION, COSTING AND VALUATION	3	1	0	4
Course Objective	1. To familiarize the methods of estimates 2. To understand the schedule of rates for rate analysis 3. To get exposed to various detailed and general specifications to meet out legal requirements 4. To emphasize the importance of proper valuation of buildings 5. To study the principles of report preparation					
Unit	Description					Instructional Hours
ESTIMATION OF BUILDINGS AND STRUCTURES						
I	Introduction to estimation – Purpose of estimates - Methods of estimates – Types of estimates – Units of measurement – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, sanitary and water supply installations and pipe lines, retaining walls and culverts - Estimate of joineries for paneled and glazed doors, windows, ventilators, handrails, etc.,- Estimate of Rain Water Harvesting					10+3
RATE ANALYSIS						
II	Analysis of rates – Concepts and Terminologies - Factors affecting the cost of materials and Labour – Measurement and abstract sheets –Schedule as basis of costs – Plant and equipment costs – Hour costs based on total costs and output – Rate analysis for all building works, canals, and Roads – CPWD/ PWD Standard schedule of rates-BOQ (Bill of Quantities) -BOM (Bill of Materials)					10+3
SPECIFICATION AND TENDERS						
III	Data – Specification – Sources – Detailed and general specification – Arbitration and legal requirements – Tender notices – types – tender procedures – Drafting model tenders, e-tendering - Digital signature certificates - Encrypting - Decrypting – Reverse auctions					9+3
FUNDAMENTALS AND METHODS OF VALUATION						
IV	Principles and purpose of valuation – Types of values – Book value, Salvage Value, Scrap value, Replacement value, Reproduction value, Earning value, Market value, Distress value, Capitalized value – Depreciation – Methods of calculation depreciation – Straight line method, Declining balance method, sinking fund method, Quantity survey method – Duties and Responsibilities of Valuers – Mortgage – Lease – Methods of valuation – Rental method, Belting method, Valuation based on land and building – Valuation from yield					10+3
REPORT PREPARATION						
V	Principles for report preparation – Report on estimate of building, Arches, Culverts, Roads, Water and Sanitary installations, Tube and Open Wells, Retaining walls, Aqueducts					9
					Total Instructional Hours	60
Course Outcome	Upon successful completion of the course, students shall have ability to 6. Produce a detailed estimated report considering the building plan and additional amenities 7. Do rate analysis based on the knowledge gained from schedule of rates 8. Specify the importance of detailed and general specifications 9. Calculate depreciation and value the building 10. Prepare a detailed report with accurate specification and values					
TEXT BOOKS:						
T1 - Dutta, B. N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2016.						
T2 - Kohli, D. D. and Kohli, R. C., “A Text Book of Estimating and Costing (Civil)”, S. Chand & Company Ltd., 2013.						
REFERENCE BOOKS:						
R1 - “Hand Book of Consolidated Data” – 8/2000, Vol.1, TNPWD.						
R2 - “Tamilnadu Transparencies in Tender Act”, 2000.						
R3 - “Standard Bid Evaluation Form, Procurement of Goods or Works”, The World Bank, 1996.						
R4 - “Standard Data Book for Analysis and Rates”, IRC, New Delhi, 2003.						
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7001	DESIGN AND DRAWING OF STEEL STRUCTURES	0	0	4	2

Course Objective

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

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

1. Analysis, design and drawing of steel beam by STAAD.Pro
2. Analysis, design and drawing of steel frame by STAAD.Pro
3. Analysis, design and drawing of steel truss by STAAD.Pro
4. Analysis, design and drawing of industrial building by STAAD.Pro
5. Design and drawing of steel tank
6. Design and drawing of plate girder
7. Design and drawing of gantry girder

Total Practical Hours 45

Course Outcome

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

CO1: Acquire hands on experience in designing and proficiently use the software packages for steel structural design

CO2: Design and draw steel roof truss elements

CO3: Design and draw industrial building with different components

CO4: Design and draw various types of steel water tanks

CO5: Design and draw plate girder and gantry girder

REFERENCE BOOKS:

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

CODE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7901	PROJECT I - DESIGN PROJECT	0	0	4	2

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

Description	Total Hours
This course conceives purely a design problem in any one of the disciplines of Civil Engineering. e.g. Design of an RC structure, Design of a wastewater treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course, the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.	45

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8901	PROJECT II – MAIN PROJECT	0	0	24	12

Course Objective

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

Description**Total Hours**

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

180**Course Outcome**

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5301	ADVANCED SURVEYING TECHNIQUES	3	0	0	3

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

Unit	Description	Instructional Hours
	ASTRONOMICAL SURVEYING	
I	Astronomical terms and definition – Motion of sun and stars – Celestial co-ordinate System - Time system - Nautical Almanac – Apparent attitude and corrections – Field observations and determinations of time, longitude, latitude and azimuth by attitude and Hour angle method.	9
	AERIAL SURVEYING	
II	Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry – overlaps – Scale of photographs – Vertical and titled photographs distortion in aerial photographs – Stereoscopic vision - Photo interpretation – Applications.	9
	TOTAL STATION SURVEYING	
III	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.	9
	GPS SURVEYING	
IV	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.	9
	MISCELLANEOUS SURVEYING	
V	Reconnaissance – Route surveys for highways, railways and waterways – Simple, compound, reverse, transition and vertical curve – Setting out methods - Hydrographic surveying – Tides – MSL – Sounding methods – Measurement of current and discharge – Tunnel alignment and setting out – Settlement and Deformation studies – Remote sensing.	9
Total Instructional Hours		45

Course Outcome
Upon successful completion of the course, students shall have ability to
CO1: Understand the concepts of astronomical surveying
CO2: Understand the importance of photogrammetric surveying
CO3: Comprehend and apply the principles of Total Station Surveying
CO4: Interpret the principles of GPS surveying and data processing
CO5: Compare the concepts of route survey, hydrographic survey and tunnel alignments

TEXT BOOKS:

T1 - Lillesand, T.M., Kiefer, R.W. and Chipman, J. W., "Remote Sensing and Image Interpretation", John Willey and Sons Asia Pvt. Ltd., New Delhi, 7th Edition, 2015.

T2 - Anji Reddy, M., "Textbook of Remote Sensing and Geographical Information System", BS Publications, Hyderabad, 4th Edition, 2019.

REFERENCE BOOKS:

R1 - Lo. C.P. and A.K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

R2 - Arora, K. R., "Surveying Vol. I & II", Standard Book House, 10th Edition, 2008.

R3 - Peter A. Burrough, Rachael A. McDonnell, "Principles of GIS", Oxford University Press, 2015.

R4 - Ian Heywood, "An Introduction to GIS", Pearson Education Asia, 2000.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5302	TRAFFIC ENGINEERING	3	0	0	3

Course Objective
6. To provide an insight on traffic, its components and factors affecting road traffic
7. To familiarize with various traffic surveys, interpretation and analysis
8. To acquire knowledge on traffic intersection design
9. To gain an insight on different traffic control systems
10. To study the IRC traffic techniques

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

Course Outcome
Upon successful completion of the course, students will have ability to
CO1: Apply knowledge of traffic, its components and factors affecting road traffic in intersection design
CO2: Apply the knowledge of sampling data in conducting various surveys and analysis
CO3: Understand traffic movements and designing islands, intersections and road lightings
CO4: Interpret the causes, effects and prevention of road accidents
CO5: Comprehend the traffic regulations and techniques

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5303	HOUSING PLANNING AND MANAGEMENT	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5304	CONSTRUCTION TECHNIQUES, EQUIPMENT AND SAFETY	3	0	0	3

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

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

- Course Outcome**
- Upon successful completion of the course, students will have ability to
- CO1: Understand the techniques used in construction industry.
 CO2: Enumerate the various equipments used in construction.
 CO3: Recognize and construction practices in construction industry.
 CO4: Identify and incorporate the safety practices in construction.
 CO5: Comprehend the techniques of sub-structure and super-structure construction

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE5305	HYDROLOGY	3	0	0	3

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

Unit	Description	Instructional Hours
	INTRODUCTION AND HYDRO METEOROLOGY	
I	Definition - Development of hydrology - hydrologic design - Hydrologic failures - Importance in Engineering - Hydrological budget. Weather and hydrology - General circulation- Temperature, humidity -Wind systems - Introduction to Climate Change and its effects on Hydrological process.	9
	PRECIPITATION	
II	Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.	9
	HYDROGRAPH ANALYSIS	
III	Flood Hydrograph -Components of flood hydrograph - Factors affecting shape of Hydrograph - Base flow separation- Unit hydrograph - Advantages – Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph - Applications.	9
	GROUND WATER HYDROLOGY	
IV	Occurrence of ground water - Types of aquifer – Dupuit’s assumptions – Darcy’s law - Estimation of aquifer parameters– Pump tests - steady state discharge in Confined and Unconfined Aquifers - Leaky aquifer - well loss - aquifer loss - problems - Methods of Artificial Recharge.	9
	FLOODS AND FLOOD ROUTING	
V	Flood frequency studies – Recurrence interval - Gumbel’s method- Flood routing - Reservoir flood routing - Muskingum’s Channel Routing - Flood control.	9
Total Instructional Hours		45

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6301	BUILDING SERVICES	3	0	0	3

- Course Objective**
1. To study the various electrical systems and components in building construction
 2. To have exposure on principles of illumination and lighting design
 3. To impart knowledge on the various methods of ventilation systems and air-conditioning facilities
 4. To emphasize the need for fire safety in buildings
 5. To gain knowledge on importance of plumbing and drainage systems in buildings

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

Course Outcome	<p>Upon successful completion of the course, students will have ability to</p> <p>CO1: Illustrate and design the electrical supply systems, systems of wiring and protective electrical installations included in buildings</p> <p>CO2: Identify and incorporate the concepts of illumination and its principles while designing the lighting system of a building</p> <p>CO3: Understand the principles of ventilation and air conditioning in the design of buildings</p> <p>CO4: Compare the various fire safety systems and devices</p> <p>CO5: Gain knowledge on the importance of plumbing, drainage and rain water harvesting systems involved in buildings</p>
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TEXT BOOKS:

- T1 - David, V. Chadderton, "Building Services Engineering", Taylor & Francis, New York, 2015.
T2 - Steffy, G., "Architectural Lighting Design", John Wiley and Sons, 2008.

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6302	AIRPORTS, DOCKS AND HARBOUR ENGINEERING	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

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

Course Objective
1. To gain knowledge on exploration and geophysical methods
2. To learn the basic concepts in exploration
3. To understand the various sampling techniques
4. To study the field testing in soil exploration
5. To learn the various instrumentation in soil engineering

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

Course Outcome
Upon successful completion of the course, students will have ability to
CO1: Select the suitable method of exploration and geophysical methods
CO2: Understand various exploration techniques
CO3: Comprehend the various sampling techniques
CO4: Estimate the bearing capacity by field tests
CO5: Understand Instrumentation in soil engineering

TEXT BOOKS:

- T1 - Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi 2017.
T2 - Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors Ltd., New Delhi, 2001.

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
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Dr. K. KARUNAKARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6304	GROUND WATER ENGINEERING	3	0	0	3
Course Objective	1. To understand various hydrogeological parameters and GEC norms 2. To introduce the concepts of well hydraulics and groundwater governing equations 3. To gain knowledge on groundwater modelling and management 4. To discuss the groundwater quality and its significance on health and environment 5. To explore the techniques involved in the groundwater conservations					

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

Course Outcome

Upon successful completion of the course, students will have ability to
 CO1: Interpret the various hydro-geological parameters and GEC norms
 CO2: Estimate the yield of groundwater from a source based on the data given
 CO3: Develop a mathematical model for efficient groundwater management.
 CO4: Understand the importance of groundwater quality and its environmental concerns
 CO5: Compare and contrast the various recharge techniques for groundwater conservation

TEXT BOOKS:

T1 - Raghunath H.M., “Ground water Hydrology”, New Age International (P) Ltd., New Delhi, 2010
 T2 - Todd D.K., “Ground Water Hydrology”, John Wiley and Sons, New York, 2011.

REFERENCE BOOKS:

R1 - Fitts R Charles, “Groundwater Science”, Elsevier, Academic Press, 2018.
 R2 - Karanth K.R., “Ground Water Assessment Development and Management” Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.
 R3 - Bear J., “Hydraulics of Groundwater”, McGraw-Hill India, 2014.
 R4 - Cushman J.H., Tartakovsky D.M., “The Handbook of Groundwater Engineering”, Taylor & Francis International, 2016.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE6305	PRINCIPLES OF ARCHITECTURE	3	0	0	3

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

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

Course Outcome
Upon successful completion of the course, students will have ability to CO1: Incorporate the basic elements and principles of architecture in the design of a building CO2: Perform site analysis and apply the layout design concepts while designing a building CO3: Apply the principles of anthropometry, safety standards and integrate the basic building services in building design CO4: Design a building taking into account the various environmental considerations and green building concepts CO5: Consider the principles of town planning; zoning regulations and landscaping while planning a building

TEXT BOOK

T1 - Francis D.K. Ching, “Architecture: Form, Space and Order”, John Wiley & Sons, 2007.

T2 - Muthu Shoba Mohan, “Principles of Architecture”, Oxford University Press, New Delhi, 2010.

REFERENCE BOOK

R1 - Edward D. Mills, “Planning and Architects Handbook”, Butterworth London, 1995.

R2 - Givoni B., “Man Climate and Architecture”, Applied Science, Barking ESSEX, 1982.

R3 - Margaret Robert, “An Introduction to Town Planning Techniques”, Hutchinson London, 2008.

R4 - “National Building Code of India”, Vol 1 & 2, Bureau of Indian Standards, New Delhi, 2016

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7301	PRESTRESSED CONCRETE STRUCTURES	3	0	0	3

Course Objective
1. To introduce the need for prestressing as well as the methods, types and advantages of prestressed concrete 2. To gain knowledge on the design of prestressed concrete beams subjected to flexure and shear 3. To calculate deflection and acquire knowledge on design of anchorage zone 4. To learn how to analyze the composite beams and continuous beams 5. To gain knowledge on miscellaneous prestressed concrete structures

Unit	Description	Instructional Hours
INTRODUCTION – THEORY AND BEHAVIOUR		
I	Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Losses of prestress – Estimation of crack width.	9
DESIGN FOR FLEXURE AND SHEAR		
II	Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S.1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.	9
DEFLECTION AND DESIGN OF ANCHORAGE ZONE		
III	Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel’s method, Guyon’s method and IS1343 code – Design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.	9
COMPOSITE BEAMS AND CONTINUOUS BEAMS		
IV	Types and analysis of composite beams – Deflection of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.	9
MISCELLANEOUS STRUCTURES		
V	Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.	9
Total Instructional Hours		45

Course Outcome
Upon successful completion of the course, students will have ability to CO1: Describe the basic fundamentals of prestressed concrete in civil engineering CO2: Design prestressed concrete beams CO3: Calculate deflection and anchorage zone stresses CO4: Evaluate the performance of composite beams and continuous beams CO5: Design miscellaneous prestressed concrete structures

TEXT BOOKS:

- T1- Krishna Raju, N., “Prestressed concrete”, Tata McGraw Hill Company, New Delhi, 2018.
 T2- Pandit, G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributors Pvt. Ltd, 2019.

REFERENCE BOOKS:

- R1- Rajagopalan, N., "Prestressed Concrete", Narosa Publishing House, 2017.
 R2- Dayaratnam, P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
 R3- Lin, T.Y. and Ned H. Burns, "Design of Prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
 R4- Ramaswamy, G.S., “Modern Prestressed Concrete Design”, Arnold Heinimen, New Delhi, 1990.

CODE BOOKS:

- C1- IS1343:2012, “Code of Practice for Prestressed Concrete”, Bureau of Indian Standards, New Delhi, 2012.
 C2- IS3370: 1967(R2008) (Part 1 to 4), “Code of Practice for Concrete Structures for the Storage of Liquids”, BIS, New Delhi, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CE7302	AIR POLLUTION MANAGEMENT	3	0	0	3
Course Objective	1. To classify the sources and understand the effects of air pollution. 2. To study the dispersion of pollutants. 3. To know the various techniques and equipment for control of air pollution. 4. To learn about the air quality standards and legislation. 5. To gain knowledge on indoor air pollution and noise pollution.					

Unit	Description	Instructional Hours
SOURCES AND EFFECTS OF AIR POLLUTANTS		
I	Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings, vegetation, animals and property – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles	9
DISPERSION OF AIR POLLUTANTS		
II	Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric Stability and turbulence – Plume rise – Wind profiles and plume patterns - Dispersion of pollutants – Dispersion models – Applications	9
AIR POLLUTION CONTROL		
III	Concepts of control – Principles and design of control measures – Particulates control by Gravity separators, Centrifugal separators, Fabric filters, Scrubbers, Electrostatic precipitators – Selection criteria for equipment – Gaseous pollutant control by Adsorption, Absorption, Condensation, Combustion, Bio-scrubbers, Biofilters - CO ₂ capturing	9
AIR QUALITY MANAGEMENT		
IV	Ambient air quality and Emission standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality— Air Pollution Climatology	9
INDOOR AIR QUALITY AND NOISE POLLUTION		
V	Sources, types and control of indoor air pollutants - sick building syndrome types – Sources and effects of noise pollution – Assessment - Standards – Control methods –Prevention	9
Total Instructional Hours		45

Course Outcome

Upon successful completion of the course, students will have ability to
 CO1: Recognize the different sources of air pollution and predict the impacts
 CO2: Interpret the dispersion of pollutants based on meteorological conditions
 CO3: Propose suitable control equipment for various air pollutants
 CO4: Comprehend the regulatory requirements for air quality monitoring
 CO5: Categorize the sources and suggest control measures for indoor air pollution and noise pollution

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7303	INDUSTRIAL WASTEWATER TREATMENT	3	0	0	3

- Course Objective**
1. To study characteristics of industrial wastewater and its effects on water bodies
 2. To explore the primary treatment methods and waste reduction techniques
 3. To learn the various advanced wastewater treatment and disposal methods
 4. To understand the characteristics and composition of wastewater from various industrial sources
 5. To give exposure on common effluent treatment plants and disposal techniques

Unit	Description	Instructional Hours
INTRODUCTION AND SOURCES OF POLLUTION		
I	Sources of pollution – Physical, Chemical and Biological properties of Industrial Wastes – Difference between industrial and municipal wastewaters – Effects of industrial effluents on sewers and natural water bodies.	9
PRIMARY TREATMENT METHODS		
II	Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by floatation – Waste reduction – Volume reduction – Strength reduction	9
ADVANCED TREATMENT METHODS		
III	Waste treatment methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane separation process – Air stripping and absorption processes – Special treatment methods – Disposal of treated wastewater	9
CHARACTERISTICS OF INDUSTRIAL WASTEWATER		
IV	Sources, Characteristics, Waste treatment flow sheets for selected industries such as textiles, tanneries, Dairy, sugar & distilleries, paper, steel plants, refineries, fertilizers, thermal power plants – Wastewater reclamation concepts	9
TREATMENT PLANTS AND PROBLEMS		
V	Joint treatment of raw industrial wastewater and domestic sewage – Common Effluent Treatment Plants (CETP) – Location, design, operation and maintenance problems - Residue management – Dewatering – Source reduction techniques – Quality requirements for wastewater reuse – Industrial reuse – Discharge into water bodies – Disposal on land – Zero Effluent Discharge (ZED) – Zero Liquid Discharge (ZLD)	9
Total Instructional Hours		45

- Course Outcome**
- Upon successful completion of the course, students will have ability to
- CO1: Identify the sources of pollution and interpret the effects of industrial effluents on environment
CO2: Classify the various primary treatment methods and waste reduction techniques
CO3: Illustrate the different advanced wastewater treatment and disposal methods
CO4: Compare the characteristics and composition of wastewater from various industrial sources
CO5: Understand the operational and maintenance problems related to treatment plants.

TEXT BOOKS:

- T1 –Metcalf & Eddy, “Wastewater Engineering Treatment and Reuse”, McGraw-Hill Inc., New York, 2017.
T2 - Patwardhan A.D., “Industrial Wastewater Treatment” PHI Learning Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

- R1 - Rao M. N. & Dutta A. K. , “Wastewater Treatment”, Oxford and IBH Publishers, New Delhi, 2018.
R2 - Freeman H.M., “Industrial Pollution Prevention Hand Book”, McGraw Hill Inc., New York, 2017.
R2 - Mark J. Hammer, Mark J. Hammer, Jr., “Water & Wastewater Technology”, PHI Learning Pvt. Ltd., New Delhi, 2017.
R3 - Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw Hill Inc., New York, 2017.

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

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

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

Course Outcome
Upon successful completion of the course, students will have ability to
CO1. Understand the codal provisions and the design of steel-concrete composite construction
CO2. Design composite members
CO3. Design connections in composite structures
CO4. Design composite box girder bridges
CO5. Understand the seismic behavior of composite structures

TEXT BOOKS:

T1 - Johnson R.P., "Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings", Vol. I, Blackwell Scientific Publications, 2004.

T2 - Oehlers D.J. and Bradford M.A., "Elementary Behaviour of Composite Steel and Concrete Structural Members", Butterworth Heinemann, Oxford, 2002.

REFERENCES:

R1 - Owens, G.W. and Knowles, P, "Steel Designers Manual", Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 1992.

R2 – Narayanan, R., "Composite Steel Structures – Advances, Design and Construction", Elsevier, Applied Science, UK, 1987.

R3 - "Teaching Resources for Structural Steel Design", Vol. 2 & 3, Institute of Steel Development and Growth (INSDAG), 2000.

R4 - Johnson R.P., "Composite Structures of Steel and Concrete - Beams, Slabs, Columns and Frames for Buildings", Wiley Blackwell Publishing, 2004.

CODE BOOK:

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

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Dr. P. N. MAGUDESWARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE7305	FINITE ELEMENT ANALYSIS	3	0	0	3

- Course Objective**
1. To understand the finite element analysis, modeling and various principles
 2. To gain knowledge on element properties
 3. To understand the concepts of Finite element analysis for one and two dimensional problems
 4. To study about isoparametric elements and its formulation
 5. To learn the applications of finite element method

Unit	Description	Instructional Hours
INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FORMULATION		
I	Basic Concepts of Finite Element Analysis (FEA) and initial value problems – Modeling – Elasticity – Steps in Finite Element Analysis (FEA) – Virtual Work and Variational Calculus Principle – Finite Element Method – Formulation of Stiffness matrix and Boundary Conditions.	9
ELEMENT PROPERTIES		
II	Member Approach for Truss and Beam Element - Member Approach for Portal Frame and Grid Element – Solid Elements – Stiffness Matrix of Isoparametric Elements – Numerical Integration: One, Two and Three Dimensional.	9
FINITE ELEMENT ANALYSIS OF ONE AND TWO DIMENSIONAL PROBLEMS		
III	Second order equations – Discretization of domain into elements – Generalized coordinates approach – Triangular and Quadrilateral Elements – Extension of Fourth order equation – Derivation of element equations and matrices – Assembly of element equation and matrices – Imposition of Boundary Conditions – Solution Techniques.	9
ISOPARAMETRIC ELEMENTS AND FORMULATION		
IV	Natural Coordinates in 1, 2 and 3 Dimensions – Isoparametric elements in 1, 2 and 3 Dimension – Lagrangean and Serendipity Elements – Numerical Elements.	9
APPLICATIONS OF FINITE ELEMENT METHOD		
V	Finite Elements for Elastic Stability – Finite Elements in Fluid Mechanics – Dynamic Analysis – Bending of Elastic Plates – Time Dependent Problems in Elasticity.	9
Total Instructional Hours		45

- Course Outcome**
- Upon successful completion of the course, students shall have ability to
- CO1: Comprehend the concepts and methods of finite element analysis
CO2: Formulate the stiffness matrix of the elements
CO3: Be conversant with the concepts of finite element analysis for one and two dimensional problems
CO4: Relate the isoparametric elements with its formulation
CO5: Select finite element methods for various applications

TEXT BOOKS:

- T1- Chandrupatla, T. R., and Belegundu, A. D., "Introduction to Finite Element in Engineering", Pearson Education Limited, 2015.
T2- Reddy, J.N. "Introduction to the Finite Element Method", Tata McGraw Hill Education, 4th Edition, 2018.

REFERENCE BOOKS:

- R1- Dhanaraj, R. and Prabhakaran Nair, K, "Finite Element Analysis", Oxford Publications, 2015.
R2- Krishnamoorthy C.S., "Finite Element Analysis – Theory & Programming", Tata McGraw Hill Publishing Company Ltd., 2007.
R3- Rao, S.S., "The Finite Element Method in Engineering", Butterworth-Heinemann, 6th Edition, 2018.
R4- Bhatti Asghar, M., "Fundamental Finite Element Analysis and Applications", John Wiley & Sons, 2005 (Indian Reprint 2013).

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Dr. P. N. MAGUDESWARAN

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Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8301	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

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

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

- Course Outcome**
- Upon successful completion of the course, students will have ability to
- CO1: Interpret the geotechnical problem and select suitable method for ground improvement.
CO2: Implement drainage and dewatering techniques for improving the properties of soil
CO3: Specify the concepts of insitu treatment methods for ground improvement
CO4: Select and use a suitable geosynthetic material for various functions.
CO5: Understand suitable grouting techniques and other soil stabilization methods for ground improvement.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

Course Objective	Description
11.	To understand the basics of prefabrication.
12.	To understand the behavior of prefabricated components.
13.	To know about design principles of prefabricated components.
14.	To acquire knowledge about joints for different structural connections.
15.	To get familiar with the design of abnormal loads.

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

Course Outcome	Description
Upon successful completion of the course, students will have ability to	
CO1:	Understand the basics of prefabrication
CO2:	Know the behavior of prefabricated components
CO3:	Design the structural components
CO4:	Identify the different types of connections between structural members
CO5:	Understand the design concept of abnormal loads

TEXT BOOKS:

T1- Hubert Bachmann and Alfred Steinle , “Precast Concrete Structures”, 2012.

T2 - Laszlo Mokka, “Prefabricated Concrete for Industrial and Public Structures”, Akademiai Kiado, Budapest, 2007.

REFERENCE BOOKS:

R1 – “PCI Design Hand Book”, 6th Edition, 2004.

R2 – “Handbook on Precast Concrete for Buildings”, ICI Bulletin 02, First Edition, 2016.

R3 - Bruggeling, A S G. and Huyghe, G. F., “Prefabrication with concrete” A.A. Balkema Publishers, Netherlands, 1991.

R4 - Glover C.W, “Structural Precast Concrete”, Asia Publishing House, 1965.

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
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Dr. K. KARUNAKARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8304	MUNICIPAL SOLID WASTE MANAGEMENT	3	0	0	3
Course Objective	1. To gain knowledge on the types and characteristics of solid waste and the elements of solid waste management system. 2. To acquire adequate information on various options for on-site storage and processing. 3. To know about the collection and transfer methodologies of solid waste. 4. To study the various off-site processing techniques for solid waste management. 5. To provide basic knowledge on the various methods of disposal of solid waste.					

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Signature of the Chairman, BoS

Dr. P. N. MAGUDESWARAN
Signature of the Dean

Dr. K. KARUNAKARAN
Signature of the Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8305	DESIGN OF FORMWORK	3	0	0	3

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

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

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

TEXT BOOKS:

- T1 - Kumar Neeraj Jha, "Formwork for Concrete Structures", Tata McGraw Hill Publishing Company Ltd., 2013.
T2 - Robert Peurify and Garold D. Oberlender, "Formwork for Concrete Structures", McGraw Hill Education, 2015

REFERENCE BOOKS:

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

CODE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
Signature of the Dean

Dr. K. KARUNAKARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8306	NON DESTRUCTIVE TESTING OF STRUCTURES	3	0	0	3

Course Objective

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

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

Course Outcome

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8307	CONSTRUCTION ECONOMICS AND FINANCE	3	0	0	3
Course Objective	1. To learn the concept of basic principles of payments. 2. To understand the cost analysis of projects. 3. To have exposure on various real estate and investment property for accounting 4. To gain knowledge on financial management 5. To study the principles of financial accounting					

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

Course Outcome

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

TEXT BOOKS:

T1 - Blank, L.T., and Tarquin,a.J., “Engineering Economy”, Mc-Graw Hill Book Co., 4th Edn., 1988.

T2 – Collier, C. and GlaGola, C., “Engineering Economics & Cost Analysis”, Addison Wesley Education Publishers, 3rd Edn. 1998.

REFERENCE BOOKS:

R1 - Shrivastava, U.K., “Construction Planning and Management”, Galgotia Publications Pvt. Ltd. New Delhi, 2nd Edn., 2000.

R2 - Steiner, H.M., “Engineering Economic Principles, Mc-Graw Hill Book, New York, 2nd Edn., 1996.

R3 - Patel, B. M.” Project management- strategic Financial Planning, Evaluation and Control”, Vikas Publishing House Pvt. Ltd. New Delhi,2000.

R4 - Gould, F.E.,“Managing the Construction Process”, 2nd ed.,Prentice Hall, Upper Saddle River, New Jersey, 2002.

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Dr. P. N. MAGUDESWARAN

Signature of the Dean

Dr. K. KARUNAKARAN

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8308	REPAIR AND REHABILITATION OF STRUCTURES	3	0	0	3

Course Objective
11. To get awareness on maintenance and repair strategies
12. To understand the strength and durability of concrete
13. To gain knowledge on special concretes
14. To learn the various repair techniques and corrosion protection methods
15. To acquire knowledge on repair, rehabilitation and retrofitting of structures

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

Course Outcome
Upon successful completion of the course, students shall have ability to
CO1: Recollect the facets and importance of maintenance and also know how to evaluate a damaged building
CO2: Deduce the factors affecting the quality of concrete
CO3: Comprehend the properties and applications of special concretes
CO4: Interpret the principles of non-destructive testing and the latest techniques in the repair and corrosion protection methods
CO5: Recommend suitable techniques for repair, rehabilitation and retrofitting of structures

TEXT BOOKS:

- T1 - Allen, R.T. and Edwards, S.C., "Repair of Concrete Structures", SponPress, Taylor & Francis group, 2005.
T2 - Modi, P. I. and Patel, C.N., "Repairs and Rehabilitation of Concrete Structures", PHI Publication, 2016.

REFERENCE BOOKS:

- R1 - Shetty M.S. and Jain, A.K., "Concrete Technology - Theory and Practice", S. Chand and Company, 8th Edition, 2019.
R2 - DovKominetzky, "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2008.
R3 - Amarnath, C., Devdas Menon, Amlan Kumar, S., "Handbook on Seismic Retrofit of Buildings", Alpha Science International Limited, 2008.
R4 - "Repair and Strengthening of Concrete Structures", FIP Guide to Good Practice, Thomas Telford Ltd., London, 1991.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8309	DISASTER RESISTANT STRUCTURES	3	0	0	3
Course Objective	1. To gain knowledge on behavior of disasters, characteristics of materials and different codes of practice for designing a disaster resistant structure 2. To study the response of different community structures and their reliability assessment 3. To gain knowledge on modern construction materials, design and construction for reducing the impacts 4. To assess the damage of structures due to disasters 5. To understand the importance of rehabilitation and retrofitting methods for different disaster					

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

Course Outcome	Upon successful completion of the course, students shall have ability to CO1: Comprehend the behaviour of disasters, response of materials and codal provisions to analyze and design disaster resistant structures CO2: Predict response of different community structures and assess their reliability CO3: Suggest modern materials and analysis for disaster resistant design CO4: Assess the damages and suggest suitable maintenance techniques and modifications to improve hazard resistance CO5: Propose rehabilitation and retrofitting options
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TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19CE8310	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	0	3

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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OPEN ELECTIVES

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Dr. P. N. MAGUDESWARAN
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Programme	Course Code	Name of the Course	L	T	P	C
B.E. .	19CE7402	INTERIOR DESIGN	3	0	0	3

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

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

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

TEXT BOOKS:

- T1 - Linda O'Shea, Chris Grimley, "The Interior Design Reference & Specification Book", Rockport Publishers Inc., USA, 2013.
 T2 – Premavathy Seetharaman, Parveen Pannu, "Interior Design and Decoration" CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2018

REFERENCE BOOKS:

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

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Signature of the Chairman, BoS

Dr. P. N. MAGUDESWARAN
Signature of the Dean

Dr. K. KARUNAKARAN
Signature of the Principal

