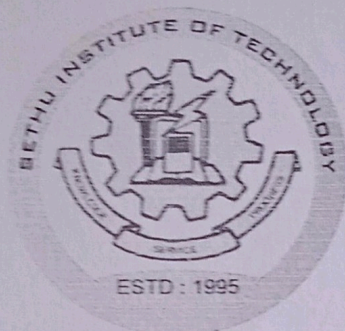# SETHU INSTITUTE OF TECHNOLOGY

Pulloor, Kariapatti – 626 115.

(An Autonomous Institution)

DEPARTMENT OF CIVIL ENGINEERING

B.E. CIVIL ENGINEERING

Curriculum & Syllabus

REGULATION 2019

CHOICE BASED CREDIT SYSTEM

Approved in the

Academic Council Meeting on **25.09.2021**

Chairperson/BOS

Chairman
Academic Council

SETHU INSTITUTE OF TECHNOLOGY

Pulloor, Kariapatti – 626 119

(An Autonomous Institution)

B.E. Degree Programme

CURRICULUM - Regulations 2019

Bachelor of Engineering in Civil Engineering

OVERALL COURSE STRUCTURE

Category	Total No. of Courses	Credits	Percentage
Humanities and Social Sciences (HS)	5	9.5	6
Basic Sciences (BS)	10	28.5	16
Engineering Sciences (ES)	9	24.5	14
Professional Core (PC)	24	67.5	38
Professional Electives (PE)	6	18	10
Open Electives (OE)	4	12	7
Project (P)	6	16	9
Mandatory Courses (MC)	5	0	0
TOTAL	69	176	100

COURSE CREDITS – SEMESTER WISE

Branch	I	II	III	IV	V	VI	VII	VIII	TOTAL
Civil Engineering	23	20.5	24	24.5	25	25	20	14	176

SEMESTER– I

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UEN101	English for Technical Communication	2	0	0	2	HS
19UMA102	Engineering Mathematics – I	3	1	0	4	BS
19UPH103	Engineering Physics	3	0	0	3	BS
19UCY106	Chemistry for Civil Engineers	3	0	0	3	BS
19UCS108	Problem Solving and Python Programming	3	0	0	3	ES
19UME109	Engineering Graphics	3	1	0	4	ES
PRACTICAL						
19UGS113	Basic Sciences Laboratory	0	0	2	1	BS
19UME111	Engineering Practices Laboratory	0	0	3	1.5	ES
19UCS110	Problem Solving and Python Programming Laboratory	0	0	3	1.5	ES
MANDATORY COURSE						
19UGM131	Induction Program (45 periods)	0	0	0	P/F	MC
	TOTAL	**17**	**2**	**8**	**23**	
Total No. of Credits – 23						

SEMESTER– II

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UEN201	Communication Skills for Professionals	1	0	1	1.5	HS
19UMA206	Differential Equations, Complex Analysis and Transform Techniques for Civil Engineering	3	1	0	4	BS
19UPH206	Building Physics	3	0	0	3	BS
19UCY204	Environmental Science	3	0	0	3	HS
19UCE205	Introduction to Civil Engineering	3	0	0	3	ES
19UEE226	Basic Electrical and Electronics Engineering	3	0	0	3	ES
PRACTICAL						
19UGS210	Energy and Environmental Science Laboratory	0	0	3	1.5	BS
19UCE211	Computer Aided Building Drawing	0	0	3	1.5	ES
	TOTAL	**16**	**1**	**7**	**20.5**	
Total No. of Credits – 20.5						

2

SEMESTER– III

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UMA325	Probability, Statistics and Transform Techniques	3	1	0	4	BS
19UCE302	Engineering Geology and Construction Materials	3	0	0	3	ES
19UCE303	Basics of Engineering Mechanics	3	1	0	4	ES
19UCE304	Water Supply Engineering	3	0	0	3	PC
19UCE305	Fluid Mechanics	3	0	0	3	PC
19UCE306	Surveying	3	0	0	3	PC
PRACTICAL						
19UCE307	Seminar	0	0	2	1	P
19UCE308	Material Testing Laboratory	0	0	3	1.5	PC
19UCE309	Surveying Laboratory	0	0	3	1.5	PC
MANDATORY COURSE						
19UGM331	Biology for Engineers	2	0	0	P/F	MC
	TOTAL	**20**	**2**	**8**	**24**	
Total No. of Credits – 24						

SEMESTER– IV

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UMA423	Numerical Methods	3	1	0	4	BS
19UCE402	Soil Mechanics	3	0	0	3	PC
19UCE403	Strength of Materials	3	1	0	4	PC
19UCE404	Waste Water Engineering	3	0	0	3	PC
19UCE405	Highway Engineering	3	0	0	3	PC
19UCE406	Applied Hydraulic Engineering	3	0	0	3	PC
PRACTICAL						
19UCE407	Water and Waste Water Analysis Laboratory	0	0	3	1.5	PC
19UCE408	Hydraulic Engineering Laboratory	0	0	3	1.5	PC
19UCE409	Soil Mechanics Laboratory	0	0	3	1.5	PC
MANDATORY COURSE						
19UGM431	Gender Equality	1	0	0	P/F	MC
	TOTAL	**19**	**2**	**9**	**24.5**	
Total No. of Credits – 24.5						

SEMESTER– V

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UCE501	Structural Analysis – I	3	1	0	4	PC
19UCE502	Foundation Engineering	3	0	0	3	PC
19UCE503	Design of Reinforced Concrete Elements	3	1	0	4	PC
19UCE504	Water Resources and Irrigation Engineering	3	0	0	3	PC
	Professional Elective – I	3	0	0	3	PE
	Open Elective – I	3	0	0	3	OE
PRACTICAL						
19UCE507	Creative Thinking & Innovation	0	0	2	1	P
19UCE508	Concrete and Highway Engineering Laboratory	0	0	3	1.5	PC
19UCE509	Survey Camp (4th Semester Summer Vacation - 2 Weeks)	0	0	0	1	P
19UGS533	Interpersonal Skills Laboratory	0	0	3	1.5	HS
	TOTAL	**18**	**2**	**8**	**25**	
Total No. of Credits – 25						

SEMESTER– VI

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UCE601	Structural Analysis – II	3	1	0	4	PC
19UCE602	Design of Steel Structures	3	1	0	4	PC
	Professional Elective – II	3	0	0	3	PE
	Professional Elective – III	3	0	0	3	PE
	Open Elective – II	3	0	0	3	OE
19UGS631	Logical Reasoning & Aptitude	1	0	0	1	BS
PRACTICAL						
19UCE607	Product Development Project	0	0	8	4	P
19UCE608	Software Applications Laboratory	0	0	3	1.5	PC
19UGS632	Soft Skills and Communication Lab	0	0	3	1.5	HS
MANDATORY COURSE						
19UGM631	Indian Constitution	1	0	0	P/F	MC
	TOTAL	**17**	**2**	**14**	**25**	
Total No. of Credits – 25						

SEMESTER– VII

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
19UME701	Project Management and Finance	3	0	0	3	PC
19UCE702	Estimating and Costing	3	0	2	4	PC
19UCE703	Smart City Technologies	3	0	0	3	PC
	Professional Elective – IV	3	0	0	3	PE
	Professional Elective – V	3	0	0	3	PE
	Open Elective – III	3	0	0	3	OE
PRACTICAL						
19UCE707	Summer Internship	0	0	0	1	P
MANDATORY COURSE						
19UGM731	Professional Ethics and Human Values	2	0	0	P/F	MC
	TOTAL	**20**	**0**	**2**	**20**	
Total No. of Credits – 20						

SEMESTER– VIII

Course Code	Name of the Course	L	T	P	C	Category
THEORY						
	Professional Elective – VI	3	0	0	3	PE
	Open Elective – IV	3	0	0	3	OE
PRACTICAL						
19UCE803	Project Work	0	0	16	8	P
	TOTAL	**6**	**0**	**16**	**14**	
Total No. of Credits – 14						

LIST OF PROFESSIONAL ELECTIVES

S. No.	Course Code	Name of the Course	L	T	P	C
1.	19UCE901	Modern Surveying	3	0	0	3
2.	19UCE902	Traffic Engineering and Management	3	0	0	3
3.	19UCE903	Housing Planning and Management	3	0	0	3
4.	19UCE904	Ground Water Engineering	3	0	0	3
5.	19UCE905	Environmental Impact Assessment	3	0	0	3
6.	19UCE906	Municipal Solid Waste Management	3	0	0	3
7.	19UCE907	Ground Improvement Techniques	3	0	0	3
8.	19UCE908	Bridge Engineering	3	0	0	3
9.	19UCE909	Tall Structures	3	0	0	3
10.	19UCE910	Prefabricated Structures	3	0	0	3
11.	19UCE911	Finite Element Methods	3	0	0	3
12.	19UCE912	Repair and Rehabilitation of Structures	3	0	0	3
13.	19UCE913	Prestressed Concrete Structures	3	0	0	3
14.	19UCE914	Railway Airport and Harbour Engineering	3	0	0	3
15.	19UCE915	Urban Planning and Management	3	0	0	3
16.	19UCE916	Coastal Engineering	3	0	0	3
17.	19UCE917	Structural Dynamics and Earthquake Engineering	3	0	0	3
18.	19UCE918	Construction Techniques, Equipments and Practices	3	0	0	3
19.	19UCE919	Concrete Technology	3	0	0	3
20.	19UCE920	Disaster Preparedness and Planning	3	0	0	3
21.	19UCE921	Structural Design and Drawing	2	0	2	3
22.	19UCE922	Environmental Laws and Policies	3	0	0	3
23.	19UCE923	Environmental Quality Monitoring	3	0	0	3
24.	19UCE924	Sustainable Construction	3	0	0	3
25.	19UCE925	Air and Noise Pollution Control and Management	3	0	0	3
26.	19UCE926	Valuation Engineering	3	0	0	3
27.	19UCE927	Application of Remote Sensing & GIS in Civil Engineering	3	0	0	3
28.	19UCE928	Instrumentation and Sensor Technology for Civil Engineering	3	0	0	3
29.	19UCE929	Design of Formwork	3	0	0	3
30.	19UCE930	Masonry Structures	3	0	0	3

List of Open Electives

S. No.	Course Code	Name of the Course	L	T	P	C
1.	19UCE971	Remote Sensing and GIS	3	0	0	3
2.	19UCE972	Air Pollution and Control Engineering	3	0	0	3
3.	19UCE973	Environmental and Social Impact Assessment	3	0	0	3
4.	19UCE974	Disaster Management	3	0	0	3
5.	19UCE975	Environmental Science and Engineering	3	0	0	3
6.	19UCE976	Metro Systems and Engineering	3	0	0	3
7.	19UCE977	Road Safety	3	0	0	3
8.	19UCE978	Solid Waste Management	3	0	0	3

List of Inter Disciplinary Courses

S. No.	Course Code	Name of the Course	L	T	P	C
1.	19UGM954	Smart Buildings (Civil & EEE)	3	0	0	3
2.	19UGM955	Waste to Energy Conversion (Civil & Chemical)	3	0	0	3

List of Mandatory Courses

S. No.	Course Code	Name of the Course	L	T	P	C
1.	19UGM131	Induction Program (45 periods)	0	0	0	P/F
2.	19UGM332	Biology for Engineering Applications	2	0	0	P/F
3.	19UGM431	Gender Equality	1	0	0	P/F
4.	19UGM634	Indian Constitution	1	0	0	P/F
5.	19UGM731	Professional Ethics and Human Values	2	0	0	P/F

List of One Credit Courses (With Industry Collaboration)

S. No.	Course Code	Name of the Course	L	T	P	C
1.	19UCE861	Green Building Concepts	1	0	0	1
2.	19UCE862	Practical Aspects of Architecture.	1	0	0	1
3.	19UCE863	Water Conservation Techniques	1	0	0	1
4.	19UCE864	Construction Safety	1	0	0	1
5.	19UCE865	Effluent Treatment Plant	1	0	0	1
6.	19UCE866	Corrosion of Steel in Concrete and Preventive Measures	1	0	0	1
7.	19UCE867	Building Planning and Byelaws	1	0	0	1
8.	19UCE868	Automation in Construction	1	0	0	1
9.	19UCE869	Building Energy Audit	1	0	0	1
10.	19UCE870	Health Monitoring of Structures	1	0	0	1
11.	19UCE871	Artificial Intelligence in Civil Engineering	1	0	0	1
12.	19UCE872	Design of Scaffolding	1	0	0	1
13.	19UCE873	Applications of Robotics in Civil Engineering	1	0	0	1
14.	19UCE874	Drone surveying	1	0	0	1
15.	19UCE875	Recycled Construction Materials	1	0	0	1
16.	19UCE876	Practical Building Information Modeling	1	0	0	1
17.	19UCE877	Building Safety	1	0	0	1
18.	19UCE878	Bar Bending and Ductile detailing	1	0	0	1
19.	19UCE879	Global Climate Change and Vulnerability Assessment	1	0	0	1
20.	19UCE880	Paver Block Manufacturing as per IS code	0	0	2	1

LIST OF WINTER COURSES

S. No	Course Code	Name of the Course	L	T	P	C	Category
1.	19UEN101	English for Technical Communication	2	0	0	2	HS
2.	19UMA102	Engineering Mathematics – I	3	1	0	4	BS
3.	19UPH103	Engineering Physics	3	0	0	3	BS
4.	19UCY106	Chemistry for Civil Engineers	3	0	0	3	BS
5.	19UCS108	Problem Solving and Python Programming	3	0	0	3	ES
6.	19UME109	Engineering Graphics	3	1	0	4	ES
7.	19UGS113	Basic Sciences Laboratory	0	0	2	1	BS
8.	19UME111	Engineering Practices Laboratory	0	0	3	1.5	ES
9.	19UCS110	Problem Solving and Python Programming Laboratory	0	0	3	1.5	ES
10.	19UGM131	Induction Program (45 periods)	0	0	0	P/F	MC
11.	19UMA325	Probability, Statistics and Transform Techniques	3	1	0	4	BS
12.	19UCE302	Engineering Geology and Construction Materials	3	0	0	3	ES
13.	19UCE303	Basics of Engineering Mechanics	3	1	0	4	ES
14.	19UCE304	Water Supply Engineering	3	0	0	3	PC
15.	19UCE305	Fluid Mechanics	3	0	0	3	PC
16.	19UCE306	Surveying	3	0	0	3	PC
17.	19UCE307	Seminar	0	0	2	1	P
18.	19UCE308	Material Testing Laboratory	0	0	3	1.5	PC
19.	19UCE309	Surveying Laboratory	0	0	3	1.5	PC
20.	19UGM332	Biology for Engineering Applications	2	0	0	P/F	MC
21.	19UCE501	Structural Analysis – I	3	1	0	4	PC
22.	19UCE502	Foundation Engineering	3	0	0	3	PC
23.	19UCE503	Design of Reinforced Concrete Elements	3	1	0	4	PC
24.	19UCE504	Water Resources and Irrigation Engineering	3	0	0	3	PC
25.	19UCE507	Creative Thinking & Innovation	0	0	2	1	P
26.	19UCE508	Concrete and Highway Engineering Laboratory	0	0	3	1.5	PC
27.	19UCE509	Survey Camp (2 Weeks)	0	0	0	1	P
28.	19UGS533	Interpersonal Skills Laboratory	0	0	3	1.5	HS
29.	19UME701	Project Management and Finance	3	0	0	3	PC
30.	19UCE702	Estimating and Costing	3	0	2	4	PC
31.	19UCE703	Smart City Technologies	3	0	0	3	PC
32.	19UCE707	Summer Internship	0	0	0	1	P
33.	19UGM731	Professional Ethics and Human Values	2	0	0	P/F	MC

LIST OF SUMMER COURSES

S.No	Course Code	Name of the Course	L	T	P	C	Category
1.	19UEN201	Communication Skills for Professionals	1	0	1	1.5	HS
2.	19UMA206	Differential Equations, Complex Analysis and Transform Techniques for Civil Engineering	3	1	0	4	BS
3.	19UPH206	Building Physics	3	0	0	3	BS
4.	19UCY204	Environmental Science	3	0	0	3	HS
5.	19UCE205	Introduction to Civil Engineering	3	0	0	3	ES
6.	19UEE226	Basic Electrical and Electronics Engineering	3	0	0	3	ES
7.	19UGS210	Energy and Environmental Science Laboratory	0	0	3	1.5	BS
8.	19UCE211	Computer Aided Building Drawing	0	0	3	1.5	ES
9.	19UMA423	Numerical Methods	3	1	0	4	BS
10.	19UCE402	Soil Mechanics	3	0	0	3	PC
11.	19UCE403	Strength of Materials	3	1	0	4	PC
12.	19UCE404	Waste Water Engineering	3	0	0	3	PC
13.	19UCE405	Highway Engineering	3	0	0	3	PC
14.	19UCE406	Applied Hydraulic Engineering	3	0	0	3	PC
15.	19UCE407	Water and Waste Water Analysis Laboratory	0	0	3	1.5	PC
16.	19UCE408	Hydraulic Engineering Laboratory	0	0	3	1.5	PC
17.	19UCE409	Soil Mechanics Laboratory	0	0	3	1.5	PC
18.	19UGM431	Gender Equality	1	0	0	P/F	MC
19.	19UCE601	Structural Analysis – II	3	1	0	4	PC
20.	19UCE602	Design of Steel Structures	3	1	0	4	PC
21.	19UGS631	Logical Reasoning & Aptitude	1	0	0	1	BS
22.	19UCE607	Product Development Project	0	0	8	4	P
23.	19UCE608	Software Applications Laboratory	0	0	3	1.5	PC
24.	19UGS632	Soft Skills and Communication Lab	0	0	3	1.5	HS
25.	19UGM634	Indian Constitution and Essence of Indian Traditional Knowledge in Civil Engineering	1	0	0	P/F	MC
26.	19UCE803	Project Work	0	0	16	8	P

I SEMESTER

19UEN101	ENGLISH FOR TECHNICAL COMMUNICATION	L	T	P	C
	(Common to All Branches except CSBS)	2	0	0	2

Course Learning Objectives:
- To enhance the vocabulary of students.
- To strengthen the application of functional grammar and basic skills.
- To improve the language proficiency of students.

Unit I   **8**

Listening –Formal and informal conversations and comprehension. Speaking- introducing oneself – exchanging personal and social information-Reading – Skimming and Scanning. Writing–Sentence Formation, Formal Letters (Permission/Requisition) - Grammar - Parts of Speech - Tense - Vocabulary Development – Technical Word Formation- Prefix- suffix - Synonyms and Antonyms-Phrases and Clauses.

Unit II   **8**

Listening– Telephonic Conversations. Speaking– Pronunciation rules with Stress pattern. Reading – comprehension-pre-reading, post-reading- comprehension questions Writing – Punctuation rules, paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions, Precise writing, Developing Hints - Report Writing (Industrial, Accident)- Grammar – Voice Vocabulary Development- Words from other languages in English.

Unit III   **7**

Listening – Motivational speech by Great Speakers Speaking–Narrating daily events -retelling short stories. Reading – Newspaper reading. Writing – Job application letter - Transformation of Information (Transcoding)–Grammar Subject-Verb Agreement (Concord),–– Vocabulary Development –Same word in different parts of speech.

Unit IV   **7**

Listening – Understating the instruction. Speaking-Intonation and preparing dialogue on various formal and informal situation Reading –Note Making from given text - Writing–Creating coherence, Essay writing with proper introduction and conclusion, Giving Instruction (Guidance/Procedure) -Grammar– Spot the Errors in English, Vocabulary Development– One word substitution.

TOTAL = 30 PERIODS

Course Outcomes:

    After the successful completion of the course, Students will be able to,
- Apply grammar effectively in writing meaningful sentences and paragraphs.
- Exhibit reading skills and comprehension to express the ideas in the given text.
- Develop writing skills to present the ideas in various formal situations.
- Develop oral fluency to express the ideas in various formal situations.
- Exhibit writing skills to prepare reports for various purposes.

Text Books:

1. KN Shoba, Lourdes Joavani Rayen,Communicative English, New Delhi, Cambridge University Press, 2017.

Reference Books:

1. Raman,Meenakshi,SangeethaSharma,**BusinessCommunication**,New Delhi, Oxford University Press,2014.
2. Lakshminarayanan.K.R,**Englishfor Technical Communication**,Chennai, Scitech Publications (India) Pvt. Ltd,2004.
3. Rizvi.AsrafM,**Effective Technical Communication** ,New Delhi, Tata McGraw-Hill Publishing Company Limited,2007.

	L	**T**	**P**	**C**

19UMA102 **ENGINEERING MATHEMATICS – I**
(Common to All Branches-Except CSBS) **3** **1** **0** **4**

Course Learning Objectives:
- To make the students capable of identifying linear equations based problems (Eigen Value) from practical areas and obtain the Eigen value oriented solutions in certain cases.
- To widen the students' knowledge base on linear algebra, growth rate computation and application of integrals.
- Able to integrating various types of functions using various integration methods.
- To familiarize the students with the basic rules of differentiation and use them to find derivatives of products and quotients of functions.
- To apply these mathematical concepts (matrix theory, differentiation and integration) in engineering field.

Unit I MATRICES **8 + 3**
Eigen value and eigenvector of a real matrix – Characteristic equation – Properties – Cayley-Hamilton theorem (excluding Proof) – Orthogonal reduction – (transformation of a symmetric matrix to diagonal form) – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

Unit II DIFFERENTIAL CALCULUS **9 + 3**
Introduction – Definition of derivatives – Limits and Continuity – Differentiation techniques (Product rule, Quotient rule, Chain rule) – Successive differentiation (nth derivatives) – Leibnitz theorem (without proof) – Maclaurin's series – Physical Applications (Newton's law of cooling– Heat flow problems, Rate of decay of radioactive materials - Chemical reactions and solutions, Ohm's law, Kirchoff's law – Simple electric circuit problems).

Unit III FUNCTIONS OF SEVERAL VARIABLES **9 + 3**
Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobian – Taylor's expansion – Maxima and Minima – Method of Lagrangian Multipliers.

Unit IV INTEGRAL CALCULUS **8 + 3**
Definitions and concepts of integrals – Methods of integration (Decomposition method, Substitution method, Integration by parts) – Definite integrals – Properties and problems – Reduction formulae – Beta and Gamma functions.

Unit V MULTIPLE INTEGRALS **8 + 3**
Double integration – Cartesian and Polar coordinates – Change of order of integration – Area as a double integral - Change of variables between Cartesian and Polar coordinates – Triple integration in Cartesian coordinates – Volume as triple integral.

SUPPLEMENT TOPIC (for internal evaluation only) **3**
Evocation /Application of Mathematics, Quick Mathematics – Speed Multiplication and
Division Applications of Matrices.

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Apply the Characteristic Equation, Characteristic roots and use the applicability of Cayley – Hamilton theorem to find the Inverse of matrix. (CO1) AP – K3.
- Analyze functions using limits, continuity, derivatives and to solve Physical application problems.(CO2) A – K4
- Apply differentiation techniques and Lagrange multiplier method to predict the extreme values of the functions with constrain.(CO3) AP – K3
- Apply the concept of some special function like Gamma, Beta function and their relation to evaluate some definite integral.(CO4) AP – K3
- Apply integration to compute Multiple integrals, Area and Volume in addition to change of order and change of variables.(CO5) AP – K3
- Understand the basic concept in Matrix, Differentiation and Integration. (CO6) U – K2

  .

Text Books:

1. BALI N. P and MANISH GOYAL, "A Text book of Engineering Mathematics", Laxmi Publications (P) Ltd, New Delhi, 8th Edition, (2011).
2. VEERARAJAN.T "Engineering Mathematics" Tata McGraw Hill Publishing Company, New Delhi, 2008.
3. GREWAL. B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 42nd Edition, (2012).

Reference Books:

1. RAMANA B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
2. GLYN JAMES, "Advanced Engineering Mathematics", Pearson Education, New Delhi, 7th Edition, (2007).
3. JAIN R.K and IYENGAR S.R.K," Advanced Engineering Mathematics", Narosa Publishing House, New Delhi, 3rd Edition, (2007).
4. BHARATI KRISHNA TIRTHAJI, "Vedic Mathematics - Mental Calculation", Motilal Banarsi Dass Publications, New Delhi, 1st Edition, (1965).
5. KREYSZIG. E, "Advanced Engineering Mathematics", John Wiley & Sons, New York, 10th Edition, (2011).
6. P.SIVARAMAKRISHNA DAS, E.RUKMANGADACHARI "Engineering mathematics", volume 1, Pearson Edison New Delhi, 2nd Edition, (2013).

	L	**T**	**P**	**C**
19UPH103 **ENGINEERING PHYSICS**				
(Common to All Branches-Except CSBS)	**3**	**0**	**0**	**3**

Course Learning Objectives:
- To develop the research interest in crystal physics.
- To use the principles of Lasers and its types.
- To apply principles of Quantum physics in engineering field.
- To develop knowledge on properties of materials.

Unit I CRYSTAL STRUCTURE   **12**

Introduction – Classification of solids –Space lattice –Basis-Lattice parameter – Unit cell – Crystal system –Miller indices –d-spacing in cubic lattice - Calculation of number of atoms per unit cell – Atomic radius-Coordination number – Packing factor for SC, BCC, FCC and HCP structures – crystal imperfection –Point defects-Line defects-Surface defects-Volume defects Burger vector.

Unit II PHOTONICS   **10**

Introduction- Principles of Laser- Characteristics of laser -Spontaneous and stimulated emission – Population inversion – Einstein's A and B coefficients - Pumping methods – Basic components of Laser - Types of lasers – Nd -YAG laser - CO_2 laser –Holography –Construction and Reconstruction of hologram – Industrial and Medical Applications.

Unit III QUANTUM MECHANICS   **13**

Introduction - Black body radiation – Planck's law of radiation - Wien's displacement law- Rayleigh Jeans law- – Compton Effect – Theory and experimental verification – Matter waves- Schrodinger's wave equation – Time dependent – Time independent equation – Particle in 1-D dimensional box.

Unit IV PROPERTIES OF SOLIDS   **10**

Introduction - Elasticity- Stress and Strain - Hooke's law – Three moduli of elasticity –stress- strain curve – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever – Young's modulus by uniform bending –I- shaped girders.

TOTAL: 45 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Classify the types of crystals, lasers and elastic behavior of solids (U).
- Apply the basic knowledge of crystal, quantum mechanics and mechanical behavior of solids to solve engineering problems (AP).
- Apply the principle of laser to estimate the wavelength of emitted photons. (AP).
- Analyze the dual nature of matter using the concepts of quantum mechanics(AN).
- Analyze the structural and optical properties of crystals in industrial and medical applications (AN).
- Analyze the structural and optical properties of materials for specific Engineering Applications. (AN).

Text Books:

1. Dr.Mani.P,"EngineeringPhysics",DhanamPublications,Edition,2018,Chennai.
2. Rajendran.V,"Engineering,Physics",TataMc-GrawHillPublishingCompanylimited, New Delhi, Revised Edition2018.
3. PalanisamiP.K.,"PhysicsForEngineers",ScitechPublications(India),PvtLtd., Chennai,2018.

Reference Books:

1. RaghuvenshiG.S.,"EngineeringPhysics",PHILearningPrivateLimited,NewDelhi, Revised Edition2018.
2. Aruldoss.G.,"Engineering Physics",PHI Learning Limited, New Delhi, Revised Edition2018.
3. Marikani.A.,"EngineeringPhysics",PHILearningPrivateLimited,NewDelhi, Revised Edition2017.
4. SankarB.N.,and Pillai. S. O., "A Textbook of Engineering Physics", New Age International Publishers Private Limited, New Delhi, Revised Edition2017.
5. AvadhanuluM.N.andKshirsagarP.G.,"ATextbook:ofEngineeringPhysics",S.Chand& Company Ltd., New Delhi,2018.

19UCY106	**CHEMISTRY FOR CIVIL ENGINEERS**	**L**	**T**	**P**	**C**
	(Civil Engineering)	**3**	**0**	**0**	**3**

Course Learning Objectives:
- To make the students conversant with boiler feed water requirements related problems and water treatment techniques.
- To gain knowledge on basics and applications of spectroscopy.
- To understand the principles and applications of corrosion.
- To know the applications of refractories, ceramics and cements.

Unit I WATER AND ITS TREATMENT TECHNOLOGIES   **11**

Hardness of water – types – expression of hardness (Problems) – units – estimation of hardness of water by EDTA – boiler troubles (scale and sludge) – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) – External treatment - Ion exchange process- zeolite process – desalination of brackish water – Reverse Osmosis.

Unit II CORROSION AND ITS PREVENTION TECHNIQUES   **11**

Introduction- Definition- Types –Chemical corrosion (Dry corrosion, mechanism and its Example)- Electrochemical corrosion (Wet corrosion, mechanism and its Types – Galvanic & Differential aeration Corrosion- Pitting, crevice & Wire fence corrosion). Corrosion prevention
-Protective coatings – Paint, Electro plating – Gold plating.

Unit III INSTRUMENTATION FOR ANALYTICAL METHODS   **11**

Spectroscopy - need and timeline - Beer-Lamberts law - Principle, instrumentation and applications – UV-Visible spectrophotometer- X-ray diffract meter – Atomic Absorption spectroscopy (AAS) - Scanning Electron Microscopy (SEM), Transition Electron Microscopy (TEM)- Gas Chromatography-HPLC and Mass Spectrometry- Principal and application.

Unit IV REFRACTORIES, CERAMICS AND CEMENT   **12**

Refractories: classification – acidic, basic and neutral refractories, manufacture and uses of alumina, magnetite and zirconia brick
Ceramics: Clays, silica, Feldspars- preparation, properties and uses. Methods for fabrication of ceramic wares-ceramic products; structural clay products, white wares, earthen wares.
Cement: composition, manufacture of Portland cement, properties – setting and hardening.

TOTAL: 45 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Understand the basic concept of chemistry involved in water treatment methods, corrosion types, instrumental methods and constructional materials. (Understand)
- Analyze the impurities of water to find its hardness and remove the hardness causing substances.(Analyze)
- Analyze the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.(Analyze)

- Apply the properties of refractories, cement and ceramics suitable for building. (Apply)
- Analyse the compounds by using different spectroscopic methods. (Analyze)

Text Books:
1. JainP.C.andMonicaJain,"EngineeringChemistry",DhanpatRaiPublishingCompany(P) Ltd., New Delhi,2010.
2. MichaelS.Mamlouk,JohnP.Zaniewski,"MaterialsForCivilandConstructionEngineers" Third Edition, Prentice Hall, Newyork,USA.
3. Pradeep.T"AtextbookofNanoscienceandNanotechnology",TataMcGraw-Hilleducation private ltd,2012.

Reference Books:
1. Physical chemistry – Samuel Glasstone, Macmillan II edition,1969.
2. A.K.Kaw,MechanicsofCompositeMaterials,CRCPress,NewDelhi2005.
3. S.C.Sharma,Compositematerials,NarosaPublications,NewDelhi,2000.
4. Bolt, G.H, Bruggen wert, M.G.M, 1978, soil chemistry,Elsevier.

19UCS108 **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**
(Common to ALL Branches-Except CSBS)   **3 0 0 3**

Course Learning Objectives:
- To impart the concepts in problem solving for computing.
- To familiarize the logical constructs of programming.
- To illustrate programming in Python.

Unit I INTRODUCTION   **9**
Definition and basic organization of computers – classification of computers – Software – Types of software – types of programming paradigms - Translators: compiler and interpreter – Problem solving tools: Algorithms – Flowchart – Pseudo code.

Unit II INTRODUCTION TO PYTHON   **9**
Introduction to python – features of python – modes of working with python. Values and data types: numbers, Boolean, strings; variables, expressions, statements, tuple assignment, precedence of operators, comments – print function- conversion of algorithm in to program – Solving simple problems involving arithmetic computations and sequential logic to solve.

Unit III CONTROL CONSTRUCTS   **9**
Flow of execution – control structures: conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass – Solving problems involving decision making and iterations.

Unit IV FUNCTIONS AND PACKAGES   **9**
Functions - function definition and use, flow of execution, parameters and arguments; parameters, local and global scope, function composition-Anonymous or Lambda Function, recursion -packages.

Unit V LISTS, TUPLES, DICTIONARIES AND STRINGS   **9**
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 - Strings: string slices; immutability, string functions and methods, string module.

TOTAL: 45 PERIODS

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Utilize problem solving tools in solving computing problems [Apply].
- Solve mathematical expressions involving sequential logic in python [Apply].
- Solve problems using python using decision structure and looping constructs [Apply].
- Write modular programs using functions and packages [Apply].
- Manipulate data using List, Tuples, Dictionaries and strings [Apply].

Text Books:
1. Ashok Nam dev Kam thane & Am it Ashok Kam thane, "Problem solving and python programming", McGraw Hill Education, 2018 (copyright).
2. Anurag Gupta & G P Biswas, "Python Programming – Problem solving, packages and libraries", McGraw Hill Education, 2020 (copyright).

Reference Books:
1. John V Guttag, " Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, "Exploring Python||, Mc-Graw Hill Education (India) Private Ltd., 2015. 4.Kenneth A. Lambert, "Fundamentals of Python: First Programs||, CENGAGE Learning, 2012. 5.Charles Dierbach, " Introduction to Computer Science using Python: A Computational.
4. Problem Solving Focus, Wiley India Edition, 2013.
5. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3||, Second edition, Pragmatic Programmers, LLC, 2013.

19UME109   **ENGINEERING GRAPHICS**   **L T P C**

                                    (Common to ALL Branches-Except CSBS)   **3 0 0 3**

Course Learning Objectives:
- To develop student's graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
- To impart knowledge in development of surfaces, isometric and perspective projections.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)   **4**

Importance of Graphics in Engineering Applications – Use of Drafting Instruments – BIS Conventions and Specifications – Size, Layout and Folding of Drawing Sheets – Lettering and Dimensioning - Introduction to Plane Curves, Projection of Points, Lines and Plane Surfaces.

Unit I PROJECTION OF SOLIDS   **12**

Projection of simple solids like prisms, pyramids, cylinder and cone with axis is parallel, perpendicular and inclined to one of the plane.

Unit II SECTION OF SOLIDS   **10**

Section of solids - simple position with cutting plane parallel, perpendicular and inclined to one of the plane.

Unit III DEVELOPMENT OF SURFACES   **10**

Development of lateral surfaces of simple and truncated solids - Prisms, pyramids and cylinders and cones - Development of lateral surfaces of sectioned solids.

Unit IV ISOMETRIC PROJECTIONS   **12**

Principles of isometric projection – isometric scale – isometric view - isometric projections of simple solids and cut solids.
.
Unit V ORTHOGRAPHIC PROJECTION   **12**

Representation of Three Dimensional objects – General principles of orthographic projection- Need for importance of multiple views and their placement – First angle projection – layout views – layout views – Developing visualization skills of multiple views (Front, top and side views) from pictorial views of objects.

TOTAL 45 (L) + 15 (T) = 60 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Apply the knowledge of First angle projection to draw the projection of points, straight lines and planes.(Apply).
- Draw the Projection of different simple solids.(Apply).

- Draw the section of solids and development of lateral surfaces of solids.(Apply).
- Apply the knowledge of Isometric projection to draw the objects like truncated solids and frustum.(Apply).
- Sketch the orthographic views from the given pictorial (isometric) view.(Apply).

Text Books:
1. Natarajan K.V., "A Text book of Engineering Graphics", Dhanalakshmi Publishers, (2006).
2. Bhatt N.D., "Engineering Drawing", 46th Edition, Charotar Publishing House, (2003).

Reference Books:
1. Venugopal K., and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, (2008).
2. Gopalakrishnan K.R., "Engineering Drawing" (Vol.I&II), Subhas Publications. (1998).
3. DhananjayA.Jolhe, "Engineering Drawing with an introduction to Auto CAD".
4. Tata McGraw Hill Publishing Company Limited, (2008).

19UGS113	**BASIC SCIENCES LABORATORY** **(Common to All Branches-Except CSBS)**	**L** **T** **P** **C** 0 0 2 1

PHYSICS LABORATORY

Course Learning Objectives:
- To create scientific Temper among the students.
- To know how to execute experiments properly, presentation of observations and arrival of conclusions.
- To view and realize the theoretical knowledge acquired by the students through experiments.

LIST OF EXPERIMENTS
(Common to All Branches)
1. Laser – Determination of particle size and wavelength of Laser source. using Diode Laser.
2. Ultrasonic Interferometer - Determination of velocity of sound and compressibility of liquid.
3. Poiseuille's method - Determination of Coefficient of viscosity of liquid.
4. Spectrometer – Determination of dispersive power of a prism.
5. Air Wedge method - Determination of thickness of a thin wire.
6. Uniform bending method – Determination of Young's modulus of the given rectangular beam.

A minimum of FIVE experiments shall be offered

TOTAL - 30 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Apply the principles of Optics, Laser physics and Mechanics to determine the Engineering properties of materials (AP).
- Analyze the given liquid sample to determine the viscosity and compressibility of the liquid (AN).
- Apply the principles of spectroscopy to determine the properties using prism (AP).

CHEMISTRY LABORATORY

Course Learning Objectives:
- To impart knowledge on basic concepts in applications of chemical analysis.
- Train the students to handle various instruments.
- To acquire knowledge on the chemical analysis of various metal ions.

LIST OF EXPERIMENTS
(Common to All Branches-Except CSBS)

1. Preparation of molar and normal solutions of the following substances – Oxalic acid , Sodium Carbonate , Sodium Hydroxide and Hydrochloric acid.
2. Conduct metric Titration of strong acid with strong base 3.Conductometric Titration of Mixture of Acids.
3. Estimation of Iron by potentiometry.
4. Determination of Strength of given acid using pH metry.
5. Determination of molecular weight of polymer by viscometry.
6. Comparison of the electrical conductivity of two samples-conductometric method.
7. Estimation of copper in brass by EDTA method.

A minimum of FIVE experiments shall be offered for every course

TOTAL: 30 Periods

After the successful completion of the course, Students will be able to,
- Apply the principles of Optics, Laser physics and Elasticity to determine the Engineering properties of   materials (Apply)Analyze the given solution quantitatively using chemical and electro analytical methods.(Analyze)
- Analyze the given liquid sample to determine the viscosity and compressibility of the liquid. (Analyze)
- Apply the principles of spectroscopy to determine the properties of materials.(Apply)
- Apply the knowledge of Molarity and Normality to prepare standard solution for chemical analysis. (Apply)
- Analyze the concentration of a given analyte by analytical methods. (Analyze)
- Apply the knowledge of electrochemical techniques to study various ions present in the
- industrial effluents. (Apply

19UME111	**ENGINEERING PRACTICES LABORATORY** **(Common to Mech, EEE, Civil, Chemical and Agriculture)**	**L T P C** **0 0 3 1.5**

OBJECTIVES:
* To demonstrate the plumbing and carpentry works.
* To train the students to perform welding, fitting and drilling operations.
* To demonstrate residential house wiring, fluorescent lamp wiring, measurement of earth resistance, color coding of resistors, logic gates and soldering.

GROUP A (CIVIL & MECHANICAL)
CIVIL ENGINEERING PRACTICE
LIST OF EXPERIMENTS:
1) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2) Preparation of plumbing line sketches for water supply and sewage works.
3) Hands-on-exercise: Basic pipe connections–Mixed pipe material connection Pipe connections with different joining components.
4) Demonstration of plumbing requirements of high-rise buildings.
5) Study of the joints in roofs, doors, windows and furniture.
6) Hands-on-exercise: Wood work, cutting, planning and joints by sawing –Half lap joint

MECHANICAL ENGINEERING PRACTICE
LIST OF EXPERIMENTS:
1) Preparation of arc welding of butt joints, lap joints and tee joints.
2) Drilling Practice.
3) Sheet metal model making – Trays, funnels, etc.
4) Different type of fittings-'V' type, 'L' Type
5) Study of Lathe Machine tool.
6) Study of Plastic Injection Moulding.
7) Study of Moulding.

A minimum of five experiments shall be offered in GROUP A (CIVIL & MECHANICAL)

GROUP B (ELECTRICAL & ELECTRONICS)
ELECTRICAL ENGINEERING PRACTICE
LIST OF EXPERIMENTS:
(a) Residential house wiring using switches, fuse, indicator, lamp and energy meter and Stair case wiring.
(b) Fluorescent lamp wiring.
(c) Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE
LIST OF EXPERIMENTS:
(a) Study of Electronic components and equipments – Resistor, colour coding
Measurement of AC Signal parameter (peak-peak, rms, period, frequency) usingCRO.
(b) Study of logic gates AND, OR, EX-OR and NOT Gate.
(c) Soldering practice – Components, Devices and Circuits – Using general purpose PCB.

TOTAL: 30 Periods

==**COURSE OUTCOMES:**==
After the successful completion of this course, the student will be able to
1. Apply the basic knowledge of plumbing to make simple house hold pipe line connections. (Apply).
2. Fabricate the given components using carpentry, sheet metal, fitting& welding equipment/tools. (Understand).
3. Perform the drilling operations. (Apply).
4. Apply basic electrical engineering knowledge for house wiring practice. (Apply).
5. Apply the knowledge of basic electrical engineering to practice soldering using general purpose PCB. (Apply).

EQUIPMENT REQUIREMENT

CIVIL ENGINEERING

S.No.	Name of the equipment	Quantity Required
1.	Assorted components for plumbing consisting of metallic Pipes, plastic pipes, flexible pipes, couplings, unions, Elbows, plugs and other fittings	5 sets
2.	Carpentry vice (fitted to workbench)	15 Nos
3.	Standard working tools	15 sets
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power tool rotary hammer	2 Nos
6.	Demolition hammers	2 Nos
7.	Planer	2 Nos
8.	Hand drilling machine	2 Nos
9.	Jigsaw	2 Nos

MECHANICAL ENGINEERING

S.No.	Name of the equipment	Quantity Required
1.	Arc welding transformer with cables and holders	5 Nos
2.	Welding booth with exhaust facility	5 Nos
3.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 sets
4.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit	2 Nos
5.	Vice	5 Nos
6.	Hacksaw frame and blade	5 Nos
7.	Files	5 Nos
8.	Study-purpose items: Centre Lathe, pattern, cope & drag box and moulding tools	Each 1 No.

ELECTRICAL ENGINEERING

Sl.No	Name of the equipment/software	Quantity Required
1.	Assorted electrical components for house wiring	15 sets
2.	Electrical measuring instruments	10 sets
3.	Megger (250V/500V)	1 No
4.	Study purpose items: Iron box, fan and regulator, emergency lamp	One each
5.	Power Tools:	2 No
	(a) Range Finder	2 No
	(b) Digital Live-wire detector	

ELECTRONICS ENGINEERING

Sl.No	Name of the equipment/software	Quantity Required
1.	Logic trainer kit	2 No
2.	CRO,AFO	2 Each
3.	Small multipurpose PCBs	10 No
4.	Soldering guns	10 No
5.	Multimeters	5 No
6.	Assorted electronic components for making circuits	Required quantity

PROBLEM SOLVING AND PYTHON PROGRAMMING   L   T   P   C
LABORATORY
(Common to ALL Branches)   0   0   3   1.5

Course Learning Objectives:
- To familiarize with programming environment.
- To familiarize the implementation of programs in Python.

LIST OF EXPERIMENTS

Problems involve Sequential logic and Decision Making

1. Develop a computing solution to process the mark processing system (Record has the following fields: Name, Reg_no, Mark1, Mark2, Mark3, Mark4, Total, average). Generate student information with total and average marks.

2. Provide a software solution to compute the +2 Cutoff mark, given the Mathematics, physics and Chemistry marks. A college has decided to admit the students with a cut off marks of180. Decide whether the student is eligible to get an admission in that college or not.

3. A pizza in a circular shape with 8 inches and which is placed in a square box whose side length is 10 inches. Find how much of the box is "empty"?

4. A person owns an air conditioned sleeper bus with 35 seating capacity that routes between Chennai to Bangalore. He wishes to calculate whether the bus is running in profit or loss state based on the following scenario:
   Amount he spent for a day for diesel filling is: Rs. 15,000
   Amount he spent for a day for Driver and cleaner beta is: Rs. 3,000
   Ticket amount for a Single person is Rs: 950
   If all the seats are filled, what would be the result?
   If only 15 seats are filled, what would be the result?

5. Consider the person 'X' has some amount in his hand and the person 'Y' has some amount in his hand. If they wish to exchange the amount among them, how they can exchange the amount by using the third party 'Z'.

Problems involve iterations

6. A man is blessed with a duck that can lay golden eggs. First day it lays one egg, in second day it lays two eggs, in third day it lays three eggs, and it continues to lay eggs in an incremental manner day by day. Now calculate how many golden eggs that duck lays till 'n'th day.

7. Four People A,B,C,D are sitting in a Circular arrangement. In how many ways their seating can be arranged.

8. The Greek theater shown at the right has 30 seats in the first row of the center section.
   Each row behind the first row gains two additional seats. How many seats are in the 5th row in the center section?

Problem involve functions and recursive functions

9.Develop a solution to identify the right angle triangle while giving the sides of a triangle. (Recall from the Pythagoras theorem that in a right triangle, the square of one side equals the sum of the squares of other two sides).

10.A game has to be made from marbles of five colors, yellow, blue, green, red and Violet where five marbles has to be kept one upon another. Write a python program using recursion, to find how many ways these marbles can be arranged.

11.Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Here is a high-level outline of how to move a tower from the starting pole, to the goal pole, using an intermediate pole:

1. Move a tower of height-1 to an intermediate pole, using the final pole.
2. Move the remaining disk to the final pole.
3. Move the tower of height-1 from the intermediate pole to the final pole using original pole.

Problems involve List and Nested List

12. In a class of 50 numbers of students, 6 students are selected for state cricket academy. Sports faculty of this school has to report to the state cricket academy about the selected students' physical fitness. Here is one of the physical measures of the selected students'; Height in cm is given for those 6 selected students [153,162,148,167,175,151]. By implementing functions, do the following operations.
(i)State academy selector has to check whether the given height is present in the selected students list or not.
(ii)State academy selector has to order the height of students in an incremental manner.
(iii)State academy selector has to identify the maximum height from the list.

Problems involve Dictionary and Tuples Dictionary

13.A university wishes to create and maintain the details of the students such as Rollno, Regno, Name, Dept, Batch, Contact_no, Nativity(Indian/NRI) as key value pairs. Do the following operations:
(i)Display the complete student details on giving Rollno as input.
(ii)Display the complete student details whose nativity belongs to NRI.
(iii)Display the complete student details whose department is CSE.

Tuples

14. A librarian wishes to maintain books details such as ISBN, Book Name, Author Name, Year published, Publisher Name. He wishes to retrieve the book details in the following scenario:
(i) Retrieve the complete details of the book on giving ISBN.
(ii)Retrieve the details of the book which published after the year 2015.
(iii)Retrieve the details of the book whose author name is 'Andrew'.
(iv)Retrieve the details of the book that name of the book is 'Python'.

Problems involve Strings

15. A musical album company has 'n' number of musical albums. The PRO of this company wishes to do following operations based on some scenarios:
(i)Name of the album starts with 's' or 'S'.
(ii)Name of the album which contains 'jay' as substring.
(iii)Check whether the album name presents in the repository or not.
(iv)Count number of vowels and consonants in the given album name.

TOTAL: 45 Periods

After the successful completion of the course, Students will be able to,

- Formulate algorithms for simple problems and translate the algorithms to a working program [Apply].
- Formulate algorithms and programs for arithmetic computations and sequential logic [Apply].
- Write iterative programs using control constructs [Apply].
- Develop programs using functions, packages and use recursion to reduce redundancy.[Apply].
- Represent data using lists, tuples, dictionaries and manipulate them through a program [Apply].

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS
HARDWARE
LAN SYSTEM WITH 30 NODES (OR) STANDALONE PCS – 30 NOS
SOFTWARE
OS – UNIX CLONE (License free Linux) EDITOR – IDLE

II SEMESTER

19UEN201	**COMMUNICATION SKILLS FOR PROFESSIONALS**	**L**	**T**	**P**	**C**
		1	0	1	1.5

Course Learning Objectives:
- Improve their oral expression and thought.
- Develop their confidence and ability to speak in public.
- Develop their capacity for leadership.

Unit I SELF INTRODUCTION & DELIVER A SPEECH BEFORE AUDIENCE   (Time: 5 to 7 minutes)

To Speak in front of an audience with courage.
- Make your message clear, with supporting material.
- Create a strong opening and conclusion.

Unit II SPEAK ON THE CHOSEN CONTENT   (Time: 5 to 7 minutes)
- Select a general topic and bring out specific purposes.
- Avoid using notes.
- Use symbolic ideas to develop your ideas.

Unit III USE EFFECTIVE BODY LANGUAGE & INTONATION   (Time: 5 to 7 minutes)
- Use appropriate posture, gestures, facial expressions and eye contact to express your ideas.
- Use proper intonation and adequate speech module.

Unit IV PRESENT YOUR TOPIC WITH VISUAL AIDS   (Time: 5 to 7 minutes)
- Persuade your points with suitable illustration, specific facts, examples.
- Use suitable visual aids to present your topic with confidence.

Unit V GRASP THE ATTENTION OF THE AUDIENCE   (Time: 5 to 7 minutes)
- Influence your listeners by adopting holistic viewpoint.
- Use emotions, stories, and positive quotes in your speech.

Total Hours =30 periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Communicate information ideas and opinions in any given situations.AP-K3
- Use language appropriately with clarity and fluency in any given circumstances AP-K3.
- Appraising the audience with clarity of thoughts with leadership quality.AP-K3.
- Present the ideas creatively with coherence for given topic.AP-K3
- Evaluate the use of language to provide suggestions for correct usage. AP-K3

Reference Books:
1. Competent Communication- A Practical Guide to becoming a better speaker, Toastmasters International, USA.
2. Norman Lewis – Word Power Made Easy, Pocket Book Publication, 2019.

19UMA206 **DIFFERENTIAL EQUATIONS, COMPLEX ANALYSIS AND TRANSFORM TECHNIQUES FOR CIVIL ENGINEERING** L T P C

                                                                            3 1 0 4

Course Learning Objectives:
- To develop an understanding of the basics of vector calculus comprising of gradient, divergence and curl, and line, surface and volume integrals and the classical theorems involving them.
- To make the student acquire sound knowledge of Laplace transform and its properties and sufficient exposure to the solution of certain linear differential equations using the Laplace transform technique.

Unit I SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS   **8+3**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Applications of ODE (Bacterial growth, Population growth, Decayed problems).

Unit II VECTOR CALCULUS   **8+3**

Gradient Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopiped.

Unit III PARTIAL DIFFERENTIAL EQUATIONS   **8+3**

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

Unit IV COMPLEX INTEGRATION   **9+3**

Statement and applications of Cauchy's integral theorem, Cauchy's integral formula and Cauchy Residue Theorem – Taylor's and Laurent's expansions – Applications of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding Poles on the real axis).

Unit V LAPLACE TRANSFORM   **9+3**

Existence conditions – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function, impulse function and periodic function - Inverse Laplace transform – Convolution theorem (excluding Proof) – Solution of linear ODE of second order with constant coefficients.

SUPPLEMENT TOPIC (for internal evaluation only)   **3**

Evocation / Application of Mathematics.

TOTAL : 45 (L) + 15 (T) = 60 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Apply the knowledge of higher order ordinary differential equations in real life engineering problems.(CO1) AP – K3
- Apply the concept of vector identities in problem solving and evaluate the line, surface and volume integrals.(CO2). AP – K3

- Apply the knowledge of partial differential equation in solving linear and higher order partial differential equation. (CO3) AP – K3
- Apply the knowledge of singularities, residues in complex integration.(CO4) AP – K3
- Apply the knowledge of Laplace transform and solve the problems with periodic function, inverse transform of convoluted function and Ordinary Differential Equation.(CO5) AP – K3
- Understands the concept of particular integral, scalar potential, poles and periodic function. (CO6) U – K2

Text Books:
1. VEERARAJAN.T "Engineering Mathematics" Tata McGraw Hill Publishing Company, New Delhi, 2008.
2. BALI N. P and MANISH GOYAL, "Text book of Engineering Mathematics", Laxmi Publications (P) Ltd., New Delhi, 3rd Edition, (2008).
3. GREWAL. B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 43rd Edition, (2014).

Reference Books:
1. RAMANA B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
2. KREYSZIG. E, "Advanced Engineering Mathematics", John Wiley & Sons, New York, 10th Edition, (2011).
3. JAIN R.K and IYENGAR S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House Pvt. Ltd., New Delhi, 3rd Edition, (2007).
4. GLYN JAMES, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 3rd Edition, (2007).

	L	T	P	C
19UPH206　　　　　　　**BUILDING PHYSICS**　　　　　　　**3　0　0　3**

Course Learning Objectives:
- To examine how sound is generated and propagates as a principle for architectural acoustic design.
- To develop the fundamental research interest in Nano materials.
- To explore the detailed behavior of new engineering materials.

Unit I THERMAL INSULATION OF BUILDINGS　　　　　　　　　　　**13**

Introduction-Thermal conduction, convection and Radiation- Thermal insulation-principles-Heat insulating materials- methods of heat insulation - heat gain and heat loss estimation - factors affecting the thermal performance of buildings -shading devices - central heating- Principles of natural ventilation - ventilation measurements-design for natural ventilation-Benefits of thermal insulation.

Unit II BUILDING ACOUSTICS　　　　　　　　　　　　　　　　　**10**

Introduction- Reverberation Time– Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination ––Factors affecting acoustics of buildings and their remedies –Echoes - Resonance-Noise – Loudness - Factors to be followed for good acoustics of building-Noise control in buildings.

Unit III NEW ENGINEERING MATERIALS　　　　　　　　　　　　**12**

Introduction-Metallic glasses– preparation – properties & applications -Shape memory alloys–preparation – properties & applications - Ceramic Materials: Introduction - Classification – Methods of Processing – Slip casting - Isostatic pressing - Gas pressure bonding -Properties – Application.

Unit IV COMPOSITES AND NANO MATERIALS　　　　　　　　　　**10**

Composites – definition and classification – Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Introduction to Nano materials –Various forms-Nano Dots-Nano rods-Nano fluids-Nano colloidal-Fullerene-Fabrication method – Top-down and bottom up approach – Chemical Vapour deposition - ball milling – Carbon nanotubes-structure-properties –Applications.

TOTAL - 45 Periods

==Course Outcomes:==

After the successful completion of the course, Students will be able to,

- Apply the concept of physics for thermal and sound insulation in building design.[Apply]
- Explain the fundamental concepts of physics which provides foundation for building construction design.[Understand]
- Illustrate new engineering materials and their properties, encountered in civil engineering.[Apply]
- Analyze the effect of new engineering materials, composites and nano materials to improve strengthening of building materials. (Analyze)
- Apply the science of architectural acoustics in building design. (Apply)
- Analyze the thermal concepts of buildings to design various building models with reference to climatic changes of environment. (Analyze)

Text Books:
1. William D. Callister, Jr. "Material Science and Engineering", Seventh Edition,
2. John Wiley & Sons Inc.New Delhi, 2018.
3. Dr. Mani.P, " Building Physics ", Dhanam Publications, Chennai Revised Edition, 2018.
4. M. N. Avadhanulu and P. G. Kshirsagar,A "Textbook of Engineering Physics", S. Chand & Company   Ltd., New Delhi, 2015.

Reference Books:
1. V. Rajendran, Engineering Physics, Tata McGraw-Hill, New Delhi, 2017.
2. P. K. Palanisami, "Physics for Engineers', Vol. 1, Scitech Pub. (India) Pvt. Ltd., Chennai, 2012.
3. R. K. Gaur and S. L. Gupta," Engineering Physics", DhanpatRai Publishers, New Delhi, 2016.

	L	**T**	**P**	**C**

19UCY204   **ENVIRONMENTAL SCIENCE**   **L   T   P   C**
3   0   0   3

Course Learning Objectives:
- To understand the concepts of Environment and ecosystem.
- To acquire knowledge about the impact of environmental pollution.
- To understand the importance of environmental issues in the society.
- To gain knowledge about the impact of environment related to human health.
- To gain knowledge in alternative energies.

Unit I ENVIRONMENT AND ECOSYSTEMS   **9**

Definition, scope and importance of environment – Need for public awareness – Conceptofecosystem–Structureandfunctionofecosystem–Producers,consumersand decomposers-Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Aquatic ecosystems (c) Grassland ecosystem.

Unit II ENVIRONMENTAL POLLUTION   **9**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution- pollution case studies - Role of an individual in prevention of pollution –Disaster management: floods, earthquake, cyclone and landslides.

Unit III SOCIAL ISSUES AND THE ENVIRONMENT   **9**

Water conservation, rain water harvesting, watershed management – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Environmental laws/Acts, (EPA).

Unit IV HUMAN POPULATION AND THE ENVIRONMENT   **9**

Population growth, variation among nations – Population explosion – Human rights – Family welfare programme – Environment and Human Health – Human Rights-Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health.

Unit V FUTURE POLICY AND ALTERNATIVES   **9**

Introduction to future policy and alternatives-fossil fuels-nuclear energy-solar energy-wind energy - hydroelectric energy-geothermal energy - tidal energy – sustainability - green power- nanotechnology.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Understand the basic concept of structure and function of ecosystem (Understand)
- Apply the knowledge of various pollution types to prevent the ecosystem and Environment (Apply)
- Analyze the environmental problem to report the social issues and the environment. (Analyze)
- Compare the suitable methods for conservation and sustainable development of natural resources (Analyze)
- Apply the principles of value education with respect to human population to preserve environment (Apply)
- Analyze the current energy crisis and suggest suitable sustainable alternatives that promotes social health and environmental prospects. (Analyze)

Text Books:
1. AnubhaKaushik, kaushik C.P., "Environmental Science and Engineering",Third..
2. Edition, New Age International, New Delhi, 2009.
3. Benny Joseph "Environmental Science and Engineering", Tata Mc-Graw Hill, New Delhi, 2006.

Reference Books:
1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science',
2. Pearson Education Upper saddle River, New Jersey, 2008.
3. Miller T.G. Jr., Environmental Science", Wadsworth Publishing Company, Belmont, California, 2005.
4. De A.K., "Environmental Chemistry", Wiley Eastern Ltd., New Delhi,2001.
5. Trivedi R.K., Goel P.K., "Introduction to Air Pollution", Techno-Science Publication, Jaipur,2005.

19UCE205	INTRODUCTION TO CIVIL ENGINEERING	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- To impart the basic knowledge of Civil engineering and its disciplines
- To study the properties of building materials.
- To study the principles of surveying and transportation planning and software applications.
- To impart the Knowledge on various Hydrological structures, water and wastewater qualities.
- To express the innovations in civil engineering concepts.

Unit I OVERVIEW OF CIVIL ENGINEERING   9

Scope of Civil Engineering- Role of Civil Engineers- Broad disciplines of Civil Engineering- Possible scopes for career in Civil Engineering- Outstanding accomplishments of Civil Engineering- Position of construction industry in comparison with other industries - outlays for Construction; Current budget allocation as for Infrastructure works.

Unit II CONSTRUCTION MATERIALS AND BUILDING COMPONENTS   9

Properties and Uses of construction materials – Stones – Bricks – Cement – Timber. Mortars-Plain, Reinforced cement concrete & Prestressed Concrete, Construction Chemicals; Steel and its types- Recycling of Construction &Demolition wastes– Component of Building – Super & sub structures – Brick and Stone masonry – Plastering-Flooring –types and applications - Lintels – Beams – Columns – Roofs - Types and applications.

Unit III SURVEYING, TRANSPORTATION AND SOFTWARE APPLICATIONS   9

Surveying – Classification – Traditional surveying techniques -Total Station and its applications - Roads – Types and Classification – Pavement Materials – Traffic Signs, Signals and Road Marking - Need for Automation - Typical softwares used in Civil Engineering(Concepts and applications only) - BIM-STAAD Pro, ETAB, MODFLOW, REVIT, TEKLA, AUTOCAD, GEOSTUDIO, PRIMAVERA, ArcGIS.

Unit IV HYDROLOGY AND ENVIRONMENTAL ENGINEERING   9

Rainfall- Runoff – Hydrological cycle – fundamentals of water storage structures (Definitions, Types & functions only)– weir – sluices – canal – channel – siphon – reservoirs – dams -Underground Structures - Multipurpose reservoir projects- Need for conservation of water- Introduction to water supply and water demand – quality of water and waste water.

Unit V INNOVATIVE CONCEPTS IN CONSTRUCTION   9

Green buildings: Concepts - Sources of global warming - Comparison of conventional & green buildings - Building in different climatic regions. Smart cities: Introduction to smart cities. Drivers and barriers - benefits of smart cities, Smart indicators, smart city rankings, emerging trends and technologies. Tall structures: General Planning Considerations – Design philosophies.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Explain the fundamentals related to the Scope of Civil Engineering and infrastructure development.
- Discriminate the various building components and properties of building materials.

- Describe the basic concepts of surveying, transportation and software applications in Civil Engineering.
- Explain the fundamentals of hydraulic structures, water and wastewater characteristics.
- Discuss the innovative concepts in Civil Engineering applications.

Text Books:
1. S.S.Bhavikatti., "Basic Civil Engineering", New age International Publishers, RTM Nagpur, (2016).
2. Punmia.B.C, Ashok K Jain and Arun K Jain, "Basic Civil Engineering", Laxmi Publication, New Delhi,(2016).
3. Palanichamy M.s &Shanmugam G., "Basic Civil and Mechanical Engineering", McGraw Hill Education, (2018).
4. Dr.S.K.Sharma.,"Irrigation Engineering & Hydraulic Structures", S.Chand Publishers, New Delhi (2017).
5. A.K.Jain., "The Idea of Green Building", Khanna Publications,(2014).

Reference Books:
1. Design of Tall Concrete Buildings In India With Reference to IS 16700: 2017 Code.
2. Duggal S.K., "Building Materials", New age International Publishers, (2019 - 5th edition).
3. Punmia.B.C, Ashok K Jain and Arun K Jain, "Building Construction", Laxmi Publication, New Delhi, (2016).
4. S.K Khanna, and C.E.G.Justo and A. Veeraragavan., "Highway Engineering", New Hand and Bros, Roorkee, (2015-10th edition).

19UEE226   **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**   **L   T   P   C**
                                                                            3   0   0   3

Course Learning Objectives:

- This course facilitates the students to get a comprehensive exposure to electrical and electronics engineering.

Unit I DC AND AC CIRCUITS   9

Direct currents and voltages, power, Kirchoffs Laws, Alternating current and voltage, Peak, RMS and average values, circuit elements R,L &C, Phasor Diagram, impedance, real and reactive power in single phase circuits.

Unit II DC MACHINES AND TRANSFORMERS   9

DC machines Construction, principle of operation and applications, Single phase transformer – construction, principle of operation, Introduction to three phase systems.

Unit III AC MACHINES   9

Synchronous and Induction machines -Construction, Principle of operation, and applications.

Unit IV SPECIAL MACHINES   9

Brushless D.C Motor, Stepper Motor, Linear motor and Universal Motor – Construction, Principle of operation and applications.

Unit V INTRODUCTION TO ELECTRONICS   9

Diode- PN Diode, Zener Diode, BJT Configurations, Rectifiers, Data acquisition system- ADC, DAC – principles of operation.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Apply the basic laws of electrical circuits to linear circuit problems.
- Summarize the working principle and construction of DC machines and transformers.
- Explain the principle of operation and construction of AC machines.
- Explain the working principle and construction of Special machines.
- Illustrate the characteristics of basic semiconductor devices.

Reference Books:

1. V K Mehta and Rohit Mehta,"Principles of Electrical Engineering and Electronics", S. Chand Publishing, New Delhi, 2019.
2. Arumugam M. and Premkumar N., "Electric circuits theory", Khanna Publihsers, 7thedition, New Delhi, 2007.
3. Kothari D.P. Nagrath I.J, "Electric Machines", Tata McGraw Hill, 2009.
4. K. Venkataratnam, Special Electrical Machines, Universities Press, 2014.
5. R.J.Smith, R.C.Dorf, Circuits devices and systems, 5th edition, John Wiley and sons 2001.
6. Malvino, A.P, Leach D.P and GowthamSha, Digital Principles and Applications, 6th   Edition, Tata McGraw hill, 2007.

19UGS210   **ENERGY AND ENVIRONMENTAL SCIENCE LABORATORY**   **L   T   P   C**

                                                                              0   0   3   1.5

Course Learning Objectives:
- To analyze the Band gap, moment of inertia, thermal conductivity and rigidity modulus of the materials.
- To gain knowledge in PHOTONICS.

PHYSICS LABORATORY
(COMMON TO ALL BRANCHES)

LIST OF EXPERIMENTS
1. Determination of Energy band gap of a semiconductor.
2. Torsion pendulum – Determination of Moment of inertia of a metallic disc and rigidity modulus of a given metallic wire.
3. Spectrometer - Determination of wavelength of mercury spectrum using grating.
4. Laser – Determination of numerical aperture and acceptance angle of an optical fiber.
5. Newton's rings – Determination of radius of curvature of a convex lens.
6. Lee's Disc - Determination of thermal conductivity of a bad conductor.
7. Determination of Solar cell Characteristics using optical transducers kit.

A minimum of FIVE experiments shall be offered
CHEMISTRY LABORATORY
LIST OF EXPERIMENTS
(Common to All Branches)
1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of Chloride in water sample (Argentometric method).
4. Determination of DO in water.
5. Estimation of chromium in tannery wastes.
6. Estimation of available chlorine in bleaching powder.
7. Estimation of iron by Spectrophotometry.
8. Determination of acidity of industrial effluents.

A minimum of FIVE experiments shall be offered

                                                                          TOTAL: 45 Periods

Course Outcomes:
          After the successful completion of the course, Students will be able to,
- Apply the principles of Light and Elasticity to determine the Engineering properties of materials. (Apply)
- Analyze the thermal conductivities of different bad conductors. (Analyze)
- Analyze the Characteristics of a semiconductor. (Analyze)
- Apply the basic knowledge of water quality testing for environmental sustainability. (Apply)
- Analyze the water quality parameters for industrial effluents to prevent water pollution. (Analyze L4)
- Estimate the quality of water that suits for domestic and industrial applications (Apply).

	L	T	P	C

19UCE211　　　　**COMPUTER AIDED BUILDING DRAWING**　　　　L　T　P　C
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　0　0　3　1.5

Course Learning Objectives:

- To prepare the Plan, Elevation and Sectional views of buildings in accordance with Development and Control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS

PART - B

Drawing using Drafting software:

1.Principles of Planning, Orientation and Joinery details (Fully paneled door& window/ Partly glazed and wooden paneled door and window – Elevation and cross section)– Cross section of a load bearing wall (including door, steps, floor, lintel & sunshade, roof, parapet, weathering course, etc.)

Preparation of Plan, Elevation and Section of

2.Single Storey Residential Buildings- (Load Bearing Structure)
3.Double Storey Residential Buildings with staircase- (Framed Structure)
4.Institutional Building -School - (RCC Framed Structure)
5.Industrial Building –Workshop(Steel Structure)

PART - B

Drawing using Drafting software:

1. Basic AutoCAD Commands [The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects; Isometric Views of lines, Planes, Simple and compound Solids] - simple diagrams using the Commands.

Preparation of Plan, Elevation and Section of

2. Single Storey Residential Building – Load bearing structure (Plan, Elevation & Section).
3. Double Storied Residential Building with staircase using given area- RCC framed structure (Plan, Elevation & Section).
4. Institutional building   School (Plan, Elevation & Section- R.C.C Framed Structure).
5. Industrial building – Workshop – Use any type of truss (Plan, Elevation & Section).

Demonstration

1.3D view of a single storey and double storied residential building.

TOTAL - 30 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,

- Prepare a plan for a building of given area. – Apply.
- Prepare plan, elevation and section of buildings with load bearing walls – Apply.
- Prepare a plan, elevation and section of R.C.C framed buildings with typical cross sections of footings, beams and columns. – Apply.
- Prepare a plan, elevation and section of industrial buildings – Apply.
- Prepare a plan, elevation and section of institutional buildings – Apply.

Text Books:
1. George Omura., "Mastering in Autocad 2019", Wiley Publishers, (2019).
2. Sham TickooSwapna D., "Advanced AUTOCAD 2018", BPB Publications Ltd, (2018).
3. Rangwala., "Civil Engineering Drawing", Charotar Publishing house Pvt. Ltd, (2017).
4. Verma.B.P.,"Civil Engineering Drawing and House Planning", Khanna Publishers, (2014).
5. Sikka V.B., "A Course in Civil Engineering Drawing", S.K.Kataria and Sons, (2015-4th Edition).

References:
1. Rangwala., "Civil Engineering Drawing", Charotar Publishing House Pvt. Ltd, (2017).
2. "A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors", John Wiley and Sons. Inc., (2018).
3. Balagopal & T.S. Prabhu.,"Building drawing & detailing –, Spades Publishers", Calicut.
4. David S. Cohn., "AutoCAD2000", Tata McGraw Hill, Publishing Company, New Delhi, (2000).
5. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, (2008).

III SEMESTER

19UMA325   **PROBABILITY, STATISTICS AND TRANSFORM TECHNIQUES**   **L T P C**
                                                                     3 1 0 4

Course Learning Objectives:
- To make the student acquire sound knowledge of standard distributions that can describe real life phenomena.
- To acquaint the student with Fourier transform techniques used in variety of situations.
- To acquaint the student with the basics of Z - transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z - transform technique bringing out the elegance of the procedure involved.

Unit I RANDOM VARIABLES   **9+3**
Axioms of probability - Conditional probability - Total probability - Bayes' theorem – Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Normal, Geometric, Uniform, Exponential and Gamma distributions.

Unit II TESTING OF HYPOTHESIS   **9+3**
Sampling distributions - Normal, t, Chi-square and F distributions - Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes.

Unit III FOURIER SERIES   **9+3**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Perceval's identity – Harmonic analysis - Application of Fourier series.

Unit IV FOURIER TRANSFORM   **9+3**
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Perceval's identity - Application of Fourier Transform.

Unit V Z-TRANSFORM AND DIFFERENCE EQUATIONS   **9+3**
Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value Theorems - Formation of difference equations – Solution of difference equations.

                                                  TOTAL : 45 (L) + 15 (T) = 60 Periods

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Apply the knowledge of concepts of probability to acquired knowledge of standard Distributions .(CO1) AP – K3
- Apply the concept of testing of hypothesis for small and large samples in Real life Problems (CO2). A – K4
- Apply the knowledge of Fourier series for the given function or Discrete data and compute the Periodic function arising in the study of Engineering problems .(CO3) AP – K3
- Apply the Fourier Transform techniques to evaluate the given integral problems using Fourier Cosine transform, Sine Transform and its properties.(CO4) AP – K3
- Apply the acquired knowledge of Z transform and its properties inverse Z transform and difference

equations.(CO5) AP – K3

- Understand the knowledge of axioms of probability, periodic and non-periodic functions. (CO6) U-K1

Text Books:

1. GUPTA S.C., KAPOOR V.K. "Fundamental of Mathematical Statistics" 10th Edition, Sultan Chand and Sons, New Delhi, 2002.
2. GREWAL, B.S., "Higher Engineering Mathematics," Khanna Publishers, New Delhi, 35th Edition, (2010).
3. JOHNSON R.A. and GUPTA C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 8th edition, (2011).

Reference Books:

1. WALPOLE. R.E., MYERS .R.H., MYERS S.L., and YE. K, "Probability and Statistics for Engineers and   Scientists", Pearson Education, New Delhi, 8th edition, (2007).
2. SPIEGEL M.R., SCHILLER J. and SRINIVASAN R.A., "Schaum's Outlines Probability and Statistics", Tata McGraw Hill, New Delhi, (2004).
3. GLYN JAMES, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 3rd Edition, (2007).
4. ERWIN KREYSZIG, "Advanced Engineering Mathematics", Wiley India, 10th Edition, (2011).

19UCE302   **ENGINEERING GEOLOGY AND CONSTRUCTION MATERIALS**

L	T	P	C
3	0	0	3

Course Learning Objectives:
- To understand the role and importance of geology in civil engineering.
- To familiarize with surface and subsurface investigations to study about rocks and minerals.
- To impart knowledge on properties of various construction materials and their practices.
- To acquire the manufacturing process, types, applications and testing procedures for construction materials.
- To understand the concept of advanced material usage in construction field.

Unit I MINERALS AND ROCKS   **9**

Geology in civil engineering – Branches of geology - Minerals, their physical properties – rock forming minerals, Formation of rocks – types of rocks - physical and engineering properties of igneous, metaphoric, and sedimentary rocks.

Unit II INTERIOR AND STRUCTURES OF EARTH   **9**

Earth's interior based on seismic models, plate tectonics and continental drift, study of earth's structures – geological maps – attitude of beds - fold, faults and joints, geological factors affecting Civil Engineering constructions, and their uses.

Unit III CONSTRUCTION MATERIALS AND PROPERTIES   **9**

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption - Efflorescence – Bricks for special use – Refractory bricks- Brick and Stone – Properties, Uses and Tests - Concrete Blocks – Fly ash Blocks - Hollow Block - Lightweight Block and Paver Blocks.

Unit IV BINDING MATERIALS AND AGGREGATES   **9**

Lime – Preparation of lime mortar -Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance –Fine aggregate - Grading – Sand Bulking.

Unit V MISCELLANEOUS AND MODERN MATERIALS USED IN CONSTRUCTION   **9**

Timber Classification, properties - defects in timber - Processing, seasoning and preservation. Alternate and Composite materials -Veneering, Plywood, Particle board, Gypsum board, PVC doors and windows. Steel and aluminium- properties and uses of different types of steel - Market forms of steel - Anticorrosive treatment for steel - Properties of Asbestos, Paints, Varnishes and Distempers – Applications of Thermocol - Bitumen's - Glass –Fibre glass reinforced plastic – Clay products – Fibre textiles– Geomembranes and Geotextiles for earth reinforcement.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Categorize the properties, flaws and qualities of minerals, rock types & construction material. (Understand).
- Examine the material properties for its suitability in current practice. (Apply).

- Estimate the pros and cons of a construction material to replace it with the effective and economical source. (Analyse).
- Review the features of material properties for the Industrial and construction needs. (Analyse) .
- Investigate the strength of construction material for the application in Civil Engineering. (Evaluate).

Text Books:
1. Parbin Singh. A Text book of Engineering and General Geology, S.K.Kataria& Sons, Katson educational series, 2013.
2. Varghese.P.C, Building Materials, second edition of Prentice Hall India Learning Pvt.Ltd, (2015).

Reference Books:
1. Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, (2012).
2. S.K.Duggalet al. Engineering Geology, McGraw Hill Education Pvt. Ltd. (2017).
3. Rangwala, Engineering Materials, Charotar Publishing House Pvt. Ltd. (2017).
4. Rajput.R.K., Engineering Materials, S. Chand and Company Ltd., (2008).

	L	**T**	**P**	**C**
19UCE303 **BASICS OF ENGINEERING MECHANICS**	**3**	**1**	**0**	**4**

Course Learning Objectives:

- To impart knowledge on equilibrium of particles and rigid bodies both in two and three dimensions.
- To help the students to calculate centroid and moment of inertia of areas and sections.
- To apply various methods for evaluating kinetic and kinematic parameters of particles and rigid bodies subjected to concurrent coplanar forces.
- To comprehend the effect of friction on equilibrium.
- To develop understanding of the state of simple and compound state of stresses in structural components as a result of different loading conditions.
- To develop knowledge on the behavior of members subjected to torsion.

Unit I STATICS OF PARTICLES **9+3**

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

Unit II EQUILIBRIUM OF RIGID BODIES **9+3**

Free body diagram – Types of supports – Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

Unit III PROPERTIES OF SURFACES AND SOLIDS **9+3**

Definition of Centroid & Centre of Gravity - Axes of Symmetry - Centroid of basic shapes by Integration - Numerical problems on Centroid of Composite sections - Theorems of Pappus & Guldinus - Concept of Moment of inertia - perpendicular axis theorem - parallel axis theorem - Moment of inertia of basic shapes by Integration - Numerical problems on moment of inertia of composite sections - Mass Moment of Inertia.

Unit IV DYNAMICS OF PARTICLES AND FRICTION **9+3**

Displacements, Velocity and acceleration, their relationship – Relative motion – Rectilinear motion - Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies. Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – Ladder friction - Rolling resistance.

Unit V SIMPLE AND COMPOUND STRESSES **9+3**

Stresses in simple and compound bars - Thermal stresses – Elastic Constants – Strain energy – strain energy due to axial load (Gradual, sudden and Impact loadings) – State of stress in two dimensions – stresses on inclined planes - Principal stresses and principal planes – Mohr's circle of stresses - Torsion of circular shafts - Springs.

TOTAL : 45 (L) + 15 (T) = 60 Periods

After the successful completion of the course, Students will be able to,

- Describe the fundamental concepts of engineering mechanics (Understand).
- Apply laws of statics and dynamics to resolve the unknown forces of particles and rigid bodies under equilibrium (Apply).
- Apply laws of mechanics to compute the properties of surfaces and solids (Apply).
- Analyze the equilibrium of particles and rigid bodies in 2D and 3D, to resolve the unknown forces. (Analyse).
- Analyse the simple and compound stresses induced in rigid bodies subjected to various loadings (Analyse).
- Evaluate the Rigid bodies for most economical condition. (Evaluate).

Text Books:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 10th Edition, Tata McGraw-Hill Publishing company, New Delhi (2010).
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.
3. Bhavikatti, S.S., "Engineering Mechanics", 7th Edition, New Age International (P) Limited Publishers (2017).

Reference Books:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 14th Edition, Pearson Education (2015).
2. Meriam J.L. and Kraige L.G., "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", 7th Edition, John Wiley & Sons (2013).
3. Rajasekaran S and Sankara subramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd. (2005).

19UCE304	**WATER SUPPLY ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Learning Objectives:

- To understand and explain the concept of water treatment process and components of water supply system.
- To have adequate knowledge on distribution network and water supply to buildings.

Unit I INTRODUCTION TO WATER SUPPLY SYSTEM   **9**

Public water supply system – Planning, Objectives, Design period, Population forecasting (Arithmetic Increase method, Geometric Increase method, Incremental Increase method & Decreasing rate method); Water demand – Sources of water and their characteristics –Surface and Groundwater – Impounding Reservoir – Development and selection of source – Water quality – Characterization – Significance – Drinking Water quality standards.

Unit II COLLECTION AND CONVEYANCE OF WATER   **9**

Water supply – Intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pump – Selection of pumps and pipe materials.

Unit III CONVENTIONAL WATER TREATMENT   **9**

Objectives – Unit operations and processes – Principles, functions, design, Operation & Maintenance aspects of water treatment plant, aerators, flash mixers, Coagulation, flocculation sedimentation tanks and sand filters – Design of Chemical feeding devices and Clariflocculator - Plate and tube settlers - Pulsator clarifier - Disinfection - Residue Management.

Unit IV ADVANCED WATER TREATMENT   **9**

Water softening – Iron and Manganese removal - Defluoridation - Adsorption – Desalination - R.O.Plant – demineralization process – Ion exchange – Membrane Systems – Operation & Maintenance aspects – Recent Advances - Sky Water Technology – Biofiltration – Ultraviolet Germicidal Irradiation.

Unit V WATER DISTRIBUTION AND SUPPLY TO BUILDINGS   **9**

Requirements of water distribution – Components – Service reservoirs Functions – Network design – Analysis of distribution networks – Software's used in Distribution process (EPANET, QANET) - Leak detection methods – Water supply to buildings - House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Define, Understand and explain the concept of water treatment process and components of water supply system. (Understand).
- Apply the knowledge of water supply and treatment principles to be able to design the treatment process, supply mains, distribution network by calculating the water demand. (Apply).
- Analyze the water quality and treatment, pump and pipe materials for the distribution system

(Analyze).
- Design solution for water treatment and network system components that meet the specified needs with appropriate consideration for the public health and environmental consideration. (Design).
- Use the knowledge based on Analysis and Interpretation of population and water quality data to provide valid conclusion for treatment processes and network design. (Evaluate).
- Select and apply appropriate advanced techniques for treatment and modern tools like EPANET, QANET for water distribution system. (Modern Tool).

Text Books:
1. Garg, S.K. Environmental Engineering, Vol.I& II Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.

Reference Books:
1. Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2010.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
3. 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.
4. Introdution to Environmental Engineering by P.AarneVesilind, Susan M. Morgan, Thompson/ Brooks/Cole; Second edition 2008.

	L	T	P	C
19UCE305	**FLUID MECHANICS**			

19UCE305   **FLUID MECHANICS**   L T P C   3 0 0 3

Course Learning Objectives:

- To learn the application and inter-relationship of various properties of fluid like mass density, viscosity, and surface tension.
- To determine the forces on plane and curved surfaces in a fluid at rest and the concepts of buoyancy and metacenter.
- To study laminar and turbulent flow in pipes, major and minor losses in pipes.
- To study the fundamentals of dimensional analysis and model studies.

Unit I FLUIDS PROPERTIES AND STATICS   **9**

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and sensors - forces on planes – Centre of pressure – buoyancy floatation.

Unit II FLUID KINEMATICS AND DYNAMICS   **9**

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms) - stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications – Venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

Unit III DIMENSIONAL ANALYSIS & MODEL STUDIES   **9**

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - dimensionless parameters - similitude and model studies - distorted models.

Unit IV FLOW THROUGH PIPES   **9**

Reynold's experiment - laminar flow through circular pipe (Hagen poiseulle's) – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor - Moody's diagram- major and minor losses of flow in pipes - hydraulic and energy gradient line - pipes in series and in parallel.

Unit V BOUNDARY LAYER   **9**

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer - displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

TOTAL - 45 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,

- Describe the basic concepts of fluid statics, dynamics, model studies and boundary layer (Understand).
- Apply the concept of statics and dynamics to solve the fluid flow problems.(Apply).
- Analyse the fluid flow problems with momentum and energy equations (Analyse).
- Evaluate the critical properties of fluids under different scenarios to suit field conditions. (Evaluate).

- Investigate the fluid flow problems and models using the knowledge of statics& dynamics. (Evaluate).
- Create a model of any measurement device using modern engineering and IT Tools to predict the fluid pressure (Create).

Text Books:
1. Bansal R.K. Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, 2018.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2002.

Reference Books:
1. Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi, 2010
2. Kumar K.L., "Engineering Fluid Mechanics" Eurasia Publishing House, 2016
3. Rajput R.K, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, Ninth Edition 2016.

	L	**T**	**P**	**C**
19UCE306 **SURVEYING**	**3**	**0**	**0**	**3**

Course Learning Objectives:
- To introduce the basics concepts of surveying using Convention Surveying Techniques.
- To find the angular measurements and difference in elevations using Theodolite and Tachometric Surveying.
- To find the area of given boundary using various methods and to introduce the concepts of errors and adjustments in various survey measurements.
- To introduce the basic concepts of different Modern Survey Techniques.
- To provide the knowledge on various types of surveying like Route surveying, Hydrographical surveying and Astronomical surveying.

Unit I FUNDAMENTALS OF SURVEYING AND LEVELLING   **9**

Basic principles of surveying- Classification- Chain Surveying - Equipment and accessories for ranging and chaining - Principles of Compass Surveying - Bearing and Types - local attraction and its elimination- Plane table surveying - Principles and theory of Leveling – Methods – Booking and Reduction - Curvature and refraction correction - Contouring.

Unit II THEODOLITE AND TACHEOMETRIC SURVEYING   **9**

Theodolite surveying: Components, Horizontal and vertical angle measurements - Temporary and permanent adjustments – Tacheo metric Surveying – Tangential and Stadia systems - Stadia constants - Anallatic lens – Subtense bar - Computation of cross sectional areas and volumes – LS and CS - Earthwork calculations - Mass haul diagrams.

Unit III CONTROL SURVEYING AND CURVES   **9**

Horizontal and vertical control – Methods – triangulation- baseline – satellite stations – reduction to centre – Route Surveying - Route surveys for highways, and railways - Simple curves – Compound curve and reverse curves – Transition curves - different methods of Setting out simple curve & vertical curves.

Unit IV MODERN SURVEYING   **9**

Total Station - Parts and accessories - working principle - On board calculations - Fundamental quantities measured - Field procedure and applications - Errors and Good practices. Basics of GIS - GPS Surveying - Different segments - satellite configuration - Anti Spoofing and Selective Availability - Hand Held and Geodetic receivers - data processing – Errors in GPS Surveying - Field procedure and applications.

Unit V PHOTOGRAMMETRY AND REMOTE SENSING   **9**

Photogrammetry – Introduction, Basic concepts, perspective geometry of aerial photograph, photographic scale-flying heights and altitude – relief and tilt displacements, terrestrial Photogrammetry - Flight planning – Drone surveying and applications. Remote sensing: Introduction-Electromagnetic spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation.

TOTAL - 45 Periods

After the successful completion of the course, Students will be able to,

- Describe the concepts of component parts of Conventional and Modern survey equipment and methods. (Understand).
- Apply the conventional and modern surveying technique to measure the Horizontal distance, included angles, Difference in Elevations, area and volume by Direct or Indirect methods. (Apply) .
- Analyse the errors and corrections of various surveying methods (Analyse).
- Investigate the Purpose and Characteristics of Various Curves, Route Surveying and Triangulation Surveying. (Analyse).
- Demonstrate the concepts of GIS, GPS, Photogrammetry and Drone surveying to measure the fundamental quantities (Understand).
- Design the simple curves and routes for Highway and railways using Modern survey equipments. (Evaluate).

Text Books:

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 2014 .
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2016.
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2014.
4. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
5. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 2004 .
6. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2014 .

Reference Books:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 4rd Edition, 2015.
2. GuochengXu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2016.
3. SatheeshGopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2019.
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2011.
5. AroraK.R.,"SurveyingVol I & II", Standard Book house, 10th Edition 2018.

19UCE307	**SEMINAR**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Learning Objectives:
- To make the student to find a specific problem in engineering field .
- To impart the knowledge on investigating methods to solve the engineering problem.
- To train the students in oral communication and preparing seminar reports.

SEMINAR DESCRIPTION

The seminar will guide students to orally articulate the key issues in Engineering field. The students will be able to present the investigating methods, analyze the issues, arriving conclusions and summarizing the results in written form.

The Seminar ensures preparedness of students to undertake Project work in higher semesters. The Seminar shall be supervised by a faculty member of the Department in which the candidate registered a course. He / She shall be required to undergo a review in a semester to assess the Seminar. The Seminar shall be evaluated based on the reviews and report submitted by the candidate. The evaluation is done for 100marks.

TOTAL - 30 Periods

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Identify complex problem in engineering field. **(Analyse).**
- Exhibit good communication skill and prepare the report. **(Apply).**
- Present the ideas effectively using visual aids **(Apply).**
- Communicate with clarity and present the ideas effectively. **(Communication).**

19UCE308	**MATERIALS TESTING LABORATORY**	L	T	P	C
		0	0	3	1.5

Course Learning Objectives:

- To apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
- To use the techniques, skills and modern engineering tools necessary for engineering.
- To understand the professional and ethical responsibility in the areas of material testing.

LIST OF EXPERIMENTS

I. Test on Cement
   1. Fineness of Cement
   2. Determination of Soundness
   3. Determination of Consistency
   4. Determination of Initial and Final setting time

II. Test on Bricks and Blocks
   1. Test for Compressive strength of bricks and blocks
   2. Test for water absorption of bricks and blocks
   3. Determination of Efflorescence of bricks

III. Test on Metals
   1. Tension test on MS rod and HYSD rod
   2. Torsion Test
   3. Double Shear Test
   4. Impact Test (Izod and Charpy)
   5. Fatigue Test
   6. Deflection Test on Metal Beam

IV. Test on Springs
   1. Tension Test on Open Coiled Helical Spring
   2. Compressive Test on Open Helical Spring

TOTAL – 45 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Determine the properties metals and springs (Apply) [Ex.8 to Ex.16].
- Analyse the quality of the given blocks as per Codal provisions. (Analyse) [Ex.5 to Ex.7].
- Investigate the quality of the cement samples as per Codal provision. (Evaluate) [Ex.1 to Ex.4].
- Adapt them to work in a group as a member or a leader for efficiently executing the given task. (Affective Domain) [Ex.1 to Ex.16].

References:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. ButterworthHeinemann.
2. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications.
3. KyriakosKomvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella.
4. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition.
5. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000).

19UCE309	**SURVEYING LABORATORY**	L	T	P	C
		0	0	3	1.5

Course Learning Objectives:
- To impart knowledge on setting out of building and curves using chain and Theodolite.
- To acquire knowledge on finding the perimeter and area using Compass.
- To familiarize the concepts on LS, CS, area and volume calculations.
- To impart knowledge on making measurements using modern survey techniques.

<div align="center">

LIST OF EXPERIMENTS

</div>

I. Chain Surveying and Compass Surveying
1. Aligning, Ranging, Chaining and Setting out
2. Compass traversing

II. Levelling
1. Fly Levelling using Dumpy level
2. Fly Levelling using Tilting level
3. Check Levelling
4. Contouring, LS and CS

III. Theodolite & Tachometric Surveying
1. Measurement of Horizontal and Vertical angle using Theodolite.
2. Measurement of heights, distances and Gradient by single plane and double Plane method.
3. Measurement of heights, distances and Gradient using stadia and tangential system of Tachometry.
4. Setting out of a Simple Circular curve using Theodolite surveying.

IV. Total Station Surveying
1. Determination of angles and height measurement using total station.
2. Determination of area of a given boundary using total station.

V. GPS Surveying
1. Determine the length of given objects using GPS.
2. Determine the area of given boundary by GPS.

<div align="right">

TOTAL: 45 PERIODS

</div>

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Setting out of foundation for a given building plan using chain surveying (Evaluate).
- Determine the perimeter and area of the given land using compass traversing (Apply).
- Analyze the reduced level of given road stretches using various leveling techniques (Analyse).
- Analyze the linear, vertical and gradient using Theodolite and Tachometry (Analyse).
- Determine the fundamental quantities of surveying using Total station and GPS (Apply).

References:
1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. GuochengXu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2003.
3. SatheeshGopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007 .
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
5. AroraK.R.,"SurveyingVol I & II", Standard Book house, 10th Edition 2008.

IV SEMESTER

19UMA423	**NUMERICAL METHODS**	**L T P C**
		3 1 0 4

Course Learning Objectives:

- To acquaint the student with the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and Eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- To familiarize the student with the methods discussed on interpolation which will be useful in constructing approximate polynomial to represent the data and to find the intermediate values, when huge amounts of experimental data are involved.
- To make the student acquire sound knowledge in applications of numerical methods in various fields, solving practical technical problems using scientific and mathematical tools when available in Engineering.

Unit I SOLUTION OF ALGEBRAIC, TRANCENDENTAL EQUATIONS AND EIGENVALUE PROBLEMS **9+3**

Iteration method – Newton- Raphson method – Gauss Elimination method – Pivoting – Gauss Jordan methods –iterative methods : Gauss Jacobi method ,Gauss Seidel method - Eigen values of a matrix by Power method – Jacobi's method for a real symmetric matrix.

Unit II INTERPOLATION AND APPROXIMATION **9+3**

Lagrange's interpolation – Newton's divided difference interpolation – Newton's forward and backward difference interpolation –cubic spline.

Unit III NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION **9+3**

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two point and Three point Gaussian quadrature formulae - Double integrals using Trapezoidal and Simpson's rules.

Unit IV NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

Unit V NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL : 45 (L) + 15 (T) = 60 Periods

After the successful completion of the course, Students will be able to,

- Apply various techniques to solve linear, nonlinear equations and Eigen value problems of a Matrix by Numerically.(CO1) AP – K3
- Apply Interpolation technique for equal and unequal intervals to find new data points within the range of known data points. (CO2) AP – K3
- Apply the Numerical techniques of Differentiation and Integration for Engineering Problems.(CO3) AP – K3
- Apply the knowledge of numerical techniques and methods for solving first and second order Ordinary

Differential Equation.(CO4) AP – K3

- Apply the knowledge of Partial Differential Equation with initial and boundary conditions by using certain techniques with engineering applications.(CO5). AP – K3
- Understand the knowledge of parabolic, elliptic, eigenvalues and ordinary differential equation. (CO6) U-K2

Text Books:

1. SASTRY S.S., "Introductory methods of Numerical Analysis", Prentice Hall of India, New Delhi, 4th Edition,(2008).
2. SRIMANTAPAL "Numerical methods Principles Analysis and Algorithm", Edition 2009, Oxford press, New Delhi.
3. IYENGAR S.R.K , JAIN R.K. , MAHIDEN KUMAR JAIN " Numerical Methods for Scientific and Engineering Computations" New Age International Publishers 7th Edition 2019 .

Reference Books:

1. KANDASAMY.P, THILAGAVATHY.K and GUNAVATHY.K, "Numerical Methods", S.Chand Co. Ltd., New Delhi, (2003).
2. GERALD C.F. and WHEATELEY P.O., "Applied Numerical Analysis", Pearson Education, New Delhi, 6th Edition, (2006).
3. GREWAL B.S. and GREWAL J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, (2007).
4. CHAPRA S. C and CANALE R. P. "Numerical Methods for Engineers", Tata McGraw-Hill, New Delhi, 5th Edition, (2007).
5. SANKAR RAO.K, "Numerical Methods for scientists and engineers", Prentice Hall of India, New Delhi, 3rd Edition, (2007).

19UCE402	SOIL MECHANICS	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- To impart knowledge to classify the soil based on index properties and to assess their engineering properties.
- To familiarize the fundamental concepts of permeability, stress transformation, compaction, and consolidation.
- To understand the shear strength parameters on various geotechnical applications.
- To provide the knowledge on behaviour and the performance of soil on stress distribution.
- To acquire knowledge on design and analysis of both finite and infinite slopes.

Unit I BASIC PROPERTIES OF SOIL   **9**

Introduction - Soil formation – History and Types of soil -Phase relation – Engineering and index properties - Grain size distribution – Atterberg limits – Soil classification significance – BIS classification system.

Unit II PERMEABILITY AND STRESS DISTRIBUTION   **9**

Introduction- Permeability – Darcy's law - Laboratory methods – Field methods - Quick sand condition - Seepage – Laplace equation - Flow nets – properties and applications –Liquefaction - Stress distribution-Effective stress concepts – Boussinesq's equation – Stress due to line load and circular and rectangular loaded area – Westergaard's equation for point load – Newmark's Influence Chart.

Unit III COMPACTION AND CONSOLIDATION   **9**

Introduction-compaction- Influencing factors - laboratory and field methods- Settlement - Components -Immediate and consolidation settlement- Terzaghi's one dimensional consolidation theory - Laboratory consolidation test – Field consolidation curve – NC and OC clays - Final and time rate of consolidation– $\sqrt{t}$ and log t methods.

Unit IV SHEAR STRENGTH   **9**

Introduction- Shear strength of soil – Mohr–coulomb's theory – Measurement of shear strength - Direct shear test, UCC test, triaxial shear test and vane shear test - Shear strength of cohesive and cohesionless soil- Pore pressure parameters – Factors influences shear strength of soil.

Unit V SLOPE STABILITY   **9**

Slope failure mechanisms - Modes - Stress analysis - Infinite and finite slopes - Stability analysis for purely cohesive and c-Φ soils - Method of slices – Friction circle method - Stability number – Slope protection measures.

                     TOTAL – 45 Periods

==Course Outcomes:==

After the successful completion of the course, Students will be able to,
- Explain the various soil types, its characteristics and testing its engineering properties. (Understand)
- Apply the knowledge of engineering fundamentals to determine the soil properties, strength, and stability of slope (Apply).

- Apply the knowledge of various Soil Mechanics theories and experimental studies to predict the stress equations and different failure modes of soil. (Apply)
- Analyse the various properties of different soil samples including stress distribution, settlement and bearing capacity. (Analyse)
- Investigate the merits and demerits of various soil tests and theories to compute an appropriate solution for the given scenario. (Investigate)
- Evaluate the various soil testing methods to provide a suitable method for determining the soil parameters. (Evaluate).

Text Books:
1. Punmia, B.C. Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, sixteenth edition,2017.
2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2018.

Reference Books:
1. IS2720 – Code of Practice for soil test and IS 7894 – Code of Practice for stability od earthen dams.
2. Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International Publishers, Third edition, 2016.
3. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2013.
4. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, Sixth edition, 2018.
5. MuniBudhu. "Soil Mechanics and Foundations". Wiley India Edition, 2016.

		L	T	P	C
19UCE403	**STRENGTH OF MATERIALS**	3	1	0	4

Course Learning Objectives:

- To provide knowledge on shear force and bending moment for all beams by recognizing the beam type and loading.
- To develop knowledge on calculating slope and deflection of determinate and indeterminate beams using various methods.
- To have knowledge on determining the behavior of columns and cylinders.
- To develop knowledge on unsymmetrical bending of beams to locate shear center.
- To apply various failure theories to understand the failure of materials.

Unit I BENDING OF BEAMS 9+3

Types of beams and transverse loadings– Shear force and bending moment for Simply supported, cantilever and over-hanging beams - Theory of simple bending – Bending stress distribution – Shear stress distribution.

Unit II DEFLECTION OF BEAMS 9+3

Double Integration method – Macaulay's method – Area moment method – Conjugate beam method - Strain energy method for determinate beams.

Unit III DETERMINATE BEAMS 9+3

Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading –– Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams.

Unit IV COLUMNS AND CYLINDERS 9+3

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – core section – Stresses in thin cylindrical and spherical shell – thick cylinder.

Unit V ADVANCED TOPICS 9+3

Unsymmetrical bending of beams - shear Centre - Theories of failure – Principal stress, principal strain, shear stress, strain energy and distortion energy theories – application problems – Curved beams – Winkler Bach Formula - Stresses in Hooks.

TOTAL : 45 (L) + 15 (T) = 60 Periods

==Course Outcomes:==

After the successful completion of the course, Students will be able to,

- Describe the concepts and principles of bending theory, column theory and failure theories. (Understand)
- Apply various methods to compute shear force, bending moment and deflection of determinate and indeterminate beams. (Apply)
- Determine load carrying capacity and stresses induced in columns, cylinders, spherical shells and hooks. (Apply)
- Analyze the beams and columns for different support conditions and cylinder, spherical shells and

curved beams for different loading conditions. (Analyze)

- Investigate reinforcement and deflection distribution as per SFD & BMD and codal provisions respectively. (Evaluate)
- Investigate stress strain distribution of beams, columns, cylinders and spherical shells using any analysis software. (Evaluate/Modern Tool Usage)

Text Books:
1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & Company Ltd., New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Rattan . S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi, 2012.
5. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010.

Reference Books:
1. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 2016.
2. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016.
3. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2016.
4. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

19UCE404	WASTE WATER ENGINEERING	L	T	P	C
		3	0	0	3

Course Learning Objectives:

- To have adequate knowledge about the basic concepts of sewage composition and various sewage treatment processes and its design.
- To provide the adequate information on various disposal standards for industrial effluents.

Unit I PLANNING AND DESIGN OF SEWERAGE SYSTEM   **9**

Characteristics and composition of sewage -- population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design - Storm runoff estimation – DWF and WWF - sewer appurtenances – sewage pumping-drainage in buildings-plumbing systems for drainage - Discharge standards for Effluents - General layout of house drainage - street connections

Unit II PRIMARY TREATMENT OF SEWAGE   **8**

Objectives – Unit Operations and Processes – Selection of treatment processes – Onsite sanitation - Septic tank- Primary treatment – Principles, functions, design, Operation and Maintenance aspects of sewage treatment units - screens - grit chamber - primary sedimentation tanks.

Unit III SECONDARY TREATMENT OF SEWAGE   **10**

Objectives – Selection of Treatment Methods – Principle, Functions, design and Operation and Maintenance - Activated Sludge Process and Extended aeration systems – Rotating biological contactors -Trickling filters Waste Stabilization Ponds.

Unit IV ADVANCES IN SEWAGE TREATMENT   **8**

Sequencing Batch Reactor – Moving bed biofilm reactor - Membrane Bioreactor – Anaerobic digestion - Reclamation and Reuse of sewage – Constructed Wetland - Nutrient removal systems - Operation and Maintenance.

Unit V SEWAGE DISPOSAL AND SLUDGE MANAGEMENT   **10**

Dilution – Self-purification of surface water bodies - Oxygen sag curve – deoxygenation and reaeration - Land disposal – Sewage farming – sodium hazards - Soil dispersion system. Objectives - Sludge characterization – Sludge Thickening – Dewatering – Drying – ultimate residue disposal – UASB – Biogas Recovery - Septage Management.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Define, understand and explain the concepts of wastewater sources, sludge composition and various sewage treatment processes. (Understand)
- Apply the knowledge of sewage flow principles to calculate the sewage generation, design of sewer pipe line, wastewater treatment process and sludge disposal methods. (Apply)
- Analyze the quality of sewage to decide the treatment process, sewer appurtenances and disposal methods. (Analyze)
- Design the sanitary sewer system, wastewater treatment process and characteristics of sludge that

meet the discharge standards. (Design)

- Use the knowledge based on Analysis and evaluates the wastewater characteristics to provide valid conclusion for treatment processes and disposal methods. (Evaluate)
- Select and apply appropriate advanced treatment techniques. (Modern Tool)

Text Books:
1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia B.C, Jain A.K and Jain A.K, "Environmental Engineering Vol-II" Laxmi Publications, 2010.

Reference Books:
1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, NewDelhi, 2010.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010.
4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.

19UCE405	HIGHWAY ENGINEERING	L	T	P	C
		3	0	0	3

Course Learning Objectives:

- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and method.
- To introduce the fundamentals related to the Planning and design of road components.
- To provide knowledge on various materials of pavement construction and method of design of highway construction.

Unit I HIGHWAY PLANNING AND ALIGNMENT
9

Significance of highway planning – Modal limitations towards sustainability – History of road development in India – factors influencing highway alignment – Soil suitability analysis – Road ecology – Engineering surveys for alignment, objectives, conventional and modern methods – Classification of highways – Locations and functions – Typical cross sections of Urban and Rural Roads.

Unit II GEOMETRIC DESIGN OF HIGHWAYS
9

Cross sectional elements – Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves – Gradients, Special consideration for hill roads – Hairpin bends – Lateral and vertical clearance at underpasses.

Unit III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS
9

Pavement components and their role – Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.

Unit IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE
9

Highway construction materials, properties, testing methods – CBR Test for sub grade – tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures – Highway drainage –– Construction machineries.

Unit V EVALUATION AND MAINTENANCE OF PAVEMENTS
9

Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems – Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Formulate the highway alignment using the engineering surveys.
- Design the sectional elements of the horizontal curves.
- Demonstrate the need for gradient in horizontal curves.

- Design pavement mixes using the alternative materials such as Geotextiles & Plastics.
- Investigate the characteristics of modern materials used in road construction.
- Evaluate the pavements based on deflection and service conditions.

Text Books:
1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
2. 2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
3. 3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

Reference Books:
1. Reference Books:
2. Agarwal, M. M.,"Indian Railway Track", Sachdeva Press, New Delhi,2013.
3. Mundrey.J.S., "Railway Track Engineering"Tata McGraw-Hill Education, 2009.

19UCE406   **APPLIED HYDRAULIC ENGINEERING**   **L T P C**
                                                                            3 0 0 3

Course Learning Objectives

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines.
- To make the students to relate the theory and practice of problems in hydraulic engineering.
- To impart knowledge on performance characteristics of pumps and turbines.
- To study open channel flow through Chezy's, Manning's formulae; economical channel sections, hydraulic jump; introduction to irregular flows

Unit I UNIFORM FLOW   9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel – Types and Regimes of flow - Velocity distribution in open channel – Modern flow measuring Techniques in Open Channel Flow - - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energy – Critical flow and its computations.

Unit II GRADUALLY VARIED FLOW   9

Dynamic equation of gradually varied flow – drawdown and backwater curves - Types of flow profiles - Classifications: Computation by Direct step method and Standard step method – Change in Grades.

Unit III RAPIDLY VARIED FLOW   9

Application of the momentum equation for Rapidly varied Flow - Hydraulic jumps - Types - Energy dissipation – positive and negative surges (Basic Concepts Only)

Unit IV TURBINES   9

Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitations - Performance of turbine - Specific speed - Runaway speed.

Unit V PUMPS   9

Classification of Pumps - Centrifugal pumps – work done - Cavitations in pumps - specific speed of pump - characteristics Curves - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work done.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Describe the basic concepts of applied hydraulics and hydraulic machinery. **(Understand)**

- Determine the characteristics of open channel flow and hydraulic machines. **(Apply)**
- Analyse the various flow conditions and profiles using various methods in open channel flow, Turbines and Pumps. **(Analyse)**
- Apply the concept of hydraulic machinery to design appropriate components for pumps and turbines and to optimize the channel section using concepts of Open Channel Flow. **(Apply)**
- Evaluate the fluid flow characteristics in open channels under various flow conditions and efficiencies of turbines and pumps based on head, specific speed and discharge. **(Evaluate)**
- Create a model of flow measurement device using mathematical and engineering sciences to predict the fluid flow. **(Create)**

TEXT BOOKS:

1. Bansal R.K. Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, 2018.
2. K. Subramaniya, Flow in open Channels.
3. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2002.

REFERNCE BOOKS:

1. VenTe Chow, Open Channel Hydraulics , McGraw Hill , New York, 2009.
2. Rajesh Srivastava, Flow through open channels, Oxford University Press, NewDelhi, 2008.
3. Rajput R.K, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, Ninth Edition 2010.

19UCE407	**WATER AND WASTE WATER ANALYSIS LABORATORY**	L	T	P	C
		0	0	3	1.5

Course Learning Objectives:

- To impart the principles of sampling and preservation of water and waste water.
- To convey the principles of testing of water and wastewater.
- To carryout air and noise pollution measurements.
- To provide analyzing methods for water and waste water with modern tools.

LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterization of water and Waste water. (Demonstration only).
2. Determination of
   (i) pH and turbidity
   (ii) Hardness
3. Determination of iron & fluoride using spectrophotometer
4. Determination of alkalinity
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen using spectrophotometer
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. Determination of BOD
13. Determination of COD
14. Determination of heavy metal using AAS.
15. Determination of air quality with ambient dust sampler.
16. Determination of ambient noise.
17. Determination of MPN index of given water sample (Demonstration only).

TOTAL - 45 Periods

COURSE OUTCOMES:

After the successful completion of the course, Students will be able to,

- Standardize the equipment and collect samples (air and water) for testing. **(Apply)**
- Determine the physical and chemical characteristics of given water, wastewater and sample. **(Apply)**
- Select suitable methods and perform tests for water and waste water. **(Analyze)**
- Suggest suitable design treatment technology for the given wastewater. **(Analyze)**
- Use modern equipment in prediction of ambient air quality and micro level contaminants. **(Apply)**

REFERENCES:
1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998.
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi.
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6 .

IS Codes:
1. IS 3025 (Part 1-60) Indian Standard Methods of sampling and test (physical and Chemical) for water and wastewater.
2. IS 10500: 2012 Indian Standard Drinking Water Specifications.
3. CPCB air pollution std.

Course Learning Objectives:

- To provide fundamental knowledge on properties of fluid flow and flow measuring devices.
- To familiarize the determination of major and minor losses in pipes.
- To impart basic concepts related to Metacentric height , Impact of jet on vanes.
- To provide knowledge on pumps and turbines.

LIST OF EXPERIMENTS

1. Flow measurement using Rota meter.
2. Flow through Venturi meter and Orifice meter.
3. Flow through Notches.
4. Bernoulli's Experiment.
5. Friction factor estimation in pipes .
6. Minor losses in Pipes with enlargement and contraction.
7. Characteristics of Centrifugal pumps.
8. Characteristics of Submersible pump.
9. Characteristics of Reciprocating pump .
10. Characteristics of Pelt on wheel turbine.
11. Characteristics of Francis turbine.
12. Determination of Metacentric height.
13. Study of Pressure Measuring Devices.
14. Hydrostatic force on Flat Surfaces [Normal / Inclined].

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Apply the concept of fluid Mechanics to measure the various fluid static and Dynamic Parameters.**(Apply)**
- Categorize the performance of flow measuring devices under varying flow conditions. **(Analyze)**
- Demonstrate the concept of Stability of floating bodies. **(Analyse)**
- Evaluate the performance characteristics of Pumps and Turbines. **(Evaluate)**

REFERENCES:

1. Dr.R.K.Bansal Fluid Mechanics and Hydraulic Machines,Laxmi Publication Private Ltd. New Delhi 2018.
2. Sarbjit Singh. Experiments in Fluid Mechanics, PHI Learning Private Ltd., New Delhi 2009.
3. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House, New Delhi, 2000.
4. Subramanya, K. Flow in open channels, Tata McGraw - Hill pub. Co., 2000.

Course Learning Objectives:
- To give exposure on classification of soil based on index properties.
- To educate the fundamentals of OMC and maximum dry density of soil mass.
- To provide knowledge on the shear strength of the given soil.
- To study about the compressibility of soil sample.

LIST OF EXPERIMENTS

Index Properties
1. Specific gravity of soil grains.
2. Grain size distribution - Sieve analysis.
3. Wet Sieve analysis – Hydrometer test (Study).
4. Relative density of sand.
5. Atterberg's limits test - Differential free swell test.
6. Determination of Moisture - Density relationship using Standard Proctor Test.
7. Permeability determination (constant head and falling head methods).

Determination of shear strength parameters by
8. Direct shear test on cohesion less soil .
9. Unconfined compression test on cohesive soil .
10. Triaxial compression test (Study).
11. One dimensional consolidation test (Determination of co-efficient of consolidation only).
12. Field density test (Core cutter and sand replacement methods).
13. Determination of CBR Value of various soil types.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Apply the knowledge of soil mechanics to find the index properties of soil. **(Apply)**
- Apply the concepts of Cohesion and consolidation to find the shear strength parameters of soil. **(Apply)**
- Analyse the Moisture Density relationship, nature of flow and Grain size distribution of the given soil sample. **(Analyze)**
- Evaluate the CBR value of various soil types and investigate the suitability of soil for various applications. **(Evaluate)**

REFERENCES:
1. IS2720 – Code of Practice for Index and Engineering Property test for Soil.
2. Punmia, B.C. Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, sixteenth edition,2017.
3. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2018.

V SEMESTER

19UCE501	STRUCTURAL ANALYSIS - I	L T P C
		3 1 0 4

Course Learning Objectives:
- To gain knowledge on computing slopes and deflections using strain energy method.
- To analyse the indeterminate structures for internal forces by slope deflection method.
- To analyse the indeterminate structures for internal forces Moment distribution method.
- To formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate problems.
- To analyse statically indeterminate structures by imposing boundary conditions on flexibility matrix.

Unit I ANALYSIS OF TRUSSES   **12**

Determinate and indeterminate trusses - analysis of determinate trusses - method of joints - method of sections - Deflections of pin-jointed plane frames - lack of fit - change in temperature - method of tension coefficient - application to space trusses.

Unit II SLOPE DEFLECTION METHOD   **12**

Slope deflection equation- Analysis of continuous beams and rigid frames - Support settlements.

Unit III MOMENT DISTRIBUTION METHOD   **12**

Stiffness and carry over factors – Distribution and carry over of moments - Analysis of continuous Beams - Plane rigid frames with and without sway – Support settlement.

Unit IV MOVING LOADS AND INFLUENCE LINES   **12**

Influence lines for reactions in statically determinate structures –Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads - Muller Breslau"s principle – Application of Muller Breslau"s principle to propped cantilever and two span continuous beams - Indirect model analysis for influence lines of indeterminate structures – Beggs deformeter.

Unit V ARCHES   **12**

Arches - Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

TOTAL - 60 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Analyze the pin-jointed plane and space frames.
- Analyse the continuous beams and rigid frames by slope defection method.
- Analyse continuous beams and rigid frames using moment distribution method .
- Draw influence lines for statically determinate and indeterminate structures.
- Analyse two hinged and three hinged parabolic and circular arches.
- Analyze the pin-jointed plane and space frames.

Text Books:

1. Bhavikatti, S.S, Structural Analysis,Vol.1,& 2, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2014.
2. Punmia, B.C., Arun Kumar, Ashok Kumar., Theory of structures, Laxmi Publications, New Delhi, 2014.

Reference Books:

1. William Weaver, Jr and James M.Gere, Matrix analysis of framed structures, CBS.
2. Publishers & Distributors, Second Edition, Delhi, 2004.
3. Reddy .C.S, "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2005.
4. Negi L.S. and Jangid R.S., Structural Analysis, Tata McGraw Hill Publishing. Co. Ltd. 2004.
5. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing HousePvt.Ltd.,New Delhi-4, 2014.

19UCE502	**FOUNDATION ENGINEERING**	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- To acquire knowledge on planning and execution of geotechnical site investigation.
- To understand the design parameters of different type of foundations as per code.
- To familiarize the concept of earth pressure theories and retaining wall analysis.
- To understand the pile foundation, its type, capacity and settlement.
- To impart knowledge on basic concepts of special foundation.

Unit I Site Investigation and Selection of Foundation 9

Introduction – Scope and objectives – Methods of exploration – Depth of boring- spacing of bore hole – Standard penetration test – significance – sampling – types, techniques and requirements- Bore log and report writing – data interpretation- strength parameters and liquefaction potential – Selection of foundation based on soil condition.

Unit II Bearing Capacity and Settlement of Shallow Foundation 9

Introduction – Types - Location and depth of foundation – Codal Provisions - Bearing capacity of shallow foundation – Terzaghi's theory, Meyerhoff's theory and BIS formula – Factors affecting bearing capacity - In-situ tests (Plate load, SPT and SCPT) – allowable bearing pressure - Seismic considerations in bearing capacity evaluation – Determination of settlement of foundations on granular and clay deposits – Total and differential settlement – Methods of minimizing settlements.

Unit III Pile Foundation 9

Introduction – Types of piles and their function – Factors influencing the selection of pile – Load carrying capacity of single pile in granular and cohesive soil – Static formula - Dynamic formulae – Capacity from in-situ tests (SPT and SCPT) – Negative skin friction – Uplift capacity – Group capacity by different methods (Feld's rule, Converse-Labarre formula and block failure criterion) - Pile load test & Interpretation – Under reamed piles - Settlement of pile groups – Codal provision.

Unit IV Earth Pressure and Retaining Walls 9

Introduction – Types of retaining wall - Plastic equilibrium in soils – Active and passive states – Rankine's theory- Cohesionless and cohesive soil - Coulombs wedge theory – Condition for critical failure plane – Graphical methods – Rebhann and Culmann methods – Determination of earth pressures by analytical methods - stability analysis for retaining walls – Codal Provision.

Unit V Raft and Special Foundation 9

Introduction – Raft and Pile Raft – Types – Design – Bearing capacity and Settlement - Machine Foundation (Principles only) - Foundations of transmission line towers – data requirements – forces - choice of foundation type - design procedure only - Well foundation - Tilt and shift - Remedial measures- Bearing capacity - methods of construction - settlement - lateral stability – Recent scenario.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Explain the types of foundations, exploration techniques, soil testing methods and various theories of foundations.
- Apply the knowledge of sub-surface investigation, earth pressure analysis and testing techniques to find the solution for geotechnical problems.
- Analyze the bearing capacity of different foundations and retaining walls using the principles of various theories, exploration techniques and in-situ tests.
- Evaluate the earth pressure, safe load, and settlement to provide a suitable foundation by examining the safety and economic conditions.
- Design the foundation and retaining structure based on the load carrying capacity and settlement with appropriate consideration for safety.
- Present the case studies of special foundations, failures in slopes and suggest appropriate improvement methods for foundation.

Text Books:

1. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017.
2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2015.
3. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.
4. Punmia, B.C. Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., New Delhi, 2005.

Reference Books:

1. GopalRanjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi, 2016.
2. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
3. Das, B.M, "Principles of Geotechnical Engineering", Thompson Brooks/ Coles Learning, Singapore, 5th Edition, 2014.
4. Purushothma Raj P "Soil Mechanics and Foundation Engineering" 2nd Edition, Pearson Education, 2013.
5. Bowles J.E, "Foundation Analysis and design", McGraw-Hill, 1994.

IS Codes: (If necessary for your course)

1. IS 6403 - Code for practice of bearing capacity of shallow foundation.
2. IS 2911 - Code for practice of Pile foundation (Section 1 & 2).
3. IS 5121-1969 – safety coding of pile.
4. IS 2950 -1 (1981) – Code of Practice for design and Construction of raft foundation.
5. IS 14458 – 1997 Guidelines for Retaining wall on hill area (Part 1 & 2)

19UCE503 **DESIGN OF REINFORCED CONCRETE ELEMENTS**

L	T	P	C
3	1	0	4

Course Learning Objectives:
- To impart knowledge on basic of concepts of design of reinforced concrete structures.
- Impart the usage of codes for strength, serviceability and durability.
- To have knowledge in designing various structural elements design and detail the basic elements like beam, slab, column, footing and staircase.
- To afford knowledge in analysis and design of RC framed structures including planning and drawings.

Unit I INTRODUCTION TO WORKING STRESS AND LIMIT STATE METHODS   **6+3**

Assumptions made in the working stress method – Permissible stresses – Flexural members - moment of resistance of singly and doubly reinforced rectangular sections - - Concepts of limit state design, Characteristic loads, Characteristic strength, Partial loads and Material Safety factors, Representative stress, strain curves, Assumptions in limit state design, Stress block parameters, moment of resistance of singly and doubly reinforced rectangular sections.

Unit II DESIGN OF SLABS

7+3

Design of one-way slabs, two-way slabs, Continuous slabs using IS coefficients. Draw reinforcement detailing as per SP 34.

Unit III DESIGN OF BEAMS   **12+3**

Limit state analysis and design of singly reinforced, doubly reinforced beams - Limit state design of T and L beam sections - Limit state analysis and design of sections for shear and torsion, Concept of bond, anchorage and development length, I.S Code provisions. Design examples in simply supported beams. Draw reinforcement detailing as per SP 34.

Unit IV DESIGN OF COLUMNS   **8+3**

Types of columns – Design of short columns for axial load, combined axial load with uniaxial and biaxial bending - use of design aids. Draw reinforcement detailing as per SP 34.

Unit V DESIGN OF FOOTINGS AND STAIRCASE   **12+3**

Footings: Different types of footings–Design of isolated, square, rectangular and circular footings. Types of stairs – Types of Staircases – Design of dog-legged and open well Staircase. Draw reinforcement detailing as per SP 34.

TOTAL 45(L) + 15(P) = 60 Periods

COURSE OUTCOMES:

After the successful completion of the course, Students will be able to,
- Explain the code provisions for the design of structural elements. **(Understand)**
- Apply the limit state concepts for the design of structural elements. **(Apply)**
- Analyze the safety and serviceability requirements of various structural elements as per IS code. **(Analyse)**
- Analyze the reinforcement detailing of various structural elements as per IS code. **(Analyse)**
- Draw the reinforcement detailing of structural elements as per IS codes **(Modern Tool Usage)**
- Create the models of structural elements and present it to the peer and Engineering community . **(Create)**

TEXT BOOKS:

1. Krishnaraju.N "Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2015.
2. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi, 2018.
3. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2010.
4. Pillai&DevdasMenon, "Reinforced concrete design", 3rd Edition, Tata McGraw Hill, New Delhi, 2009.

REFERENCE BOOKS:

1. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009.
3. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.

IS CODES:

1. IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000.
2. SP16: "Design Aids for Reinforced Concrete to IS 456, New Delhi, 1999.
3. Sp 34 - 1987 Handbook on Concrete Reinforcement and Detailing.

19UCE504	WATER RESOURCES AND IRRIGATION ENGINEERING	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- To introduce the concept of hydrological aspects and measurement.
- To impart required knowledge on Irrigation principles, soil water relationship, Irrigation methods and management practices.
- To provide an understanding of the diversion structures and canal irrigation.

Unit I PRECIPITATION AND ABSTRACTIONS 9

Hydrologic cycle – watershed – catchment characteristics – factors affecting: precipitation – types and forms of precipitation, measurement of precipitation, Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods – Evaporation, factors affecting evaporation, measurement of evaporation – Evapo-transpiration – factors affecting evapo-transpiration, measurement of evapo-transpiration, infiltration – Factors affecting infiltration, measurement of infiltration, infiltration indices.

Unit II RUN OFF 9

Factors affecting run off – Run off estimation using empirical – Strange's table and SCS methods – Stage discharge relationships-flow measurements- Hydrograph – Unit Hydrograph – IUH - Flood estimation and Routing.

Unit III IRRIGATION PRINCIPLES 9

Irrigation – Necessity and importance – Advantages and disadvantages – Standards for irrigation water – Crop water requirement: Soil, Moisture and Plant Relationship – Crops and crop seasons in India – Duty, Delta, Base Period – Factors affecting Duty – Irrigation requirements of crops – Consumptive use of water.

Unit IV DIVERSION STRUCTURES AND CANAL IRRIGATION 9

Head works – Weirs and Barrage – Types of Spillways – Energy dissipators – Classification of canals – Alignment of canals – Design of irrigation canals – Regime theories, Kennedy's and Lacey's Regime theory – Canal Head works – Canal regulators – Canal drops – Cross drainage works – Canal Outlet, Escapes – Lining and maintenance of canals – Aqueducts, types of aqueducts.

Unit V METHODS OF IRRIGATION AND MANAGEMENT 9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system – Irrigation efficiencies – Planning and Development of irrigation projects - Participatory irrigation management with case studies

TOTAL - 45 Periods

After the successful completion of the course, Students will be able to,
- Describe the various phases of the hydrological cycle and the features of irrigation processes.
- Apply the principles of hydrology and irrigation to estimate hydrological components, irrigation water requirement, methods and efficiency.

- Analyze the various components of the irrigation management system and hydraulic structures using principles of hydrological sciences.
- Analyze the variation of discharge with respect to time for the given watershed, using unit hydrograph principle.
- Design suitable water conveyance systems and irrigation channels that meet the specified needs with appropriate consideration for the societal and environmental considerations.
- Investigate the water quality, hydrological and irrigation methods to provide an efficient water and irrigation management system for a given scenario.

Text Books:
1. Subramanya .K. "Engineering Hydrology", Tata McGraw Hill Education, 2017.
2. Jayarami Reddy .P. "A Textbook of Hydrology", Laxmi Publications, 2016.
3. Punmia B.C., et. al; "Irrigation and water power Engineering", Laxmi Publications,16th Edition, New Delhi, 2019.
4. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publisher, 23rd Revised Edition, New Delhi, 2009.

Reference Books:
1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill Education, 2017.
3. Raghunath .H.M., "Hydrology", New Age International Pvt. Ltd., 2015.
4. Michael A.M., "Irrigation Theory and Practice", 2nd Edition, Vikas Publication House Pvt. Ltd., Noida, UP, 2008.
5. Dilip Kumar Majumdar, "Irrigation Water Management: Principles and Practice", Prentice-Hall of India, New Delhi, 2013.

19UCE507	CREATIVE THINKING AND INNOVATION	L	T	P	C
		0	0	2	1

Course Learning Objectives:
- To develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
- To transform innovative ideas into successful businesses.
- To use a range of creative thinking tools to develop Out of the Box Ideas.

Introduction to Creativity and Innovation- Creative Techniques - Problem Identification through Brain Storming - Solution Identification through Creative Techniques - Presentation on the Innovative Idea - Market Analysis - Revenue and Business Model - Preparation of promotional aids - Customer Feedback Analysis.

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Demonstrate the ability to assess societal, health and safety issues and the consequent responsibilities relevant to the professional engineering practice (Valuing – Affective Domain).
- Examine impact on environment and society in the proposed innovative idea and provide solutions for sustainable development (Organization – Affective Domain).
- Adapt themselves to work in a group as a member or a leader for efficiently executing the given task (Organization – Affective Domain.

19UCE508   **CONCRETE AND HIGHWAY ENGINEERING LABORATORY**   L   T   P   C
                                                                                                                    0   0   3   1.5

Course Learning Objectives:
- To conduct the preliminary tests related to cement, aggregate and its characteristics.
- To learn the principles and procedures of testing Concrete and Highway materials.
- Calculate material requirements for concrete and bituminous mixes as per Codal provisions.

LIST OF EXPERIMENTS

Part A: Concrete Lab
. I. 1.Design of concrete mix as per IS-10262. Tests on fresh concrete:
II. Tests on fresh concrete:
        2.Slump Cone
        3.Flow Table test
        4.Compaction factor
        5. Vee Bee test
III. Tests on hardened concrete:
        6.Compressive strength test,
        7.Split tensile strength test,
8.Flexural strength test
IV. NDT tests
        9.Rebound hammer
10.Pulse velocity test

Part B: High way materials Lab
I. Tests on Aggregates
        11.Aggregate Crushing value
        12.Los Angeles abrasion test
        13.Aggregate impact test
        14.Aggregate shape tests (elongation and flakiness)
        15.Water absorption
II. Tests on Bituminous Materials
        16.Penetration test
        17.Ductility test
        18.Softening point test
        19.Specific gravity test
        20.Viscosity test by tar viscometer
        21.Bituminous Mix Design by Marshall Method (Demonstration only)

TOTAL – 45 PERIODS

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Determine the properties of concrete and aggregates by various tests. (Apply). [Ex. No 2-8,14].
- Analyse the quality of the given aggregate and concrete strength as per IS code. (Analyse) [Ex.No 9-13,15-17].
- Investigate the properties of the bituminous material and also reliability of NDT tests as per IS code.(Evaluate) [Ex. No 9,10,18-23].

- Design material requirements for concrete mixes for various situation as per codal

provisions.(create)[Ex.No 12] .

References:

1. M.L.Gambir, "Concrete Manual", DanpatRai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand & Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual ", Nem Chand Bros, Roorkee.
6. L R Kadiyali, "Highway Engineering ", Khanna Publishers, New Delhi.

IS Codes: (If necessary for your course)

1. IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete.
2. IS 383– 1970 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.
3. IS 13311– 1992 Indian Standard specification for Method of Non-destructive testing of concrete.

	L	**T**	**P**	**C**

19UCE509 **SURVEY CAMP** **L T P C**
(During IV semester Summer Vacation 2 weeks) **0 0 0 1**

Course Learning Objectives:
The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

LIST OF EXPERIMENTS

Two weeks Survey Camp will be conducted during summer vacation in the following activities:
1. Triangulation Survey.
2. Trilateration Survey.
3. Contouring.
   i. Radial tachometric contouring - Radial Line at Every 45 Degree and Length not
   Less than 60 Meter on each Radial Line.
   ii.Block Level/ By squares of size at least 100 Meter x 100 Meter at least 20 Meter interval.
   iii.L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter at leastL.S at Every30M and C.S at every 90m.
4. Offset of Buildings and Plotting the Location.
5. Use of GPS to determine latitude and longitude and locate the survey camp location.
6. Traversing using GPS.
7. Traversing using Total station.

TOTAL - 30 Periods

<mark>Course Outcomes:</mark>
After the successful completion of the course, Students will be able to,
- Apply modern surveying techniques in field to establish horizontal control. (Apply)
- Plot the profile of the earth surface using different leveling methods (Apply)
- Apply the modern survey equipment to locate the given traverse for various engineering works (Apply)
- Familiarize in setting out work for plotting of buildings to the site. (Apply)

						L	T	P	C

19UGS533   **Interpersonal Skills Lab**

L T P C
0 0 3 1.5

LIST OF EXPERIMENTS

Part - A : Communication and Leadership Projects

I) Speech Projects

1. The Open up Speech (Prepared Speech)
2. Speech Organizing to the Point (Prepared Speech)
3. Table Topics Speech

II) Evaluation Projects

4. Speech Evaluation
5. TAG (Timer, Ah Counter and Grammarian) Evaluation

III) Leadership Roles

6. Speech Master of the Day
7. General Evaluator
8. Table Topics Master

Part - B : Problem-Solving and Decision- Making Project

IV) Quality Circle Project

Course Outcomes:

After the successful completion of the course, Students will be able to,

1. Communicate orally with fluency and clarity in a given contextual situation (Responding - Affective Domain)
2. Evaluate a speech and offer constructive evaluation of the speech (Evaluating - Cognitive Domain)
3. Adapt themselves to work in a group as a member or a leader for efficiently executing the given task (Organization – Affective Domain)
4. Analyze a problem and find appropriate solution (Analyze - Cognitive Domain)
5. Take decision by organizing relevant information and defining alternatives (Create - Cognitive Domain)

VI SEMESTER

	L	**T**	**P**	**C**

19UCE601   **STRUCTURAL ANALYSIS – II**

L T P C
3 1 0 4

Course Learning Objectives:
- To learn the method of drawing influence lines and its uses in various applications like beams, bridges and plane trusses.
- To analyse the arches and suspension bridges
- To introduce the importance of plastic analysis to calculate the collapse loads for beams and frames.
- To formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate problems.
- To analyse statically indeterminate structures by imposing boundary conditions on flexibility matrix. To understand the basics of finite element method and its application to structural analysis.
- To analyse the suspension bridges and space truss.

Unit I PLASTIC ANALYSIS OF STRUCTURES   **12**

Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

Unit II MATRIX STIFFNESS METHOD   **12**

Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

Unit III MATRIX FLEXIBLITY METHOD   **12**

Degree of Static Indeterminacy -Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

Unit IV SPACE AND CABLE STRUCTURES   **12**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan - Suspension cables – suspension bridges with two and three hinged stiffening girders.

Unit V APPROXIMATE ANALYSIS OF FRAMES   **12**

Approximate analysis for gravity loadings – substitute frame method for maximum moments in beams and columns – Approximate analysis for horizontal loads – portal method and cantilever method – assumptions – axial force, shearing force and bending moment diagrams.

TOTAL - 60 Periods

==Course Outcomes:==

After the successful completion of the course, Students will be able to,
- Employ plastic analysis to calculate the collapse loads for beams and frames.
- Analyse the statically indeterminate structures using stiffness method.
- Analyse the statically indeterminate structures using flexibility method.
- Apply the finite element method to structural analysis.
- Determine the member forces in space truss and analyse suspension bridges.

Text Books:
1. . Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4,
2. 2014.
3. 2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi,
4. Publications,2004

Reference Books:
1. Negi.L.S and JangidR.S ., Structural Analysis , Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co. Ltd., Third Edition,2010.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.
4. Vazrani.V.N And Ratwani,M.M, Analysis of Struc.

DESIGN OF STEEL STRUCTURES

L	T	P	C
3	1	0	4

Course Learning Objectives:

- To explore limit state design concepts and design of bolted and welded joints.
- To provide knowledge on design tension members.
- To get familiar with compression member design.
- To have Knowledge on design of beams.
- To gain knowledge on design of industrial structures.

Unit I DESIGN OF CONNECTIONS 9+3

Steel Structures – Limit State Design Philosophy – Working Stress Design Philosophy – Review of IS:800 – 1984 and IS 800 - 2007 – Partial Safety factors – Load combinations . Design of Bolted Connections – Welded Connections – Prying action – Eccentric connections – Mini Project (Alternate Assessment).

Unit II TENSION MEMBERS 9+3

Design of tension members – Calculation of Net Section including lag effects – Staggered Holes and Block Shear – Design of tension splice.

Unit III COMPRESSION MEMBERS 9+3

Buckling Class – Flexural Buckling and Flexural –Torsional Buckling – Effective length factor – Column Formula Design of Compression member – Strut – Stanchion – Column Splicing – Built up Columns – Load comparison of column & Built up column- Lacing and Battening.

Unit IV FLEXURAL MEMBERS 9+3

Classification of the section: Plastic, Compact, Semi Compact, Slender- Laterally restrained beams – laterally Unrestrained Beams – Lateral Torsional Buckling –Effects of restraints and Effective length- Beam columns.

Unit V INDUSTRIAL STRUCTURES AND PLATE GIRDERS 9+3

Elements of roof trusses – Purlins – Loads on trusses – Estimation of Wind Loads on Structures – Design of Gantry Girder – Design of Plate Girder- Applications of Plate girder and purlin.

TOTAL PERIODS:45(L)+15(T) = 60

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Understand/Remember the concept of various design philosophies and connection design.(Understand/Remember)
- Design connections and structural steel members.(Apply)
- Analyze the connections as per IS codes. (Analyze)
- Investigate the flexural beam using IS codes. (Evaluate)
  Design a program on bolted connection by using modern tool as per IS codes.(Create)
- Write a technical report on design on connection.(Create)

Text Books:
1. Subramanian.N, Design of Steel Structures, Oxford University Press, 2008.
2. Bhavikatti.S.S, Design of Steel Structures By Limit State Method as per IS: 800– 2015, IK International Publishing House Pvt. Ltd., 2009.

Reference Books:
1.Purnima B.C Ashok Kumar Join and Arun Kumar Join, "Design of Steel Structures" Laxmi publication Pvt. Ltd, 2015.
2. Duggal S.K "Limit State Design of Steel Structures" McGraw Hill Education (India), 2014.
3. Narayanan.R.et.al. Teaching Resource on Structural Steel Design, Vol.I& II, INSDAG, Ministry of Steel Publications, 2002.
4. NegiL.S.. Design of Steel Structures, Tata McGraw Hill Publishing Pvt Ltd, New Delhi,2007.

IS Codes: (If necessary for your course)
1. IS 800:2015 Indian Standard General Construction in Steel – code of practice, Third Revision.
2. SP 6-1:1964(Reaffirmed 2003) Handbook for Structural Engineers.
3. IS: 875 (Part I) - 1987(Reaffirmed 2003) Code of practice for design loads- Dead loads, Second revision.
4. IS: 875 (Part II) - 1987(Reaffirmed 2003) Code of practice for design loads-Imposed loads, Second revision.
5. IS: 875 (Part III) - 1987(Reaffirmed 2003) Code of practice for design loads-Imposed loads, Second revision.
6. IS: 875 (Part IV) - 1987(Reaffirmed 2003) Code of practice for design loads-Imposed loads, Second revision.
7. IS: 875 (Part V) - 1987(Reaffirmed 2003) Code of practice for design loads-Imposed loads, Second revision.

19UGS631 – LOGICAL REASONING AND APTITUDE   L   T   P   C

1   0   0   1

OBJECTIVES :

1. To make the student acquire sound knowledge of the characteristic of quantitative and qualitative aptitude.
2. To familiarize the student with various principles involved in solving mathematical problems.
3. To develop an understanding of the basic concepts of reasoning skills.

UNIT I   QUANTITATIVE APTITUDE   8

Ratio and Proportion - Averages – Percentages – Problems on ages – Profit and Loss – Simple and Compound Interest -– Time – Speed –Distance - Time and Work – Permutation and Combination - Alligation or Mixture – Probability – Clocks – Calendars.

UNIT II   VERBAL AND NON VERBAL REASONING   7

Analytical Reasoning – Circular and Linear arrangement – Direction problems – Blood relations – Analogy – Odd Man Out – Venn Diagrams - Data Sufficiency – Data interpretation –– Syllogism - Coding – Decoding.

TOTAL = 15 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Select an appropriate technique to solve the quantitative problems within the stipulated time. (Apply)
- Apply Verbal and Non Verbal Reasoning skills to solve the problems based on the logical and analytical reasoning. (Apply)
- Analyse the direction to solve equations involving one are more unknowns. (Analyse)

WEBSITES:

www.m4maths.com, www.indiabix.com, www.fresherworld.com, www.campusgate.co.in, www.indianstudyhub.in, www.tcyonline.com.

TEXT BOOKS:

1. Dr. R.S.AGARWAL, "Quantitative Aptitude", S. Chand Publications, New Delhi, 20th Edition, (2013).
2. ABIJIT GUHA, "Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill Publication, New Delhi, 4th Edition, (2011).
3. R.V.Praveen, "Quantitative Aptitude and Reasoning", PHI Learning Pvt. Ltd., Delhi, 2nd Edition, (2013).

REFERENCE BOOKS:

1. ASHISH AGGARWAL, "Quick Arithmetic", S. Chand Publications, New Delhi, 6th Revised Edition, (2014).

2. Dr.V.A.SATHGURUNATH'S "A Guide for Campus Recruitment", Sagarikka Publications, Thiruchirapalli, 3rd Edition, (2011).

		L	T	P	C
19UCE607	**PRODUCT DEVELOPMENT PROJECT**	0	0	8	4

Course Learning Objectives:

- To introduce the basic concepts of engineering design and product development.
- To understand the overview of product development process.
- To impart the knowledge of concept generation and selections tools.
- To use the various materials, techniques, skills and modern engineering tools necessary for development of prototypes.

DESCRIPTION

The group of students have to identify a topic of interest in product development. To choose the topic the student should review the literature and case studies. This helps the students to get familiar with need of the society, design methodologies and development processes. The group of students have to develop physical prototype using various materials with enhanced feature or they have to develop computer code using modern tools in consultation with the Head of the Department. The project shall be supervised by a faculty member of the Department in which the candidate registered a course.

The product should be designed as per design standards and it has to be analyzed for strength and stiffness. In case, if a Product development work has to be done at Industrial / Research organization, the Product development project shall be jointly supervised by the faculty supervisor and an expert from the organization.

Team shall be required to undergo three reviews in a semester to assess the progress of the Product Development Project. The Product Development Project shall be evaluated based on the project report submitted by the team and Viva-voce examination conducted by a committee consisting of an external examiner, internal examiner, and the supervisor of the candidate.

TOTAL–80 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Analyze research literature to identify the problem and provide valid novel conclusion. (Analyse)
- Use of modern tools and techniques to develop product as per the norms of engineering practice (Apply)
- Evaluate the performance of the developed product using appropriate modern tools and techniques. (Evaluate)
- Design/Develop a product for societal issues with environmental considerations by applying the basic engineering knowledge (Create)
- Apply management principles to function effectively in the project team for product development. (Affective Domain)
- Engage in learning for effective product development with consideration for public health, safety, cultural and societal needs.(Affective Domain)
- Write effective reports and make clear presentation to the engineering community and society (psychomotor Domain).

19UCE608	SOFTWARE APPLICATION LABORATORY	L	T	P	C
		0	0	3	1.5

Course Learning Objectives:

- Enhance the ability to perform modeling, drafting, designing practice and interpretation of results for final design for civil engineering infrastructure.
- To select the suitable software that can perform multi engineering tasks efficiently and satisfy more specific users demands.
- Facilitate the use of spread-sheets to get well verse in design of structural elements and concrete mix design.

LIST OF EXPERIMENTS

Unit I – Civil Engineering software
Use of STADD.pro for,   12
1. Analysis of Plane Truss
2. Analysis of Fixed beam, Propped cantilever & Continuous beam
3. Analysis of Two storied 2D Portal frame
4. Analysis of 3D Portal frame

Unit II Project Management software & Open source software for GIS
 Application   9+3
Use of Primavera for,
1. Constructing Project: create WBS, Activities, and tasks and Computation Time using Excel spread sheet and transferring the same to Project management software.
2. Identification of Predecessor and Successor activities with constrain
3. Constructing Network diagram (AON Diagram) and analyzing for Critical path, Critical activities and other non-Critical paths, Project duration, Floats.
4. Basic understanding about Resource Creation and allocation
5. Understanding about Splitting the activity, Linking multiple activity, assigning Constrains, Merging Multiple projects, Creating Baseline Project.

Use of Open source software for GIS Application
1. To create shape files for point, line and polygon features with a map as reference.
2. To create decision maps for specific purpose.

Unit III – Microsoft Office Software   6
Use of Excel Spreadsheet for,
1. Design of Singly reinforced rectangular beam.
2. Design of Doubly reinforced rectangular beam.
3. Design of One-way slab.
4. Design of Two way slab.
5. Mix design for various grade of concrete.

TOTAL - 30 Periods

After the successful completion of the course, Students will be able to,

- Use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work. (Apply)
- Proficiently use Excel to undertake engineering calculations. (Analyse)
- Select appropriate techniques to solve engineering problems with their limitations. (Evaluate)
- Understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation, thereby creating any building project. (Create)

References:
1. Krishnamurthy, C.S. and Rajeev, S., "Computer Aided Design and Analytical Tools", Narosa publishers, Second Edition 2018.
2. User Manual.

IS Codes: (If necessary for your course)
1. IS 456:2000 Plain and Reinforced Concrete – Code of Practice.
2. IS 10262:2019 Indian Standard Concrete Mix Proportioning – Guidelines, Revised Edition.

LABORATORY EQUIPMENT REQUIREMENTS

Description of Equipment	Quantity
Computer system of Pentium IV or equivalent	1 for Each Student
Licensed version of Standard Analysis and Design software package	Multiple User
Licensed version of Project Management software package	Multiple User

	L	**T**	**P**	**C**
19UGS532 **SOFT SKILLS AND COMMUNICATION LABORATORY**	**3**	**2**	**0**	**4**

Course Learning Objectives:
- To develop a requisite knowledge in Communication skills and Soft skills.
- To enhance the students' acumen in honing the skills to meet the Global changes and Industrial needs.

Unit I SPEAKING SKILLS   **6**

Conversational Skills - Self Introduction - Group Discussion - Public Speaking - Presentation Skills

Unit II WRITING SKILLS   **6**

Letter Writing – Report Writing – Email Writing – Job Application – Resume Preparation.

Unit III READING AND LISTENING SKILLS   **6**

Reading Comprehension – Enriching Vocabulary – Error Spotting – Listening and Note Taking.

Unit IV SOFTSKILLS   **6**

Professional Ethics – Interpersonal Skills – Stress Management – Leadership Qualities – Time Management – Conflict Resolution.

Unit V INTERVIEW SKILLS   **6**

Types of Interview – Body Language – Professional Grooming – Basic Etiquette.

TOTAL: 30 (L) = 30 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Students will give oral presentations and improve their reading fluency skills through extensive reading and listening.
- Students will increase their reading speed and comprehension of academic articles by enhancing their vocabulary by keeping a vocabulary journal.
- Students will strengthen their ability to write academic papers, essays, official documents and summaries using the process approach.
- Students will be aware of correct usage of English grammar and develop in writing skills, speaking fluently and comprehend properly.

VII SEMESTER

19UME701   **PROJECT MANAGEMENT AND FINANCE**   L   T   P   C

                                                                    3   0   0   3

OBJECTIVE:

- To impart knowledge to find solutions and approaches for various projects.
- To familiarize the utilization of project within time, resource and financial constraints.

UNIT I   PROJECT MANAGEMENT CONCEPTS   9

Concept and characteristics of a project, importance of project management, types of project, project organizational structure, project life cycle, Statement of Work, Work Breakdown Structure.

UNIT II   PROJECT PLANNING   9

Project Planning and Scheduling techniques - developing the project network using CPM/PERT, Limitations of CPM/PERT, Precedence Diagramming Method, constructing diagram and computations using precedence diagramming method, PERT/CPM simulation, reducing project duration.

UNIT III   RESOURCE SCHEDULING & CRITICAL CHAIN SCHEDULING   9

Resource Scheduling - Resource allocation method, splitting and multitasking, Multi project resources scheduling - Critical Chain Scheduling -Concept of critical chain scheduling - critical chain scheduling method, application of Critical chain scheduling and limitations.

UNIT IV   PROJECT QUALITY MANAGEMENT   9

Concept of project quality, responsibility for quality in projects, quality management at different stages of project, tools and techniques, Quality Management Systems, TQM in projects - Project Performance Measurement and Control - Monitor and assess project performance, schedule, and cost. Earned Value Management, performance measurement methods to monitor, evaluate and control planned cost and schedule performance - Project Closure/ Termination - Meaning of closure/ termination, project audit process, termination steps, final closure.

UNIT V   FINANCIAL ACCOUNTING   9

Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis – Comparative financial statements. Investments - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

                                                                    Total: 45 Periods

COURSE OUTCOMES:
After successful completion of this course the students will be:

1. Describe the concept and characteristics of project management and application of resource scheduling and critical chain scheduling. (Understand)
2. Estimate the suitable resources required for given project work (Apply)
3. Construct the balance sheet to identify the fund flow and cash flow statements (Apply)

4. Apply the concept of CPM and PERT to develop the project network (Apply)

5. Examine the various tools and techniques at different stages of Quality management. (Analysis)

6. Evaluate the decision related to fore casting, inventory, quality control problems etc. for the industries (Evaluate)

TEXT BOOKS:

1. Prasanna Chandra, "'Fundamentals of Financial Management'", Tata Mcgraw-Hill Publishing Ltd,2015.

2. Jack Meredith, Samuel J.Mantel, "Project Management- A Managerial Approach", John Wiley andSons.

REFERENCE BOOKS:

1. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process ", Tata Mcgraw-Hill Publishing Co Ltd.

2. John M Nicholas, "Project Management For Business And Technology", Prentice Hall of India Pvt Ltd.

3. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, 2020.

19UCE702	ESTIMATING AND COSTING	L	T	P	C
		3	0	2	4

Course Learning Objectives:

➢ To impart the knowledge on basic concepts related to estimate preparation.

➢ To analyse the rate of a work item according to the specification.

➢ To identify various items of work in a building & calculate their quantities using appropriate methods.

UNIT I INTRODUCTION TO ESTIMATIONAND SPECIFICATION   10

General introduction to estimation–purpose of estimates - Types of estimates – Units of measurements for works and materials – Degree of accuracy in measurements - Purpose and basic principles of General and Detailed Specifications- detailed specifications for various items of work– Report accompanying theestimate.

UNIT II RATE ANALYSIS, TENDERS& CONTRACTS   10

Data- lead statement - Schedule of rates - Standard data book - Lump sum provision – Task/out turn of work-Rate analysis for various work items - Tender and process oftendering-Contracts – Types of contracts – Arbitration and legalrequirements.

Unit III BUILDINGESTIMATE   10

Taking out quantity – Method of Measurement, abstract sheets and recording of measurements - Centre line method and Long wall - short wall method – Detailed estimate of masonry buildings and R.C.C works - Preparation of Bar Bending Schedule – Various types of arches – Calculation of brick work and RCC works in arches – Deductions for openings - Preparation of bills of quantities Approximate estimates – Casestudies.

Exercises for practical component   30

1. Introduction to estimation software.
2. Automatic & Manual Takeoff Tools-Currency.
3. Project Settings-Estimation Of Joinery Details.
4. Estimation of Wall Section .
5. Estimation of Steps.
6. Estimation of Wall Elevation & Wall Opening.
7. Estimation of Residential Building -Material Cost -Labor Cost -Sub Contractor Cost And Time Estimate.
8. Report Generation & Export Files .

TOTAL – 30+30 Periods

After the successful completion of the course, Students will be able to,

1. Illustrate the concepts of estimation, costing, Tenders, Contracts and Valuation. (Understand)

2. Apply the knowledge of estimation and costing to compute the various rates of work, detailed estimate and standard rent in construction projects.(Apply)

3. Compare and Analyze the various methods of estimation, valuation and tendering.(Analyze)

4. Analyze and formulate detailed reports and contracts for a given construction project.(Analyze)

Text Books:

1. Dutta .B.N, "Estimating and Costing in Civil Engineering Theory and Practice," UBS Publishers Pvt. Ltd., 2019.
2. Patil .B.S , "Civil Engineering Contracts and Estimates", Universities press(India) Pvt. Ltd., 2017

Reference Books:

1.Birdie .G.S, "A Text Book on Estimating and Costing", DhanpatRai Co. Pvt. Ltd., New Delhi, 2017.
2. Banerjee.D.N. "J A Parks Principles And Practice Of Valuation", Eastern Law House Private Ltd., New Delhi, 2015
3.Public works department Schedule of rates 2020-21.

	L	**T**	**P**	**C**

19UCE703   **SMART CITY TECHNOLOGIES**

L T P C
3 0 0 3

Course Learning Objectives:

- To make the students understand the core challenges relating to the foundation of sustainable smart cities.
- To impart knowledge on understanding, and critical thinking related to smart, sustainable urban development.
- To explore issues relating to the development and deployment of new and emerging technologies, that will create a thorough understanding of smart processes and systems of the present and future.
- To gain in- depth knowledge to implement smart wastewater management system in smart cities.
- To apply the concept of Internet of Things in real world scenario.

Unit I INTRODUCTION   9

Understanding – Dimensions – Feasibility Analysis, Global experience, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, financing smart cities development, Governance of smart cities.

Unit II GREEN BUILDING CONCEPTS AND SUSTAINABLE DEVELOPMENT   9

Green projects in smart cities, sustainability – green building – Rating system – Energy efficient building – energy saving systems.

Unit III SMART URBAN TRANSPORT & EMERGENCY RESPONSE SYSTEM   9

Introduction- Intelligent Public Transport – Parking - Traffic Control Systems- Applications of IoT. Surveillance systems- Emergency response – Incident management systems. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

Unit IV SMART WATER, SEWERAGE AND WASTE MANAGEMENT   9

Introduction-Water Supply -Sewerage & Waste management - Smart Water and Sewerage Management System-. Waste Collection and Transportation Monitoring system – IoT and Sensors - Case study.

Unit V E- GOVERNANCE AND IOT   9

The concept of management, concept of e-management & e-business, e-Government Principles, Form e-Government to e-governance, e-governance and developing countries, Designing and implementing e-Government Strategy, E-governance: Issues in implementation. IOT fundamentals, protocols, design and development, data analytics and supporting services, case studies.

TOTAL - 45 Periods

After the successful completion of the course, Students will be able to,

- To understand the fundamental concepts of smart cities and green building with technology advancement.
- To apply knowledge of engineering, energy, and information technology for smart city architecture.
- To analyse the importance and role of government, urban planners, city developers, universities and stakeholders for smart city development.

- To design and develop responsive smart cities with green buildings, intelligent transport system, smart water and drainage networks.
- To recognize the role of modern ICT and data analytics in addressing the urban challenges and key issues.

Text Books:
1. Aniket Bhagwat, Suparna Bhalla, Sanjay Prakash Ashish Bhalla Destination 100 (The Making of Smart Cities in India, Future Institute publishers, 2014. (ISBN 13: 9781 4392 57883).
2. Vinod kumar T. M., Geographic Information Systems for Smart Cities, Copal Publishing, New Delhi, 2014.(ISBN: 9788 1924 73352).
3. Komakech, D., 'Achieving More Intelligent Cities", Municipal Engineer, 2005.
4. Nohrstedt, 'Digital Planning: Integrating New Information and Communication Technologies in Urban Planning", www.oruse.com, 2002.
5. Peng, L., Tao, Z., 'Establish the Intelligent City System and Realize its Level Analysis", Telematics and Informatics, 2010.

Reference Books:
1. Allen G.Noble, (Eds), 'Regional Development and Planning for the 21st Century: New Priorities and New Philosophies', Aldershot, USA, 1988.
2. Andy Pike, Andres Rodriguez-Pose, John Tomaney, 'Handbook of Local and Regional Development', Taylor & Francis, 2010
3. Andreas Faludi and Sheryl Goldberg, 'Fifty years of Dutch National Physical Planning, Alexandrine Press, Oxford, 1991.
4. Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, 2008

L	T	P	C
0	0	0	1

19UCE707   **SUMMER INTERNSHIP**

Course Learning Objectives:
- To train the students in the field work so as to have a first hand knowledge of practical problems related to Civil Engineering in carrying out engineering tasks.
- To develop skills in facing and solving the field problems.

DESCRIPTION

The students individually undertake training in reputed Civil Engineering Companies during the summer vacation for a specified period of four weeks. At the end of training, a detailed report on the work done should be submitted. The students will be evaluated through a viva-voce examination by a team of internal staff.

Course Outcomes:
      After the successful completion of the course, Students will be able to,
1. Tackle a practical field/industry orientated problem related to Civil Engineering.

VIII SEMESTER

19UCE803	**PROJECT WORK**	L	T	P	C
		0	0	16	8

Course Learning Objectives:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports.
- To prepare the students to face reviews and viva voce examination.

DESCRIPTION

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Identify and solve problems pertaining to Civil Engineering.
- Develop good technical reporting and data presentation skill.

PROFESSIONAL ELECTIVES

19UCE901   **MODERN SURVEYING**   **L   T   P   C**
                                                                                        3   0   0   3

Course Learning Objectives:
- To study the basic principles and methods of hydrographic surveying.
- To get introduced to the concept of astronomy in locating a celestial body.
- To impart knowledge on the basics of aerial photogrammetry.
- To learn on the principles of Electronic distance measurements, Total station and GPS.
- To give exposure to advanced surveying techniques involved such as remote sensing, GIS,etc.

Unit I HYDROGRAPHIC SURVEYING   **9**

Shore line survey - River survey- Sounding-Gauges & Equipment - Sounding Rods and Lead Lines- Sounding Chain and lead- Sounding Machine, Fathometers, Signals, Sextants- Methods of sounding- Location of soundings- Plotting of sounding-The Three point problem-Mechanical, Graphical& Analytical methods.

Unit II ASTRONOMICAL SURVEYING   **9**

Celestial sphere - astronomical terms and definitions - motion of sun and stars - apparent altitude and corrections - celestial co-ordinate systems - spherical trigonometry – latitude and longitude of a place - field observations and calculations for azimuth- Nautical almanac.

Unit III AERIAL PHOTOGRAMMETRY   **9**

Photogrammetry- types and geometry of aerial photograph- Photographic scale- Flying heights and altitude-Relief and tilt displacement – corrections – Flight Planning-Layout of Photography.

Unit IV EDM, TOTAL STATION,GPS SURVEYING   **9**

Electromagnetic distance measurement (EDM) – principle – types – Total station- working principle, GPS Basics – system overview – working principle of GPS – Satellite ranging – Calculating position- GPS Survey- types-Kinematic and static survey techniques.

Unit V BASICS OF REMOTE SENSING&GIS   **9**

Introduction – Historical Background - Electromagnetic Radiation (EMR) - Electromagnetic Spectrum -. Airborne Platforms-Sensors -Types-optical Remote Sensing,Microwave remote sensing-Applications of Remote sensing-LIDAR,GIS-History of Development - Components of GIS- Data models – Raster and Vector data structures- – Advanced applications of GIS.

TOTAL - 45 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,
- Locate a celestial body using different co-ordinate systems in astronomical surveying.
- Interpret and scale aerial photographs.
- Apply total station and EDM in distance measurement and traversing.
- Adopt advanced surveying techniques over conventional methods in the field of civil engineering.

Text Books:

1. SatheeshGopi, "Advanced Surveying", Pearson Education,2007.
2. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, Standard Publishers, New Delhi 2008.
3. SatheeshGopi, "The Global Positioning System and Surveying using GPS", Tata McGraw,2005.

Reference Books:

1. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England,2006.

2. Bossler, J.D., "Manual of Geospatial Science and Technology", Taylor and Francis,2002.

3. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information System", Oxford University Press,2000.

4. Duggal R.K, "Surveying" Vol. I and II, Tata McGraw Hill Publishing Company Ltd., New Delhi,2004.

TRAFFIC ENGINEERING AND MANAGEMENT **L T P C**
3 0 0 3

Course Learning Objectives:
- .To provide knowledge on the various methods of traffic forecast and applications of modeling.
- To impart knowledge on various traffic flows and control.
- To familiarize the statistical applications of traffic flow.
- To cover concepts of accidents, road safety and traffic system management.

Unit I TRAFFIC FORECAST   9
Scope, definitions - traffic forecast: principles and methods - relationship between flow, density & capacity of traffic - hourly volume, AADT - speed studies, car following theory and its applications - traffic flow problems - introduction to simulation, applications in traffic modeling –Traffic analysis software.

Unit II TRAFFIC FLOW AND CONTROL   9
Definitions: vehicle arrivals, headway, phases, cycles - signal time - optimal cycle time – Traffic signs, markings &signals – types - advantages - signal setting for an intersection -fixed time signals- vehicle actuated signals - design of signal time for an intersection-(problems) – signal co-ordination- Case studies.

Unit III STATISTICAL APPLICATIONS OF TRAFFIC FLOW   9
Traffic flow - conditions-types of flow - heterogeneity conditions- Traffic studies, surveys - need, uses and types - Junctions - types and functions - roundabouts - rotary design: principle – problem of rotary design – types - applications of statistical methods - sampling -significance testing - introduction to queuing theory, MLR analysis.

Unit IV ACCIDENTS AND ROAD SAFETY   9
Accidents: types - influencing factors: road surface, driver, road users and vehicle characteristics - accident rate - collision diagram - recording system-accident analysis - preventive measures - accident cost – Road users cost: case study of CRRI road users cost study- road safety awareness.

Unit V TRAFFIC SYSTEM MANAGEMENT   9
Traffic system management – types of measures – scope in Indian scenario - merits and demerits. passenger car units (PCU) –traffic volume – hourly volume measurement - highway capacity- unit and standards of volume as per IRC – Volume to capacity ratio (V/C) - Level of service –definition, factors affecting capacity-relationship between V/C ratio and LOS- types-vehicular level of service- pedestrian level of service (PLOS)- influence of mixed traffic on Level of service- Level of service of various types of roads.

TOTAL - 45 Periods

Course Outcomes:
After successful completion of this course, the students will be able to
- Analyse the various types of traffic flow.
- Plan and design the traffic signal duration.
- Practice the traffic engineering and practice the control measures.
- Analyse the causes and report the accident.

- Manage the traffic congestion using the available management measures.

Text Books:
1. Dr.L.R.Kadiyali, "Traffic engineering and transport planning",Khanna Publishers, Delhi, 8th Edition ,2014.
2. SubhashSaxena, "Text Book of Highway andTraffic Engineering", CBS Publishers & Distributors,2017.

Reference Books:
1. R J Salter, N B Hounsell, "Highway Traffic Analysis and Design",Red Globe Press Publishers,2016.
2. Khisty CJ and BK Lall,"Transportation Engineering: An Introduction", Prentice Hall International, Inc,2015.

19UCE903   **HOUSING PLANNING AND MANAGEMENT**   **L   T   P   C**

                                                                             3   0   0   3

Course Learning Objectives:
- To acquire knowledge on planning and execution of geotechnical site investigation.
- To understand the design parameters of different type of foundations as per code.
- To familiarize the concept of earth pressure theories and retaining wall analysis.
- To understand the pile foundation, its type, capacity and settlement.
- To impart knowledge on basic concepts of special foundation.

Unit I INTRODUCTION TO HOUSING   **9**
Definition: House, Home, Household -Row houses, Apartments, Multi storied Buildings, Special Buildings- Objectives and Strategies of National Urban Housing and Habitat Policy (NUHHP) 2007 &NUHHP, 2017-Principle of Sustainable Housing-Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies -DC Regulations, Institutions for Housing at National, State and Local levels.

Unit II HOUSING PROGRAMMES   **9**
Basic Concepts, Contents and Standards for various Housing Programmes Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing - Slum Housing Programmes: location, redevelopment, improvements, Use of GIS and MIS in Slum Housing projects-   Public, Private and NGOs role in Slum Housing.

Unit III PLANNING AND DESIGN OF HOUSING PROJECTS   **9**
Housing Programmes: Introduction- Types- Schemes implemented by State & Central Governments-Plan outlays for various housing schemes - Formulation of Housing Projects –Byelaws & Development control Regulations -Site Analysis, Layout Design,- Procedure for site analysis and layout planning - Design of Housing Units (Simple design problems)- Housing project cost analysis.

Unit IV CONSTRUCTION TECHNIQUES AND COST- EFFECTIVE MATERIALS   **9**
New Constructions Techniques – Cost Effective Modern Construction Materials, Sustainable low-cost housing techniques & practices of Laurie Becker - Building Centers – Concept, Functions and Performance Evaluation- Green materials.

Unit V HOUSING FINANCE & PROJECT APPRAISAL   **9**
Economic appraisal of Housing /plotted development projects.– Housing Finance-Agencies involved in financing housing projects- Cost Recovery –Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units(Problems), Rents & Recovery Pattern (Problems).

                                                                 TOTAL - 45 Periods

Course Outcomes:
- Interpret the various housing programme using sustainability concept. Understand.
- Plan the housing projects as per NUHHP & Building regulations. Apply.
- Analyze the housing project based on area of plot and cost of projects. Analyze.
- Design the Slum housing projects using GIS & MIS Design.
- Evaluate the cost-effective construction materials & techniques for mass housing. Evaluate.
- Present the Performance of economic analysis-based project appraisal of housing projects. Communication.

Text books

1. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017.
2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers and Distributers Ltd., New Delhi, 2015.
3. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.
4. Punmia, B.C. Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., New Delhi, 2005.

Reference Books:

1. GopalRanjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi, 2016.
2. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
3. Das, B.M, "Principles of Geotechnical Engineering", Thompson Brooks/ Coles Learning, Singapore, 5th Edition, 2014.
4. Purushothma Raj P "Soil Mechanics and Foundation Engineering" 2nd Edition, Pearson Education, 2013.
5. Bowles J.E, "Foundation Analysis and design", McGraw-Hill, 1994.

IS Codes: (If necessary for your course)

1. IS 6403 - Code for practice of bearing capacity of shallow foundation.
2. IS 2911 - Code for practice of Pile foundation (Section 1 & 2).
3. IS 5121-1969 – safety coding of pile.
4. IS 2950 -1 (1981) – Code of Practice for design and Construction of raft foundation.
5. IS 14458 – 1997 Guidelines for Retaining wall on hill area (Part 1 & 2)
6. GopalRanjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi, 2016.
7. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
8. Das, B.M, "Principles of Geotechnical Engineering", Thompson Brooks/ Coles Learning, Singapore, 5th Edition, 2014.
9. Purushothma Raj P "Soil Mechanics and Foundation Engineering" 2nd Edition, Pearson Education, 2013.

19UCE904	GROUNDWATERENGINEERING	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- The objective of this course is enable the student to understand the principles of Ground water governing Equations, Characteristics of different aquifers and techniques of ground water model development and management.

Unit I HYDROGEOLOGICAL PARAMETERS 9

Introduction — Water bearing Properties of Rock — Type of aquifers - Aquifer properties — permeability,specific yield, trans missivity and storage coefficient–Methods of Estimation–GEC norms - Steady state flow - Darcy's Law - Groundwater Velocity –-Dupuit For chheimeras sumption–Steady Radial Flowin to a Well.

Unit II WELL HYDRAULICS 9

Unsteady state flow – The is method - Jacob method – Chow's method – Law of Times – The is Recovery–Bailer method–Slug method-tests-Image well theory Partial penetration of wells Welllosses–Specific Capacity and Safe yield-Collector well and Infiltration gallery.

Unit III GROUND WATER MANAGEMENT 9

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

Unit IV GROUNDWATER QUALITY 9

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

Unit V GROUND WATER CONSERVATION 9

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

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Define the ground water system basic, types of aquifers,aquifer arameters,movement and it spotential For confined and unconfined aquifers.
- Apply the knowledge of groundwater flow in steady and unsteady flow characteristic so fwellhy draulics

- Explain the concept of ground water model development and data base management for Ground water management.
- Describe the importance of artificial recharge and ground water quality concepts.
- Apply the creative and innovative technique on conservation of groundwater.

Text Books:
1. RaghunathH.M.,"GroundWaterHydrology",NewAgeInternational(P)Limited,NewDelhi,2010
2. ToddD.K.,"Ground Water Hydrology",John Wiley andSons,NewYork,2000.

Reference Books:
1. FittsRCharles,"Ground water Science".Elsevier, AcademicPress, 2002.
2. Ramakrishnan,S,Ground Water,K.J. Grapharts,Chennai,1998.
3. Chahar BR,Ground water hydrology,McGrawHillEducation(India)PvtLtd,NewDelhi,2015.
4. RastogiA.K.,Numerical Ground water Hydrology,2011.

19UCE905   **ENVIRONMENTAL IMPACT ASSESSMENT**   **L   T   P   C**
                                                                          3   0   0   3

Course Learning Objectives:
- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects.
- To provide the concepts of environmental assessment and environmental audit.
- To give an overview of case studies pertaining to developmental projects.

Unit 1 INTRODUCTION   **9**
Impacts of Development on Environment – Sustainable Development Goals - Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle – EIA Notification and Legal Framework – Stakeholders and their Role in EIA– Selection & Registration Criteria for EIA Consultants – Screening and Scoping in EIA – EIA draft policy 2020.

Unit II ENVIRONMENTAL ASSESSMENT   **9**
Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives.

Unit III ENVIRONMENTAL MANAGEMENT PLAN   **9**
Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Environmental Clearance – Environmental Audit – ISO 14001.

Unit IV SOCIO ECONOMIC ASSESSMENT   **9**
Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis- Public Consultation.

Unit V CASE STUDIES   **9**
EIA case studies pertaining to Infrastructure Projects – Real Estate Development - Roads and Bridges – Mass Rapid Transport Systems - Ports and Harbor – Airports - Dams and Irrigation projects - Power plants – Wastewater Treatment Plants- Waste Processing and Disposal facilities - Mining Projects.

                                                                      TOTAL - 45 Periods
Course Outcomes:
After the successful completion of the course, Students will be able to,

- Comprehend the importance of assessing impacts on society and ecosystem by stressing on sustainable development concepts.(Understand)
- Describe the objectives, capability, limitations and methodologies of environmental impact assessment(Understand)
- Identify and provide legal requirements and suitable solutions to overcome and mitigate impacts (Apply)
- Apply the knowledge of impact in developmental projects on air quality, water quality, vegetation and wildlife (Apply)

- Carry out assessment works and case studies on Environment Impact Assessment pertaining to development Projects. (Analyze)
- Prepare environmental management plan, monitoring system and conduct baseline studies by considering environmental aspects, impacts and potential hazards respectively for any project Analyze)

Text Books:

1. Canter, R.L (1997). Environmental impact Assessment, 2nd Edition, McGraw Hill Inc., New Delhi.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu (1997). Environmental Impact Assessment for Developing Countries in Asia. Volume 1 – Overview, Asian Development Bank .

Reference Books:

1. John Glasson, RikiTherivel, Andrew Chadwick (2005), "Introduction to Environmental Impact Assessment", Routledge Publishers.
2. Barry Sadler and Mary McCabe (2002), "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme.
3. Anjaneyalu, Y. Valli manickam, "Environmental Impact Assessment Methodologies," B S Publications, India.

19UCE906   **MUNICIPAL SOLID WASTE MANAGEMENT**   L   T   P   C
                                                                            3   0   0   3

Course Learning Objectives:

- To impart the knowledge and skills to identify and assess the waste storage, collection, transfer, handling and disposal measures.

- To provide the knowledge on issues of solid waste management.

- To know the impact of waste processing various options for disposal of wastes.

Unit I SOURCES AND TYPES OF MUNICIPAL SOLID WASTE   9

Sources and types of solid wastes – quantity – factors affecting generation of solid wastes – Need for solid waste management – Public health and environmental effects – Salient features of Indian legislations on management and handling of municipal solid wastes – Elements of Integrated waste management – Public Awareness – Role of NGO's – Public Private participation.

Unit II WASTE CHARACTERIZATION AND SOURCE REDUCTION   9

Waste generation rates and variation – Composition – Physical, Chemical and biological properties of solid wastes – waste sampling and characterization – source reduction of waste – reduction, recycling and reuse.

Unit III STORAGE, COLLECTION AND TRANSPORT OF WASTES   9

Onsite storage methods – materials used for containers - handling and segregation of wastes at source. Methods of Residential and commercial waste collection – collection vehicles – Analysis of collection systems – HCS&SCS: Transfer stations – selection of location, operation and maintenance – Preparation of master schedule – collection routes – Manpower – case studies under Indian condition.

Unit IV WASTE PROCESSING   9

Objectives of waste processing - Processing techniques and Equipment; Resource recovery from solid wastes composting, Incineration, Pyrolysis and Bio methanation – Case studies under Indian conditions.

Unit V DISPOSAL   9

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners - Leachate collection and treatment – Management of landfill gas – Landfill Bioreactor.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Explain the waste management hierarchy and identify opportunities to minimize solid waste production. Understand

- Classify solid wastes explain the functional elements of SWM and determine the effects of poor waste management on public health and the environment. (Understand)

- Identify the purpose of waste processing and explain the processing techniques for reducing the volume and size of wastes (Apply)

- Carry out physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.(Apply)

- Integrate technical solid waste management options and imposed environmental legislation to

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develop legal and safe solutions.(Analyze)

- Evaluate how a collection system is planned, implemented and maintain the required data for record keeping and inventory control.(Analyze)

Text Books:
1. George Tchobanoglous, Hilary The is en and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill India, First edition, 2015.
2. Cherry P M, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018
3. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management – Science and Engineering , Butterworth-Heinemann, 2016

Reference Books:
1. CPHEEO, "Manual on Municipal Solid waste management,Vol I, II and III, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.
2. William A. Worrell, P. AarneVesilind, Christian Ludwig, Solid Waste Engineering - A Global Perspective, 3rd Edition, Cengage Learning, 2017.
3. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc-Graw Hill International edition, New York,2010.
4. John Pitchtel,Waste Management Practices, CRC Press,Taylor and Francis Group,2014.
5. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010.

19UCE907   **GROUND IMPROVEMENT TECHNIQUES**

Course Learning Objectives:

- Understanding the engineering Behaviour of various natural and man-made soil deposits.
- Understanding the concept of various ground improvement techniques.
- Selection of site specific method of improvement and its design.
- Exposure to recent ground improvement techniques through various case studies.

Unit I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES   **9**

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

Unit II DEWATERING   **9**

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

Unit III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS   **9**

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

Unit IV EARTH REINFORCEMENT   **9**

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

Unit V GROUTING TECHNIQUES   **9**

Types of grouts – Grouting equipment's and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Explain the methods of Ground improvement techniques based on different types of soils (Understand)
- Discuss the various drainage and dewatering concepts. (Understand)
- Describe the insitu treatment methods for cohesive and cohesion less soils (Remember)
- Describe the concepts of soil reinforcements with their types and applications (Understand)
- Explain the different grouting techniques and soil stabilization concepts. (Understand)

Text Books:
1. Purushothama Raj. P, "Ground Improvement Techniques", Firewall Media,2005.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill,1994.

19UCE908   **BRIDGE ENGINEERING**

                                                                        L   T   P   C
                                                                        3   0   0   3

Course Learning Objectives:
- To create awareness about various components of bridge structures and design considerations.
- To impart knowledge on specifications of road bridges.
- To train the students in designing concrete, steel bridges and substructures.

Unit I INTRODUCTION   **9**

Definition - components of bridge and Historical Developments - Site Selection for Bridges - Classification of Bridges - Survey and data collection for a bridge site selection -geometric and hydraulic design consideration - loading standards for highway and railway bridges - general design consideration - optimum spans.

Unit II SPECIFICATIONS OF ROAD BRIDGES   **9**

Standard specification for Road bridges: Width of carriageway – Clearances - Loads to be considered: Dead load, I.R.C. standard live loads, Impact effect, Wind load, Longitudinal forces, Centrifugal forces, Horizontal forces due to water currents, Buoyancy effect and Earth pressure.

Unit III CONCRETE BRIDGES   **9**

Concrete bridges: culverts, Slab, T-beam, box girder bridges, balanced cantilever bridge, cable stayed bridge, extrados bridges; arch bridge; - Special requirements for Prestressed Concrete bridges Design of Slab Culvert and T- beam bridge.

Unit IV STEEL BRIDGES   **9**

Steel bridges: plate girder bridge, truss bridge, suspension cable bridge, cable stayed bridge -Design of Truss Bridges and Plate girder bridges.

Unit V SUBSTRUCTURE   **9**

Substructures: design of piers and abutments - pile and well foundations - bearings and expansion joints - special wearing coats - seismic design considerations - Aerodynamic stability considerations - special durability measures - provisions for inspection and maintenance.

                                                                        TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Apply loads on bridges and selection of type of bridge for the site condition
- Apply Standard specification for Road bridges
- Design Slab Culvert and T- beam bridge
- Truss Bridges and Plate girder bridges
- Design and check the stability of piers and abutments
- Decide the appropriate sub structural systems , bearings and expansion joints for the bridges

Text Books:
1. Johnson D Victor, "Essentials of Bridge Engineering", Oxford & IBH Publishing Co., New Delhi, 2019
2. Krishna Raju N, "Design of Bridges", Oxford & IBH Publishing Co New Delhi.2019.
3. Jagadeesh .T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013

Reference Books:
1. SP Bindra, DhanpatRai& Sons, "Principles and Practice of Bridge Engineering", New Delhim 2012.
2. PonnuSwamy, "Bridge Engineering", 4th Edition, McGraw-Hill Publication, 2017.
3. Swami Saran, "Analysis and Design of sub-structures",2nd Edition, Oxford IBH Publishing Co.Ltd., 2018.
4. Vazirani, Ratvani&Aswani, "Design of Concrete Bridges",5th Edition, Khanna Publishers, 2006.
5. IRC 6–2000 Standard Specifications and Code of Practice For Road Bridges Section II Loads and Stresses, The Indian Road Congressm New Delhi, 2011.

19UCE909   **TALL STRUCTURES**   **L T P C**
                                                                                            3 0 0 3

Course Learning Objectives:
- To make the students understand the essential services and modern construction materials used in tall buildings.
- To train them in loading considerations, analysis and design of tall buildings.
- To analyze the performance and stability of tall structures.

Unit I INTRODUCTION   **9**

History, Advantages and disadvantages, Economics, Essential amenities, Lifts (elevator), Fire safety,   Water supply, Drainage and garbage disposal, Miscellaneous services, Structural and foundation systems;
Materials: Concrete, High strength steel and Glass.

Unit II LOADING   **9**

Gravity Loading: Dead load, Live load – Live load reduction techniques, Impact load, gravity load-Construction load, Sequential loading; Wind Loading: Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading: Equivalent lateral Load analysis, Response Spectrum Method - Combination of Loads.

Unit III BEHAVIOUR OF STRUCTURAL SYSTEMS   **9**

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, In - filled frames, Shear walls, Coupled Shear walls, Wall – Frames, Tubular, Outrigger , braced and Hybrid systems

Unit IV ANALYSIS   **9**

Modeling for approximate analysis, accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for drift and twist. Computerized 3D analysis.

Unit V DESIGN PARAMETERS   **9**

Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance, Stability of Tall Structures - PΔ Effects, Buckling analysis of Tall Buildings.

                                                                               TOTAL - 45 Periods

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Illustrates Essential amenities and construction materials used for the tall building construction. *(Understand)*
- Apply the knowledge of engineering fundamentals to characterize various types of loading which could be considered for the analysis of tall building. *(Apply)*
- Analyze various structural systems, their behaviour and performance under different loading conditions. *(Analyze)*
- Analyze the structures as an integral unit for drift and twist. *(Analyze)*
- Design tall structures under different conditions. *(Create)*

Text Books:

1.Taranath B.S., "Analysis & Design of Tall Building", McGraw-Hill Book Co, 2011.

2. Bryan S.S, and Alexcoull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 2011.

Reference Books:

1. Coull, A. and Smith Staford.B, Tall Buildings ,Pergamon Press, London, 1997.

2. LinT.Y. and Burry D.Stotes, Structural Concepts and Systems for Architects and Engineers, John Wiley, 1994.

3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

4. Wolfgang Schuler, High Rise Building Structures, John Wiley & Sons, New York, 1976.

19UCE910   **PREFABRICATED STRUCTURES**   **L T P C**

                                                                                         3 0 0 3

Course Learning Objectives:
- To understand the basic principles of prefabrication.
- To be thorough with the calculation of handling and erection stresses.
- To know about dimensioning and detailing of joint.
- To acquire knowledge on erection of structures.
- To get familiar with the design principles of prefabricated units.

Unit I INTRODUCTION   **9**

Modular co-ordination – Standardization - Components - Prefabrication systems and structural schemes - Types of foundation - Design considerations - Economy of prefabrication - Prefabrication of load-carrying members - Disuniting of structures - Structural Behaviour of precast structures

Unit II HANDLING STRESSES AND ERECTION STRESSES   **9**

Handling stresses and erection stresses - Application of pre stressing of roof members – Floor systems - Two way load bearing slabs - Wall panels - Shear walls.

Unit III DIMENSIONING AND DETAILING OF JOINTS   **9**

Dimensioning and detailing of joints for different structural connections – Construction joints and expansion joints - Allowance for joint deformation.

Unit IV ERECTION OF STRUCTURES   **9**

Production - Transportation and Erection - Organizing of production – Storing -and erection equipment - Shuttering and mould design - Dimensional tolerances, Erection of R.C. structures – Total Fully prefabricated buildings.

Unit V DESIGN OF PRE FABRICATED UNITS   **9**

Design considerations - Code provisions -Progressive collapse – Prefabricated units for Industrial structures, Multi-storied buildings and Water tanks etc., Application of pre stressed concrete in prefabrication.

                                                                                TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Attain the knowledge about the process of manufacturing, transportation and erection of the prefabricated components. *(Understand)*
- Implement the applications of various components of prefabricated structures. *(Apply)*
- Analyse various components of the prefabricated structure to ensure the limitations.*(Analyse)*
- Diagnose the problems occur while designing the prefabricated components.*(Analyse)*
- Estimate the load calculations and dimensions of the prefabricated members while designing. *(Evaluate)*
- Assemble the individually made members to form a complete prefabricated structure. *(Create)*

Text Books:
1. Hubert Bachmann, Alfred Steinle, "Precast Concrete Structures", Ernst and Sohn GMBH & Co., K.G.,2011.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009.
3. Gerostiza C.Z., Hendrikson C. and Rehat D.R.," Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994.

Reference Books:
1. B.Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam / London / New York, 1966.
2. Levit, M., (2000), Precast concrete materials, Manufacture properties and usage, Applied Science Publishers, London.
3. Kim S. Elliott, "Precast Concrete Structures" Butter – Heinemann, 2002.
4. LassloMokk, "Prefabricated Concrete for Industrial and Public Sectors, AkademiaiKiado", Budapest,1964.
5. KonczT.,"Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH,1976.

| 19UCE911 | **FINITE ELEMENT METHODS** | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Course Learning Objectives:
- To impart the concepts of finite element methods.
- To impart knowledge in the analysis of frame structures.
- To train the students in the analysis of beams and 2D,3D Frame structures using Finite element software.

Unit I INTRODUCTION TO FINITE ELEMENT METHOD   **9+6**

Introduction - Basic Concepts of Finite Element Analysis - Introduction to Elasticity - Steps in Finite Element Analysis - Virtual Work and Variation AL Principle -Rayleigh-Ritz method- Galerk in Method-simple application in structural analysis.

Unit II ELEMENT PROPERTIES   **9+6**

Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements -Isoparametric Formulation - Stiffness Matrix of Isoparametric Elements Numerical Integration: One, Two Dimensional and Three Dimensional.

Unit III ANALYSIS OF FRAME STRUCTURES   **9+6**

Stiffness of Truss Members - Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam - Plane Frame Analysis - Analysis of Grid and Space Frame-Finite Element Formulation for 3 Dimensional Elements – Solution for simple frames.- Introduction to Plate Bending Problems

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Describe the basic concepts of finite element analysis, element properties and Framed structures *(Understand)*
- Analyse problems on continuous beams and plane frames using finite element method. *(Analyze)*
- Solve problems on continuous beams and plane frames using finite element method. *(Apply)*
- Develop models and interpret the numerical results in design. *(Create)*
- Use the modern tools to formulate the problem, and able to create geometry, discretize, apply boundary condition to solve problems of, truss, beams, to find stress with different loading conditions(Modern tool usage)
- Make an effective communication and presentation as a Individual / team in Multi storey structures Problems(Communication)

Text Books:
1. Bhavikatti.S.S, "Finite Element Analysis", New Age International Publishers, Third Edition 2015.
2. Chandrupatla, R.T. and Belegundu, A.D., "Introduction to Finite Elements in Engineering",Prentice Hall of India,2014.
3. 3. Seshu P. "Text Book of Finite Element Analysis", Prentice Hall, New Delhi, 2007.

Reference Books:

1. David Hutton, "Fundamentals of Finite Element Analysis", Tata McGraw Hill Publishing Company Limited, New Delhi, First Edition 2017.

2. Moaveni, S., "Finite Element Analysis Theory and Application with ANSYS", Prentice Hall Inc.,2017.

3. Rao.S.S, "Finite Element Method in Engg.", Butterworth – Heinemann, UK, Sixth Edition 2017.

REPAIR AND REHABILITATION OF STRUCTURES   **L T P C**
                                                                                                3 0 0 3

Course Learning Objectives:
- To provide knowledge on quality of concrete and durability aspects.
- To give an overview on causes of deterioration, assessment of distressed structures and repairing of structures.
- To teach the concepts of demolition techniques.

UNIT I MAINTENANCE AND REPAIR STRATEGIES   **9**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE   **9**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES   **9**

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.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS   **9**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES   **9**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, and earthquake. Demolition techniques -Engineered demolition methods - Case studies.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Demonstrate the various types of distress in concrete structures.
- Discuss the effects due to climate, temperature, chemicals, wear and erosion on structures.
- Describe the special concrete and state its applications
- Explain the different corrosion protection techniques.
- Recommend the best Materials and Techniques for Repair.

Text Books:
1. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1993
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.

Reference Books:

1. Shetty.M.S., Concrete Technology - Theory and Practice, S.Chand and Company, 2008.
2. Dov Kominetzky.M.S., - Design and Construction Failures, Galgotia Publications Pvt. Ltd., 2001
3. Ravishankar.K., Krishnamoorthy.T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Allied Publishers, 2004.

IS Codes: (If necessary for your course)

1. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.

19UCE913	**PRESTRESSED CONCRETE STRUCTURES**	L	T	P	C
		3	0	0	3

Course Learning Objectives:

- To import knowledge on the basic concepts of pre stressing.
- To make familiar with the design principles of prestressed concrete.
- To get exposed to design of prestressed concrete tanks and pipes.
- To have good knowledge on analysis of composite members.
- To develop knowledge on design of prestressed concrete bridges.

Unit I THEORY AND BEHAVIOUR 9

Basic concepts – Early Attempts of Pre stressing – Definitions - advantages – Limitations - materials required – systems and methods of prestressing - Devices– analysis of sections– stress concept – strength concept – load balancing concept – effect of loading on the tensile stresses in tendons – effect of tendon profile on deflections – factors influencing deflections – calculation of deflections – short term and long term deflections - losses of pre stress – estimation of crack width - Limits of crack width.

Unit II DESIGN FOR FLEXURAL AND ANCHORAGE ZONE 9

Flexural strength – simplified procedures- codal provision – .strain compatibility method – basic concepts in selection of cross section for bending – determination of stress distribution in end block - Design of end anchorage zones using IS code method – check for transfer bond length in pre tensioned beams - limit state design criteria – partial prestressing – applications.

Unit III CIRCULAR PRESTRESSING 9

Introduction – General features of prestressed concrete tanks –Analysis and Design of prestressed concrete tanks – Design of cylindrical and non-cylindrical pipe - Ring beams- partial prestressing – applications.

Unit IV COMPOSITE CONSTRUCTION 9

Composite beams - Types - Analysis for stresses –Differential shrinkage - estimate for deflections – flexural and shear strength of composite members.

Unit V PRE-STRESSED CONCRETE BRIDGES 9

General aspects – Classification of bridge - Loads acting on bridges - typical cross section detailing – Advantages –pre tensioned prestressed concrete bridge decks – Post tensioned prestressed concrete bridge decks – Principles of design only.

TOTAL - 45 Periods

After the successful completion of the course, Students will be able to,

- Specify and characterize the materials required for prestressed concrete structures. (Understand) Calculate losses and deflection in various prestressed members. (Apply)
- Design end block reinforcement, concrete tanks and pipe for PSC members.(Apply)
- Analyze the stresses encountered in PSC element during transfer and at working (Analyse)
- Analyze prestressed concrete members for flexure and their flexural strength. (Analyse)
- Justify how the end blocks of prestressed concrete beams are strengthened against bursting tension. (Evaluate)

Text Books:
1. Krishna Raju N., "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

Reference Books:
1. Rajagopalan, N, "Prestressed Concrete", Alpha Science, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

IS Codes:
1. IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, Second revision.
2. IS: 784 - 2001 - IS Specification for Prestressed Concrete Pipes.IS: 6006-1983 Uncoated Stress relieved Strand for Prestressed concrete
3. IS 3370 Code of practice for concrete structures for the storage of liquids Part III Prestressed concrete structures.
4. IS 3370 Code of practice for concrete structures for the storage of liquids Part IV Design Table

19UCE914	**RAILWAYS AND AIRPORT ENGINEERING**	L	T	P	C
		3	0	0	3

Course Learning Objectives:
- To expose the concepts of railway planning and geometrics to the students.
- To familiarize the students about the railway construction & maintenance.
- To impart the concepts of Airport planning to students.
- To expose the concepts on airport geometrics standards to the students.
- To convey the concepts related to air traffic control to the students.

Unit I RAILWAY PLANNING & GEOMETRIC DESIGN   **9**

Introduction- role of rail transportation in economic development - Merits of rail transportation, gauges - permanent way -components: Sleepers-functions, types, sleeper density- ballast- functions - types of materials. Rails-Coning of wheels and tilting of rails- rail cross sections- wear and creep of rails- rail fixtures & fastenings. Geometric design: Gradients- transition curves- widening of gauges - cant and cant deficiency-Point and crossing- turnouts - track junctions. signaling and interlocking-control of train movements-Level Crossings.

Unit II RAILWAY CONSTRUCTION AND MAINTENANCE   **9**

Earthwork – Stabilization of track on poor soil –Quantity of Materials required for track laying – Track drainage – Construction and maintenance of railway track – Components of Railway Station, yards and passenger amenities-- methods of construction, -material requirements- special measures for high speed track- maintenance of tracks and traffic operations – Recent trends.

Unit III AIRPORT PLANNING   **9**

Air transport -aircraft characteristics: size turning radius, speed, airport characteristics and its influence on airport planning – airport classification – ICAO standards – airport planning: new airports-Site selection- topographical, geographical and Airport obstruction -imaginary surfaces-typical airport layouts, Zoning laws, parking and circulation Area, case studies.

Unit IV AIRPORT GEOMETRIC DESIGN   **9**

Runway Design: Orientation, Wind Rose Diagram, Problems on basic runway length, Corrections for runway length- ICAO standards, runway configuration, runway intersections-Elements of Taxiway Design – exit taxiways -airport zones – Passenger Facilities and Services –Airport capacity-Factors affecting capacity, Determination of runway capacity related to delay, gate capacity, and Taxiway capacity - Holding aprons - terminal buildings - aircraft hangers- Airport Drainage.

Unit V AIR TRAFFIC CONTROL   **9**

Lighting & Markings of Airport - runways and taxiways -Turnaround or bypass taxiway and approach areas. Terminals -Apron - size & number of gate position -aircraft parking system. Air traffic control- Air traffic control network - air traffic control aids: Enroute aids-visual & landing aids- ILS and other associated aids.

TOTAL - 45 Periods

Text Books:
1. Saxena S.C. and Arora S. P., "A Course of Railway Engineering", DhanpatRai, New Delhi,2010
2. Robert M. Horonjeff, Francis X. Mckelvey Planning and Design of Airports, TMH publishers,2010.

Reference Books:
1. C Venkatramaiah, "Transportation Engineering: Volume II: Railways, Airports, Docks and Harbours, Bridges and Tunnels" , The Orient Blackswan ,2016.
2. S.K.Khanna, M.G.Arora, S.S.Jain, Airport Planning & Design, Nemchand Bros, Roorkee, 2011.
3. Web references:
4. ICAO standards:https://www.icao.int/
5. FAA standard: https://www.aai.aero/en/content/airport-policy/

19UCE915   **URBAN PLANNING AND MANAGEMENT**   **L   T   P   C**
                                                                                      3   0   0   3

Course Learning Objectives:

- To study town planning concepts and theories.
- To perceive the concept of urbanization and various growth patterns.
- To study norms and aspects of land use planning policies and survey techniques.
- To study the concepts for different area planning.
- To study the concepts related to planning surveys

Unit I Evolution of Town Planning   9

Evolution in planning- Concept of urban human settlement-rural and urban settlement- Town Characteristics. Urban planning process- Role of urban planner- urban form- Industrial revolution on planning –Case studies of Ebenezer Howard, Patrick Geddes, Sir Arthur Clarence Perry- Le-Corbusier.

Unit II Urbanization   9

Demography and Census Statistics- Significance of Census and Demographics- Planning policies based on Census - Rural and urban Migration- impacts of urbanization, socio – economic impacts of growth of population-Levels of Urbanization - Indian scenario - Issues and Policies, Global scenario, Future trends .

Unit III Growth Patterns   9

Elements of town structure-classification: Functional and geographical- City Centre, Walled city and Urban Fringe areas- growth theories- Characteristics of the urban environment- land use, Modern urban forms- issues in urban areas.

Unit IV Urban Land Use Planning   9

Objectives and Principles of Urban planning- Different Land use planning norms- Environmental aspects of land use planning,- DTCP guidelines in Town planning - Land use- demand and supply of land relationship- Government policies of urban development - Role of Professional bodies.

Unit V Planning Surveys   9

Objectives, types, significance, methodology and applications of planning survey-   Use of planning surveys- Modeling such as MLR analysis - Planning parameters- Neighborhood Planning- Satellite Towns- Government Policies for small and medium towns.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Apply the concept of urban planning process during programme planning.
- Analyse the impact of urbanization on socio economic levels of cities.
- Analyse the characteristics of Urban Environment using the demand and supply of land.
- Apply the urban planning theories in developing urban centers & layouts.
- Apply the planning parameters recommended by DTCP in Land use planning.
- Apply the concept of MLR techniques in modeling.

Text Books:
1.　　R. Ramachandran, "Urbanisation and Urban Systems in India", Oxford Publications.
2.　　2. K. C. Shivrama Krishnan, "Revisioning Indian Cities", Sage Publications.

Reference Books:
1.　　A.B. Gillion and Simon Eisner, "The Urban Pattern", CBS Publishers and Distributors.
2.　　S.Ward (2002), "Planning the 20th Century City" John Wiler & Sons.

19UCE916   **COASTAL ENGINEERING**   **L T P C**
                                                                          3 0 0 3

Course Learning Objectives:
- The main purpose of coastal engineering is to protect harbors.
- It helps in improving navigation.
- The students are exposed to the diverse topics of wave mechanics and wave climate.
- To inculcate knowledge on laboratory investigations using model studies.

Unit I INTRODUCTION TO COASTAL ENGINEERING   **9**

Indian Scenario - Classification of Harbours Introduction - wind and waves - Sea and Swell introduction to small amplitude wave theory - use of wave tables- Mechanics of water waves Linear (Airy) wave theory, Introduction to Tsunami.

Unit II WAVE PROPERTIES AND ANALYSIS   **9**

Behaviour of waves in shallow waters, Introduction to non-linear waves and their properties Waves in shallow waters - Wave Refraction, Diffraction and Shoaling - Hind cast wave generation models, wave shoaling; wave refraction; wave breaking; wave diffraction random and 3D waves Short term wave analysis - wave spectra and its utilities - Long term wave analysis- Statistics analysis of grouped wave data.

Unit III COASTAL SEDIMENT TRANSPORT   **9**

Dynamic beach profile; cross-shore transport; along shore transport (Littoral transport), sediment movement- Dredging – Dredgers - Environmental effects of dredging - Remote sensing and GIS application in coastal engineering.

Unit IV COASTAL DEFENSE   **9**

Field measurement; models, groyne, sea walls, offshore breakwaters, artificial nourishment planning of coast protection works - Design of shore defense structures Maintenance of coastal structures.

Unit V MODELING IN COASTAL ENGINEERING   **9**

Physical modeling in Coastal Engineering - Limitations and advantages - Role of physical modeling in coastal engineering - Numerical modeling - Modeling aspects - limitations – Tsunami mitigation measures.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Understand coastal engineering aspects of harbors methods to improve navigation.
- Understand the wave properties and analysis of wave.
- Understand the concepts of sediment transport.
- Design of shore defense structures.
- Gain knowledge in modeling in coastal engineering.

Reference Books:
1. Mani J.S., ―Coastal Hydrodynamics‖, PHI Pvt. Ltd. New Delhi - 2012.
2. Dean, R.G. and Dalrymple, R.A., ―Water wave mechanics for Engineers and Scientists‖, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1994.
3. Ippen, A.T., ―Estuary and Coastline Hydrodynamics‖, McGraw-Hill, Inc., New York, 1978.
4. Sorenson, R.M., ―Basic Coastal Engineering‖, A Wiley-Inter science Pub. New York, 1978.
5. 5.Coastal Engineering Manual, Vol. I-VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC, 2006.

19UCE917   STRUCTRURAL DYNAMICS AND EARTHQUAKE ENGINEERING   L   T   P   C

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Course Learning Objectives:

- To provide a basic understanding of dynamic loading.
- To outline the effects of earthquake loading on the Behaviour of structures.
- To make the students to understand the codal provisions to design the earthquake resistant structures.

Unit I SINGLE DEGREE OF FREEDOM SYSTEM   9

Definition of degree of freedom – Idealization of structure as SDOF system – Formulation of equation of motion for various SDOF system – D"Alembert's Principles – Effect of damping – Free and forced vibration of damped and un damped structures – Response to harmonic forces and periodic forces.

Unit II MULTI DEGREE OF FREEDOM SYSTEM   9

Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of un damped and damped MDOF systems – Modal superposition methods.

Unit III INTRODUCTION TO EARTHQUAKE ENGINEERING   9

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seism tectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

Unit IV EARTHQUAKE EFFECTS ON STRUCTURES   9

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

Unit V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN   9

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Base Isolation Techniques – Design and detailing using (IS 13920:1993).

TOTAL - 45 Periods

After successful completion of this course, the students will be able to

- Calculate the free and forced vibration characteristics of SDOF systems.
- Evaluate and describe the response of MDOF systems using the principal of mode superposition.
- Estimate earthquake parameters.
- After successful completion of this course, the students will be able to
- Calculate the free and forced vibration characteristics of SDOF systems.
- Perform calculations to evaluate seismic response of simple structures using response spectra

method.

- Apply BIS codes for earthquake resistant design and detailing of R.C.C. and masonry buildin gs.

TEXT BOOKS:
1. S.R.Damodarasamy and Kavitha S.Basics of Structural Dynamics and Aseismic Design, PHI Learning Private Limited, New Delhi, 2009.
2. Agarwal.P and Shrikhande.M.,Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.
3. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, Mc Graw Hill International Edition, 1995

REFERENCES:
1. Mario Paz, Structural Dynamics – Theory and Computations, Third Edition, CBS publishers, 1990.
2. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 1994.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986
4. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2001.

STANDARDS:
1. IS 13920:1993 Ductile detailing of reinforced concrete structures subjected to seismic forces - code of practice.
2. IS 4326:1993(Reaffirmed 2003) Earthquake resistant design and construction of buildings code of practice, Second revision.
3. IS 1893(Part 1):2002 Criteria for earthquake resistant design of structures, Fifth revision .

19UCE918   CONSTRUCTION TECHNIQUES, EQUIPMENTS AND PRACTICES   L   T   P   C

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Course Learning Objectives:

- The various construction techniques used in the construction field.
- The latest construction practices used in the construction.
- The various construction methods for the sub-structure used in the construction sites.
- The knowledge about the various construction procedures for super-structure such as bridge deck, offshore structures, domes etc.
- The various equipment needed for construction of various types of structures to handle the materials.

Unit I CONSTRUCTION TECHNIQUES   9

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 - Meaning - Building automation - Energy efficient buildings for various zones.

Unit II CONSTRUCTION PRACTICES   9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick –– weather and water proof – roof finishes – acoustic and fire protection.

Unit III SUB STRUCTURE CONSTRUCTION   9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking 102 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.

Unit IV SUPER STRUCTURE CONSTRUCTION   9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors Erection of articulated structures, braced domes and space decks

Unit V CONSTRUCTION EQUIPMENT   9

Selection of equipment for earth work - 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 – types of cranes - Equipment for dredging – Safety Measures.

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Know the different construction techniques and structural systems (Understand / Remember)
- Understand various techniques and practices on masonry construction, flooring, and roofing.(Apply)
- Plan the requirements for substructure construction.(Analyse)
- Know the methods and techniques involved in the construction of various types of super structures(Evaluate)
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.(Create/Individual Team work)
- Make an effective communication and presentation as a Individual / team in related problems(Communication)

Text Books:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997. 103
3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

Reference Books:

1. 1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. 2. Sharma S.C. —Construction Equipment and Management‖, Khanna Publishers New Delhi, 2002.
3. 3. Deodhar, S.V. —Construction Equipment and Job Planning‖, Khanna Publishers, New Delhi, 2012.
4. 4. Mahesh Varma, —Construction Equipment and its Planning and Application‖, Metropolitan Book Company, New Delhi, 1983.

19UCE919	**CONCRETE TECHNOLOGY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Learning Objectives:
- To provide knowledge on the microstructure, admixtures, properties and mix design of concrete.
- To introduce the applications of special concretes and the concreting methods.

Unit I PRODUCTION OF CONCRETE AND ADMIXTURES 9

Production of concrete, mixing, compaction curing, Quality of water for use in concrete. Chemical admixtures - Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

Unit II FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Fresh properties: Workability – definition, factors affecting workability, measurement of workability by slump, compaction factor, vee-bee and flow tests. Segregation and bleeding- Defects in Concrete– Hardened properties: Behavior of concrete in tension and compression, shear and bond, Influence of various factors on test Results, Time dependent behavior of concrete -creep, shrinkage and fatigue - Non-destructive tests on concrete.

Unit III PROPORTIONING OF CONCRETE MIX 9

Concrete mix design- Design Mix and Nominal Mix - Proportioning of concrete mixes, basic considerations, cost specifications, factors in the choice of mix proportion, different method of mix design- BIS, ACI and DOE Methods of Mix Design - Mix Design Examples.

Unit IV SPECIAL CONCRETES 9

Special concrete; types and specifications – Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferro cement - Ready mix concrete – SIFCON - Shot Crete – Polymer concrete - High performance concrete - Geopolymer Concrete.

Unit V DURABILITY OF CONCRETE 9

Durability – definition and significance. Permeability, sulphate and acid attack, chloride attack and carbonation, Resistance to freezing, , efflorescence, fire resistance- Quality control, Behavior of concrete in extreme environment; temperature problem in concreting, hot weather, cold weather and under water conditions, Inspection and testing of concrete-Concrete cracking, types of cracks, causes and remedies -Deterioration of concrete and its prevention Repair and rehabilitation.(Case studies).

TOTAL - 45 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,
- Explain the Production, Properties, Mix proportion and Durability of Concrete. **(Understand)**
- Perform the Quality control test on Fresh, Hardened and Durability of Concrete properties. **(Apply)**
- Estimate the Quantities of construction materials for concrete mix design using standard software package. **(Apply)**
- Analyse the suitable special concrete for different site conditions & requirements. **(Analyse)**
- Analyse the effects of Admixtures in fresh concrete properties and its durability. **(Analyse)**
- Investigate the durability study on concrete to avoid deterioration in structures. **(Evaluate)**

Text Books:
1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2014.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2020.
3. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
4. Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2018.

Reference Books:
1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2000.
2. Gambhir, M.L; "Concrete Technology", 5thEdition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2017
3. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
4. Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2017.

IS Codes: (If necessary for your course)
1. IS code: IS10262-2009 Concrete Mix Design, Bureau of Indian Standards, New Delhi

19UCE920   **DISASTER PREPAREDNESS & PLANNING**   **L T P C**
                                                                                        3 0 0 3

Course Learning Objectives:
- To Understand basic concepts in Disaster Management.
- To Understand Definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand Impacts of Disasters Key Skills.

Unit I Introduction   9
Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details,capacity,impact,prevention,mitigation.

Unit II Disasters   9
Disasters classification; natural disasters (floods,draught,cyclones,volcanoes,earthquakes, tsunami, landslides coastal erosion, soil erosion, forest fires etc.); manmade disasters(industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and Vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit III Disaster Impacts   9
Disaster impacts (environmental, physical, social, ecological, economic, political,etc.);health,psycho-socialissues;demographic aspects(gender,age,specialneeds);hazardlocations;globalandnationaldisaster trends; climate change and urban disasters.

Unit IV Disaster Risk Reduction (DRR)   9
Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structuralandnon-structuralmeasures;riskanalysis,vulnerabilityandcapacityassessment;early warningsystems,Postdisaster,environmentalresponse(water,sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions,NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Unit V Disasters, Environment and Development   9
Factors affecting vulnerability suchas impact of developmental project sand environmental modifications (including use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and developm

TOTAL - 45 Periods

Course Outcomes:
After the successful completion of the course students will be able to,
- The application of Disaster Concepts to Management.
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters and.
- Realization of the responsibilities to society.

Text Books:

1. PradeepSahni,2004,DisasterRiskReductioninSouthAsia,PrenticeHall.

2. SinghB.K.,2008,HandbookofDisasterManagement:Techniques&Guidelines,RajatPublication.

3. GhoshG.K.,2006, Disaster Management,APHPublishingCorporation.

Reference Books:

1. http://ndma.gov.in/(HomepageofNational DisasterManagementAuthority)

2. http://www.ndmindia.nic.in/(NationalDisastermanagementinIndia,Ministryof HomeAffairs).

3. DisasterMedicalSystemsGuidelines. EmergencyMedicalServicesAuthority,StateofCalifornia,EMSAno. 214,June 2003.

4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health andPsychosocialSupportin EmergencySettings.Geneva:IASC .

STRUCTURAL DESIGN AND DRAWING   **L   T   P   C**

                                                                                                   2   0   2   3

Course Learning Objectives:
- To provide students with a solid background on the principles of structural engineering design.
- To prepare the students to design liquid storage structures, retaining walls and industrial structures.
- To expose the students the theories and concepts of both concrete and steel design.

Unit I RETAINING WALLS   **10**

Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surcharge– Design of Shear Key-Design and Drawing.

Unit II LIQUID STORAGE STRUCTURES   **10**

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks– Hemispherical Bottomed Steel Water Tank –-Design and Drawing

Unit III INDUSTRIAL STRUCTURES   **10**

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing

Design and Drawing Exercises for practical component   **30**
1. Cantilever Retaining wall.
2. Underground Rectangular Water Tank.
3. Elevated circular water Tank.
4. Simple Steel Roof Trusses.
5. Steel water Tank.

                                                                    TOTAL – 30+30 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,
5. Design reinforced concrete Cantilever Retaining Walls. (Apply)
6. Design reinforced concrete and steel water tanks. (Apply)
7. Design the various steel trusses (Apply)
8. Draw the structural detailing of retaining walls, RCC water tanks and Steel Roof Trusses by using drafting software. (Modern Tool Usage)

Text Books:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C,Ashok Kumar Jain and Arun KumarJain,Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

IS Codes:

1. Krishnamurthy D,Structural Design and Drawing VolI,IIandIII,CBS Publishers, 2010.
2. Shah V L and Veena Gore,Limit State Design of Steel Structures.
3. IS800-2007,Structures Publications, 2009.

4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.

5. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.

6. IS 800 (2007) Indian Standard General Construction In Steel—Code of Practice, Bureau of Indian Standards, New Delhi.

7. IS 875 Part 1 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Dead Load, Bureau of Indian Standards, New Delhi.

8. IS 875 Part 2 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Imposed Load, Bureau of Indian Standards, New Delhi.

9. IS 875 Part 3 (2003) Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Code of Practice-Wind Load, Bureau of Indian Standards, New Delhi.

19UCE922 **ENVIRONMENTAL LAWS AND POLICIES** **L T P C**
                                                         3 0 0 3

Course Learning Objectives:

- To impart knowledge on the policies, legislations, institutional frame work and enforcement mechanisms for environmental management in India.
- To equip the students with the skills needed for interpreting laws, policies and judicial decisions.
- To explore issues relating to the development and deployment of new and emerging technologies, that will create a thorough understanding of smart processes and systems of the present and future.

Unit I INTRODUCTION   9

Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Concept of absolute liability – multilateral environmental agreements and Protocols – Montreal Protocol, Kyoto agreement, Rio declaration –Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act – Institutional framework (SPCB/CPCB/MOEF)

Unit II WATER (P & CP) ACT, 1974   8

Power & functions of regulatory agencies - responsibilities of Occupier, Provision relating to prevention and control, Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Water Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

Unit III AIR (P & CP) ACT, 1981   8

Power & functions of regulatory agencies - responsibilities of Occupier, Provision relating to prevention and control, Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Air Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

Unit IV ENVIRONMENT (PROTECTION) ACT, 1986   12

Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorization – Biomedical waste rules – responsibilities of generators and role of Pollution Control Boards.

Unit V OTHER TOPICS & ISO 14000 SERIES   8

Relevant Provisions of Indian Forest Act, Background and development of ISO 14000 series Public Liability Insurance Act, CrPC, IPC -Public Interest Litigation - Writ petitions - Supreme Court Judgments in Landmark cases. Environmental law in India: Environmental policy and laws.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- To know the origins and sources of environmental laws, and understand how and by whom

environmental laws are made and interpreted.

- To understand the key principles of, and actors within, environmental laws.
- To critically analyze environmental laws within various contexts and to evaluate laws against procedural and substantive criteria.
- legal knowledge and the Legal system operating in India and will be in a position to prepare compliance reports for getting environmental clearance.

Text Books:
1. Shyam Divan and Armin Roseneranz "Environmental law and policy in India" Oxford University Press, New Delhi, 2001.
2. Dr Nishtha Jaswal Dr. P S Jaswal "Environmental Law" Allahabad Law Agency, 2017.

Reference Books:
1. 1 CPCB, "Pollution Control acts, Rules and Notifications issued there under "Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi, 1997.
2. Greger I. Megregor, "Environmental law and enforcement", Lewis Publishers, London1994.
3. Constitution of India [Referred articles from part-III, part-IV and part-IV A]
4. Pares Distn. Environmental Laws in India (Deep, Latest edition.)
5. Handbook of environmental management and technology: Gwendolyn Holmes, Ben Ramnarine Singh, Louis Theodore.
6. The ISO 14000 Handbook: Joseph Cascio.
7. ISO 14004: Environmental management systems: General guidelines on principles, systems and supporting techniques (ISO 14004:1996 (E)).
8. ISO 14001: Environmental management systems: Specification with guidance for use (ISO 14001:1996b(E)).

19UCE923   **ENVIRONMENTAL QUALITY MONITORING**   L   T   P   C
                                                                              3   0   0   3

Course Learning Objectives:
- To introduce the students to conceive knowledge about the sampling methods for the quality monitoring for Air, Water and Soil.
- The course will also emphasize environmental investigative techniques, instrument selection, and quality control, including documentation, calibration, and sample management.

Unit I Introduction to EQM   **9**

Definition of Environment - Objectives and functions of monitoring-Environmental Indicators - Link between source/environment/receptor - Exposure; Health effects; Toxicology - fate and transport of pollutants.

Unit II Quality control and Quality Assurance   **9**

Quality Parameters for environmental water, air and soil - Monitoring of environmental parameters - definition and synthesis of a monitoring – sampling - analysis method – Selection of monitoring sites- Types of monitoring program - Sampling requirements- Sampling methods – Preservation of samples - Quality Assurance and quality control (QA/QC).

Unit III Water Quality Monitoring   **9**

Water quality guidelines – Quality indicators - Monitoring of quality indicators – Water quality monitoring programs – In situ and Ex situ studies – Structure of monitoring report for water quality – Rehabilitation and Sustainable usage.

Unit IV Air and Soil Quality Monitoring   **9**

Air quality guidelines – Air quality monitoring programs – Emission control– Indoor and outdoor monitoring - Soil contaminants – Rehabilitation studies - Soil remediation – Barrier system – Physico chemical methods – Biological methods – Rehabilitation studies.

Unit V Advanced monitoring system   **9**

Environmental Information system (ENVIS) – Real time monitoring system with GIS and Remote sensing – Sensors and IoT based techniques – Case Studies.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Comprehend the importance of quality monitoring on society and ecosystem by stressing on quality practices.(Understand)
- Describe the nature of exposure, health effects due to transport of toxicants.(Understand)
- Identify the contaminants, monitor them and treat them with suitable technology.(Apply)
- Apply the concepts of engineering with advanced technologies to select sampling sites, collect samples and forecast soil, water and air quality. (Apply)
- Carry out sample collection, preserve them, analyze the collected samples and plan suitable

monitoring system with advanced software.(Analyze)
- Prepare reports for real time monitored data and suggest possible remediation and rehabilitation measures. .(Analyze)

Text Books:
1. FR Burden, Alex Guenther, Ian McKelvie, Environmental Monitoring Handbook, Tata McGraw-Hill Publishing Company Limited,2002.
2. Ragazzi, Marco, Air quality monitoring, measuring and modeling environmental hazards, Apple Academic Press (2017)
3. Young J. Kim, Advanced Environmental Monitoring, Springer, 2008.

Reference Books:
1. IS:5182 , Methods for measurements of air pollution(Part- I,II,IV,V,X).
2. Guidelines on the Shared Environmental Information System reporting mechanism, United Nations Economic Commission for Europe, 2020.

19UCE924   **SUSTAINABLE CONSTRUCTION**   **L   T   P   C**
                                                                           3   0   0   3

Course Learning Objectives:
- To get a comprehensive overview of materials used for sustainable buildings.
- To understand the effects of technology on materials and the way they are used with respect to sustainability.
- Demonstrate an ability to evaluate and/or design whole or parts of projects, taking into account not only the financial and economic issues but also the social and environmental impacts affecting the sustainability of infrastructure.
- Promote an approach to project evaluation that is based on an appreciation of the needs of society, the potential for sustainable development, and recognition of the problems that may result from poorly conceived or poorly implemented projects and programs.

Unit I INTRODUCTION TO SUSTAINABLE BUILDING MATERIALS   9
Introduction to sustainable building materials, qualities, use, examples - Natural building materials, locally available and locally manufactured materials, bio materials - Salvaged and recycled materials - Non-toxic materials: low VOC paints, coating and adhesives. Basics of Formwork and Staging.

Unit II CONCEPTS OF EMBODIED ENERGY AND CARBON FOOTPRINT   9
Idea of embodied energy - Development of the concept, factors to be considered, calculation techniques for embodied energy - Data sets available for calculation of embodied energy - Case studies of embodied energy calculations - Sample embodied energy calculations for a material - Concept of embodied carbon or carbon footprint of material, calculation techniques, methods to off-set high embodied energy - Cradle to cradle material, whole life cycle and life cycle costing analysis techniques.

Unit III SUSTAINABLE CONSTRUCTION TECHNIQUES   9
Alternative construction techniques such as SMB, CSEB, and steam cured blocks, composite beam and panel, funicular shells, filler slabs, reinforced concrete masonry, vaulted roofs, Ferro-cement walls etc., - Case studies- Examination of the current LEED for New Construction rating system, and case study analysis of highly successful recent "green construction projects" through student team assignments and presentations.

Unit IV SUSTAINABLE CONSTRUCTION METHODS   9
Types of foundations and construction methods; Common building construction methods ; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges; Identification of cutting edge sustainable construction materials,. Preparation for the LEED Green Associate professional licensing exam.

Unit V ENGINEERING MATERIALS FOR SUSTAINABILITY   9
Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design, evaluation, and production of green construction materials. Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design,

evaluation, and production of green construction materials.

<div align="right">**TOTAL - 45 Periods**</div>

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Understand rating systems and compares key features such as cost, ease of use, and building performance.
- Know rating systems in detail, including its evolution, objectives, criteria, levels of certification benefits, and shortcomings.
- Know a series of case studies representing diverse project types, sizes, certification levels, and climate regions.
- Know what are "lessons learned" of sustainable construction through case studies.

Text Books:

1. Sustainable Building - Design Manual Pt 1 & 2, The Energy and Resources Institute, TERI, 2004.
2. Ross Spiegel.G, Green Building Materials A Guide to Product Selection and Specification, 3rd Edition by, John Wiley & Sons, 2010.
3. Jagadish. K.S. Alternative Building Materials and Technologies, New age International Pvt Ltd Publishers, 2008.
4. Traci Rose Rider, Stacy Glass, Jessica McNaughton, Understanding Green Building Materials, W.W.Norton and Company, 2011

   Johan van Lengen, The Barefoot Architect: A Handbook for Green Building, Shelter Publication, 2008.

19UCE925   **AIR AND NOISE POLLUTION CONTROL AND MANAGEMENT**   **L   T   P   C**
                                                                                 3   0   0   3

Course Learning Objectives:
- To impart knowledge on the principle and design of control of Noise, particulate and gaseous air pollutant and its emerging trends.
- To provide an understanding of the fundamentals of meteorology and stability of atmosphere.

Unit I SOURCES AND EFFECTS OF AIR POLLUTANTS   9
Definition, Scope and Scales of Air Pollution - Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings- property- aesthetic value and visibility vegetation- animals – automobile pollution - Global warming - Ozone layer depletion.9

Unit II DISPERSION OF POLLUTANTS   9
Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Stack Plume pattern – Dispersion of pollutants – Dispersion models – Applications.

Unit III AIR POLLUTION CONTROL   9
Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Incineration - Bio Filters – CO_2 capturing - Pollution control for specific major industries.

Unit IV AIR QUALITY MANAGEMENT   9
Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Legislation and enforcement – Environmental Impact Assessment.

Unit V NOISE POLLUTION   9
Sources of noise pollution - Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria – Effects – Assessment - Standards – measurement and various control methods – Prevention of noise pollution – special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom.

                                                                        TOTAL - 45 Periods

Course Outcomes:
      After the successful completion of the course, Students will be able to,
- Understand and explain the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management. (Understand).
- Apply the knowledge to identify, formulate and solve air and noise pollution problems. (Apply).
- Design of components for stacks and particulate air pollution control devices to meet applicable standards. (Design).
- Recognize, articulate and investigate the efficiencies and ability to select appropriate particulate and gaseous control equipment's for various complex air pollution problems. (Analysis)
- Use the knowledge based on Analysis and Interpretation of air pollution problems in various areas

and air quality data to provide valid conclusion for control of air pollution. (Evaluate)
- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools to solve air pollution prediction and modelling. (Modern Tool Usage).

Text Books:
1. Lawrence K. Wang, Norman C. Pareira and Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Mc Graw Hill, New York, 2000.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

Reference Books:
1. David H.F. Liu and Bela G. Liptak„ "Air Pollution", CRC Press, 2018.
2. Arthur C.Stern„ "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis„ "Air Pollution Engineering Manual", John Wiley & Sons, Inc.,2000.
4. Rao, C. S., "Environmental Pollution Control Engineering", New Age International, New Delhi, 2007.
5. Rao, M. N. and Rao H. V. N., "Air Pollution", Tata McGraw-Hill, New Delhi, 2017.

19UCE926   **VALUATION ENGINEERING**   **L   T   P   C**
                                                                                                3   0   0   3

Course Learning Objectives:
- Make the students to understand the various methods and guidelines for valuing the properties.

Unit I DIMENSIONS OF VALUATION   **9**
History of valuation – Purpose of valuation – Responsibilities of a valuer - Basic principles of valuation.

Unit II VALUATION OF LAND   **9**
Introduction – Explanations of various terms used in valuation of land - Extent of land – Unit rate – FSI and plot coverage – Land locked land – Recess land – Strips of land – FMB & Topo Sketch – Case studies

Unit III VALUATION OF BUILDING   **9**
Introduction – Explanations of various terms used in valuation of buildings. Replacement value – Depreciation – Present value – Straight line method – Linear method – Life of structure – Case studie

Unit IV GUIDELINES FOR PREPARATION OF VALUATION REPORT   **9**
Different methods of valuation - Guidelines for valuation of residential buildings and flats – Formats of valuation forms – Model reports

Unit V COMPUTER APPLICATIONS IN VALUATION PRACTICE   **9**
Use of internet, GIS in valuation reports – Introduction to software for valuation of properties.

                                                                                        TOTAL - 45 Periods

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Predict the value of properties considering various influencing factors.
- Prepare the valuation report corresponding to the required specification.
- Arrive rates of various work items and get familiarized with valuation process.
- Calculate the values of various building by using standard measurement sheet.
- Perform quantity take-offs for various work items using various methods of processing dimensions
- Prepare cost quality control by using software.

Text Books:
1. M Chakraborti, Estimating,Costing,Specification & Valuation In Civil Engineering, Chakraborti publications, 2006.
2. BN Dutta, Estimating and Costing in Civil Engineering (Theory and Practice), CBS Publishers & Distributors Private Limited, 2020.
3. D D Kohli, A Textbook Of Estimating And Costing (Civil), S Chand Publishing, 2013.
4. Rangwala, Estimating, Costing And Valuation, Charotar Publishing House Pvt. Ltd, 2017.

Reference Books:
1. Birdie .G.S, "A Text Book on Estimating and Costing", DhanpatRai Co. Pvt. Ltd., New Delhi, 2021.
2. Banerjee.D.N. "J A Parks Principles And Practice Of Valuation", Eastern Law House Private Ltd., New Delhi, 2015.
3. Jagannathan .G, "Getting More at Less Cost", - The Value Engineering Way, Tata McGraw Hill, New

Delhi, 2004.
4. Course notes on "Estimation and costing", State Institute of Vocational Education Andhra Pradesh, Hyderabad. First Edition: 2006.

	L	**T**	**P**	**C**

19UCE971   **REMOTE SENSING AND GIS**

L   T   P   C
3   0   0   3

Course Learning Objectives:
- To study the basics of EMR and its interaction with atmospheric windows.
- To impart the knowledge on basics of platforms and sensors.
- To provide the knowledge on interpretation of images
- To get introduced on basic concepts of GIS.
- To understand the process of storage and analysis of various data.

Unit I EMR AND ITS INTERACTION WITH ATMOSPHERE   **9**

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory– Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil .

Unit II PLATFORMS AND SENSORS   **9**

Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors-resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space borne TIR and microwave sensors.

Unit III IMAGE INTERPRETATION AND ANALYSIS   **9**

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.

Unit IV GEOGRAPHIC INFORMATION SYSTEM   **9**

Introduction – Maps – projections – types – map analysis –GIS definition – basic components of GIS – standard GIS software – Data type – Spatial and non-spatial data – measurement scales – Data Base Management Systems (DBMS).

Unit V DATA ENTRY, STORAGE AND ANALYSIS   **9**

Data models – vector and raster data – data compression – data input by digitization andscanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information system.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Analyze Electromagnetic radiations and their interactions with atmosphere.
- Classify and apply passive and active sensors.
- Interpret and analyze the images.
- Differentiate vector and raster data.
- Analyze data models for different studies.

Text Books:

1. Satheesh Gopi, "Advanced Surveying", Pearson Education, 2007.
2. Duggal R.K, "Surveying" Vol. I and II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

Reference Books:

1. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England, 2006.
2. Anderson, J.M. and Mikhail, E.M., "Surveying: Theory and Practice", McGraw Hill, 1998 .
3. Schofield, W. and Breach M., "Engineering Surveying", 6th Ed., Butterworth-Heineman,2007.
4. Bossler, J.D., "Manual of Geospatial Science and Technology", Taylor and Francis,2002.
5. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information System", Oxford University Press, 2000.

19UCE928 **INSTRUMENTATION AND SENSOR TECHNOLOGY FOR CIVIL ENGINEERS** **L T P C**

3 0 0 3

Course Learning Objectives:

- To learn the principles of measurements of static and dynamic response of structures and carryout the analysis of results.

Unit I INTRODUCTION AND STRAIN MEASUREMENT   9

Basic Concept in Measurements – Types of strain gauges – Hydraulic jacks – pressure gauges – proving rings – electronic load cells-vibrating wire sensors– Fibre optic sensors.

Unit II Linear Variable Differential Transformer (LVDT)   9

Linear Variable Differential Transformer (LVDT) – Transducers for velocity and acceleration measurements. Vibration meter – Seismographs – Vibration Analyzer – Display and recording of signals– Digital data Acquisition systems.

Unit III FLOW AND THERMAL SENSOR   9

Flow sensors: Solid-Flow- and Liquid Flow Measurement, Pipe Flow Principles, Restriction Flow Sensors, Obstruction Flow Sensor- Magnetic Flow Meter
Temperature Sensor: Thermocouple, RTD, & Liquid in Glass; Flow Sensor: Ultrasonic, Electromagnetic, Laser & Thermal; Level Sensor: Ultrasonic & Capacitive; Proximity Sensor, Concept of Smart Sensors:

Unit IV MEASUREMENTS AND CONTROL   9

Diagnosis of distress in structures–Crack observation and measurements – corrosion of reinforcement
in concrete –– damage assessment – controlled blasting for demolition – Techniques for residual stress measurements – Structural Health Monitoring.

Unit V NON DESTRUCTIVE TESTING METHODS   9

Load testing on structures, buildings, bridges and towers – Rebound Hammer – acoustic emission – ultrasonic testing principles and application –– Brittle coating, Advanced NDT methods – Ultrasonic pulse echo, Impact echo, impulse radar techniques, GECOR , Ground penetrating radar (GPR).

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Choose the methodology of measuring errors and strains and calibrate the machineries and equipment used in the laboratory.
- Use various vibration measuring instruments and analyse the structures using digital display unit.
- Scale the model using direct and indirect model analysis.
- Measure distress in the structures using various electronic equipment.
- Perform advanced NDT methods in accessing the load testing of structures.
- To conduct modern engineering experiments with sensor technologies with the application of smart sensors using IoT, AI and ML.

Reference Books:

1. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi,1996.
2. Dalley.J.W andRiley.W.F, "Experimental Stress Analysis", McGraw HillBook Company, N.Y. 1991.
3. Srinath.L.S, Raghavan.M.R, ingaiah.K, Gargesha.G, Pant.B and Ramachandra.K, "Experimental Stress Analysis", Tata McGraw Hill Company, New Delhi, 1984.
4. Sirohi.R.S.,Radhakrishna.H.C, "Mechanical Measurements", New AgeInternational (P) Ltd. 1997.
5. Bray.D.E. and Stanley.R.K., "Course Material on Non-destructive Evaluation",
6. McGraw Hill Publishing Company, New York.1989
7. Ravisankar.K.and Chellappan.A., "Advanced course on Non-DestructiveTesting and Evaluation of Concrete Structures", SERC, Chennai, 2007.
8. Ganesan.T.P, "Model Analysis of Structures", University Press, India, 2000.

	L	T	P	C

19UCE929   **DESIGN OF FORMWORK**

L T P C
3 0 0 3

Course Learning Objectives:

- To teach form work materials.
- To impart the knowledge on From work design for special structures.
- To prepare them to study flying formwork and form work failures.

Unit I Introduction and Formwork Materials   **9**

Requirements and Selection of Formwork. Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

Unit II Formwork Design   **9**

Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams..

Unit III Formwork Design for Special Structures   **9**

Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

Unit IV Flying Formwork   **9**

Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues – Pre- and Post-Award.

Unit V Formwork Failures   **9**

Causes and Case studies in Formwork Failure, Formwork Issues in Multistory Building Construction.

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Select proper formwork, accessories and material. (Understand)
- Design the form work for Beams, Slabs, columns, Walls and Foundations. (Apply)
- Design the form work for Special Structures. (Apply)
- Understand the working of flying formwork. (Understand)
- Judge the formwork failures through case studies. (Evaluate)

Reference Books:

1. Formwork for Concrete Structures, Peurify, Mc Graw Hill India, 2015.
2. Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education, 2012.
3. IS 14687: 1999, False workfor Concrete Structures - Guidelines, BIS.

		L	**T**	**P**	**C**
19UCE930	**MASONRY STRUCTURES**	**3**	**0**	**0**	**3**

Course Learning Objectives:
- To provide knowledge on various materials used in the masonry structures.
- To provide knowledge on behavior of masonry in compression and effect of masonry unit height on compressive strength.
- To develop an understanding on the basic concepts in the behavior and design of masonry structures under flexural and shear strength.
- To explain the basic concepts in the design of load bearing masonry structures.
- To explain the behavior of masonry structures during earthquakes.

Unit I   INTRODUCTION   9
Introduction, Masonry units, materials and types: History of masonry, Characteristics of Brick, stone, clay block, concrete block, stabilized mud block masonry units. Strength, modulus of elasticity and water absorption. Masonry materials – Classification, properties of mortars & Selection of mortars.

Unit II   STRENGTH OF MASONRY IN CONSTRUCTION   9
Behavior of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, failure theories of masonry under compression. Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength

Unit III   FLEXURAL AND SHEAR BOND   9
flexural strength and shear strength: Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength. Permissible stresses: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.

Unit IV   DESIGN OF LOAD BEARING MASONRY BUILDINGS   9
Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall.

Unit V   EARTHQUAKE RESISTANT MASONRY BUILDINGS   9
Behavior of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions, Masonry arches, domes and vaults: Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure

TOTAL: 45 PERIODS

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Classify the various types of masonry units and properties of binding mortar.
- Analyze the behavior of masonry in compression and failure theories in masonry walls.
- Describe the flexural and shear strength of the masonry walls.
- Design a masonry wall subjected to various loading and boundary conditions as per codal provisions.

- Identify and solve masonry structural system subjected to gravity, wind and seismic loadings.
-

TEXTBOOKS:
1. Dayaratnam P, "Brick and Reinforced Brick Structures"- Oxford & IBH.
2. Sinha B.P & Davis S.R., "Design of Masonry structures"- C R C press.

REFERENCES:
1. Hendry A.W., "Structural masonry"- Macmillan Educaon Ltd., 2nd edition
2. Curtin, "Design of Reinforced and Pre-stressed Masonry"- Thomas Telford
3. Sven Sahlin, "Structural Masonry"-Prentice Hall.
4. Jagadish K S, Venkatarama Reddy B V and Nanjunda Rao K S, "Alternative Building Materialsand Technologies"-New Age International, New Delhi & Bangalore.
5. IS 1905, BIS, New Delhi.
6. SP20(S&T), New Delhi.

OPEN ELECTIVE COURSES

REMOTE SENSING AND GIS

L	T	P	C
3	0	0	3

Course Learning Objectives:
- To study the basics of EMR and its interaction with atmospheric windows.
- To impart the knowledge on basics of platforms and sensors.
- To provide the knowledge on interpretation of images.
- To get introduced on basic concepts of GIS.
- To understand the process of storage and analysis of various data.

Unit I EMR AND ITS INTERACTION WITH ATMOSPHERE   9

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory– Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil

Unit II PLATFORMS AND SENSORS   9

Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors-resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space borne TIR and microwave sensors.

Unit III IMAGE INTERPRETATION AND ANALYSIS   9

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.

Unit IV GEOGRAPHIC INFORMATION SYSTEM   9

Introduction – Maps – projections – types – map analysis –GIS definition – basic components of GIS – standard GIS software – Data type – Spatial and non-spatial data – measurement scales – Data Base Management Systems (DBMS).

Unit V DATA ENTRY, STORAGE AND ANALYSIS   9

Data models – vector and raster data – data compression – data input by digitization andscanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information system

TOTAL - 45 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Analyze Electromagnetic radiations and their interactions with atmosphere.
- Classify and apply passive and active sensors.
- Interpret and analyze the images.
- Differentiate vector and raster data.
- Analyze data models for different studies.

Text Books:

3. Satheesh Gopi, "Advanced Surveying", Pearson Education, 2007.
4. Duggal R.K, "Surveying" Vol. I and II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.

Reference Books:

6. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England, 2006.
7. Anderson, J.M. and Mikhail, E.M., "Surveying: Theory and Practice", McGraw Hill, 1998
8. Schofield, W. and Breach M., "Engineering Surveying", 6th Ed., Butterworth-Heineman,2007
9. Bossler, J.D., "Manual of Geospatial Science and Technology", Taylor and Francis,2002.
10. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information System", Oxford University Press, 2000.

19UCE972 AIR POLLUTION AND CONTROL ENGINEERING   L   T   P   C
                                                        3   0   0   **3**

Course Learning Objectives:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.
- To give an overview of factors affecting selection of control equipment for particulate and gaseous contaminants.
- To teach the various control and preventive measures of noise pollution.

UnitI INTRODUCTION

9

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

Unit II METEOROLOGY

9

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

Unit III CONTROL OF PARTICULATE CONTAMINANTS

9

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

Unit IV CONTROL OF GASEOUS CONTAMINANTS

9

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

Unit V INDOOR AIR QUALITY MANAGEMENT

9

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

After successful completion of this course, the students will be able to

- Understand the various sources of air pollutants and their effects on human beings, materials and   vegetation.
- Evaluate the processes, approaches, and devices used to control air pollution.
- Apply the knowledge to control of particulate and gaseous contaminants in the environment.

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- Understand the control and preventive measures of noise pollution.
- Apply the appropriate method to improve indoor air quality.
- Use the knowledge based on Analysis and Interpretation of air pollution problems in various areas and air quality data to provide valid conclusion for control of air pollution.

TEXT BOOKS:
1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Anjaneyulu. Y, „Air Pollution and Control Technologies", Allied Publishers (P) Ltd.,India 2002.

REFERENCES:
1. David H.F. Liu, Bela G. Liptak „Air Pollution", Lweis Publishers, 2000.
2. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, „Air Pollution Engineering Manual", John Wiley & Sons, Inc.,2000.
4. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 1995.

Course Learning Objectives:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects.
- To provide the concepts of environmental assessment and environmental audit.
- To give an overview of case studies pertaining to developmental projects.

Unit I INTRODUCTION   9

Impacts of Development on Environment – Sustainable Development Goals - Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle – EIA Notification and Legal Framework – Stakeholders and their Role in EIA– Selection & Registration Criteria for EIA Consultants – Screening and Scoping in EIA – EIA draft policy 2020.

Unit II ENVIRONMENTAL ASSESSMENT   9

Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives.

Unit III ENVIRONMENTAL MANAGEMENT PLAN   9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Environmental Clearance – Environmental Audit – ISO 14001

Unit IV SOCIO ECONOMIC ASSESSMENT   9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis- Public Consultation

Unit V CASE STUDIES   9

EIA case studies pertaining to Infrastructure Projects – Real Estate Development - Roads and Bridges – Mass Rapid Transport Systems - Ports and Harbor – Airports - Dams and Irrigation projects - Power plants – Wastewater Treatment Plants- Waste Processing and Disposal facilities -Mining Projects.

TOTAL: 45 PERIODS

<mark>COURSE OUTCOMES:</mark>
After successful completion of this course, the students will be able to
- Describe the objectives, capability, and limitations of environmental impact assessment

- Explain the methodologies and legal aspects of environmental impact assessment
- Summaries the preparation and review of EIA reports
- Assess the impact of the construction projects on the environment and suggest rehabilitation measures
- Do a case study on Environment Impact Assessment pertaining to Infrastructure Projects.

TEXT BOOKS:
1. Canter, R.L (1997). Environmental impact Assessment, 2nd Edition, McGraw Hill Inc., New Delhi.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu (1997). Environmental Impact Assessment for Developing Countries in Asia. Volume 1 – Overview, Asian Development Bank

REFERENCES:
1. John Glasson, Riki Therivel, Andrew Chadwick (2005), "Introduction to Environmental Impact Assessment", Routledge Publishers
2. Barry Sadler and Mary McCabe (2002), "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme.
3. Anjaneyalu, Y. Valli manickam, "Environmental Impact Assessment Methodologies," B S Publications, India.

19UCE974   **DISASTER MANAGEMENT**   **L T P C**
                                                                            3 0 0 3

Course Learning Objectives:
- To impart knowledge of the basic concepts in Disaster Management, Types and Categories of Disasters the Challenges posed by Disasters and the Impacts of Disasters.
- To provide an understanding of the approaches to disaster risk reduction.
- To create awareness of the disaster management Policies and Legislation in India.

Unit I INTRODUCTION AND TYPES OF DISASTERS   **9**

Definition: Disaster, Hazard, Vulnerability, Resilience risks severity, frequency and details, capacity, impact, prevention, mitigation. Geological disaster: Earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Man-made Disasters (building collapse, rural and urban fire, transportation accidents, nuclear radiation, radiological, chemicals and biological disasters) - mountain and coastal areas - ecological fragility.

Unit II DISASTER IMPACTS   9

Impacts (including social, economic, political, ecological, environmental, health, psycho-social, etc.) Differential impacts: urban disasters, pandemics, complex emergencies, Climate change - hazard locations - global and national disaster trends.

Unit III DISASTER RISK REDUCTION (DRR)   **9**

Disaster management cycle - its Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- non-structural measures – risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities ofcommunity, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs) and other stake-holders.

Unit IV DISASTERS AND DEVELOPMENT   **9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects and environmental modifications such as dams, changes in Land-use, urbanization, etc. sustainable and environmental friendly recovery; reconstruction and development methods.

Unit V DISASTER RISK MANAGEMENT IN INDIA   **9**

Disaster (Hazard and vulnerability) Profile of India – Mega Disasters of India and Lessons Learnt, Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter-Governmental Agencies

TOTAL: 45 PERIODS

After successful completion of this course, the students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society .
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Assess the impact of development projects in Indian Scenario and use appropriate technology and resources.
- Draw the hazard and vulnerability profile of India.
- Carry out field works related to disaster management .

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCES:

1. "Disaster Management Guidelines". GOI-UNDP Disaster Risk Reduction Programme, 2012.
2. "Disaster Medical Systems Guidelines". Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
3. "National Disaster Management Authority", Government of India, New Delhi, 2005.
4. "National Disaster Management Policy", Government of India, ,2009.

	L	**T**	**P**	**C**
19UCE975 **ENVIRONMENTAL SCIENCE AND ENGINEERING**	**3**	**0**	**0**	**3**

Course Learning Objectives:

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

Unit I COMPONENTS OF ENVIRONMENT   9

Components – Water, air and land – Inter-relationship between components – Subcomponents; Ecosystem – Structure and functional components of ecosystem – Development and evolution of ecosystem – Energy flow and material cycling in ecosystem – Natural and man made impacts on water, air and land; Environment and development – Concept of sustainable development

Unit II SCIENCE OF ENVIRONMENT   9

Chemistry, Physics and biology of water, air and land; Stress on the Chemistry, Physics and Biology of water, air and land owing to the impacts; Environmental quality objective and goals – Policies on development projects and their impacts, with emphasis on the branch of engineering of the student.

Unit III CURRENT ENVIRONMENTAL ISSUES   9

Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Air pollution due to industries and vehicles; Global issues – Biodiversity, Climatic change, and Ozone layer depletion

Unit IV ENGINEERING INTERVENTIONS TO REDUCE THE ENVIRONMENTAL STRESSES   9

Minimization of Stress – Principles of Physics, chemistry and biology in engineering interventions such as waste treatment – Flow sheets of engineering interventions relevant to the Engineering discipline of the student – Waste minimization techniques – Clean technology options – Standards of performance of the interventions

Unit V TOOLS FOR ENVIRONMENTAL MANAGEMENT   9

Environmental impact assessment; Precautionary Principle and Polluter Pays Principle; Constitutional provisions, Legal and economic instruments in Environmental Management; Role of Non-government organizations – Community participation environmental management works; International conventions and protocols; Pollution Control Boards and Pollution Control Acts.

TOTAL - 45 Periods

Course Outcomes:

After successful completion of this course, the students will be able to

- Describe the necessity of sustainable development.
- Frame environmental quality policies for development projects and assess their impacts.
- Realize the importance of current environmental issues.
- Have an elaborate knowledge about techniques of waste minimization.
- Understand the social issues and various environmental acts.

Text Books:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Third Edition, Pearson Education, Upper saddle River, New Jersey, 2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata Mc-Graw Hill, New Delhi, 2006.

Reference Books:

1. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Company, Belmont, California, 1996.
2. Anubha Kaushik, Kaushik C.P., "Environmental Science and Engineering", Third Edition, New Age International, New Delhi, 2009.
3. De A.K., "Environmental Chemistry", Wiley Eastern Ltd., New Delhi, 2001.
4. Trivedi R.K., Goel P.K., "Introduction to Air Pollution", Techno-Science Publications, Jaipur, 1995.

	L	T	P	C
19UCE976 **METRO SYSTEMS AND ENGINEERING**	3	0	0	3

Course Learning Objective:
- To familiarize the concepts related mass rapid transit system.
- To expose to various facilities in metro systems.
- To expose about Metro signal systems.
- To provide knowledge on train electrification & operation management.
- To familiarize the concepts on metro stations & depot management.

Unit I   MASS RAPID TRANSIT SYSTEM   9

Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials. Overview and construction methods for: Elevated and underground Stations Commercial and Service buildings. Initial Surveys & Investigations.

Unit II   METRO STATIONS   9

Viaduct spans and bridges; Underground tunnels; Depots; Basics of Construction Planning and Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems - permanent way. Facilities Management

Unit III   METRO SIGNALING AND CONTROL SYSTEMS   9

Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

Unit IV METRO MECHANICAL SYSTEMS   9

Rolling stock, vehicle dynamics Train detection (occupancy of track) and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators

Unit V METRO ELECTRICAL SYSTEMS   9

OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics.

TOTAL - 45 Periods

Course Outcomes:
After successful completion of this course, the students will be able to,
- Select and apply appropriate elevated and underground structure at appropriate situation. (Apply)
- Identify and formulate the sustainable metro structures and routes using the basic principlesof mass rapid transit system.(Analyse)

- Design the layout for operation control systems and focuses on the complexities of project planning and implementation.(Design)
- Investigate the sites and initial surveys resulted in significant transport infrastructure and intra-city connectivity.(Investigate)

- Evaluate the need and purposes of metro transport system to enhance the efficiency of protections and operations.(Evaluate)

TEXT BOOKS:
1. Ponnunsamy S, "Bridge Engineering" , McGraw Hill Education (India) Pvt Ltd, New Delhi, Third edition, 2017.
2. Saxena S C, "Tunnel Engineering" DhanpatRai Publications Pvt Ltd, New Delhi, 2015.
3. Indian Railways Manual Railway Electrification Systems 2012.
4. Ramachandran M, "Metro Rail Projects in India" Oxford University Press, 2011.

REFERENCES:
1. Detailed Project Reports of Various Metro Projects in India – By Delhi Metro Rail Corporation- 2018.
2. Maintenance Manual for Diesel Locomotives – Indian Railways -2013

19UCE977	ROAD SAFETY	L	T	P	C
		3	0	0	3

Course Learning Objectives:

- Exposure on the traffic engineering basics & statistics methods to analysis the traffic safety.
- Knowledge on the influencing factors and causes of accidents.
- Idea about the role of road safety in planning and design of the urban infrastructure.
- Exposure about the traffic management systems for improving the road safety.

Unit I   Fundamentals of Traffic Engineering   9

Characteristics of Motor vehicle Traffic, Highway Capacity- Applications of Traffic Control Devices- Traffic Design of Parking Facilities- type of surveys – Application of statistical methods in Traffic Safety – Regression Methods, Poisson Distribution, Chi- Squared Distribution (problems).

Unit II   Accident Investigations and Risk Management   9

Accident Data-Condition and Collision Diagram-Causes and Remedies-Traffic Management Measures- Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Crashes and Countermeasures, Safety Design - Accident Reconstruction.

Unit III   Road Safety in Geometric Design   9

Vehicle, road users and road characteristics-road design and equipments redesigning junctions, -intersection improvements-reconstruction & rehabilitation, traffic control, concepts of vehicle design& protective devices.

Unit IV   Urban infrastructure in Road safety   9

Geometric design of roads- significance of horizontal & vertical elements- Role and importance of junctions: at grade and grade separated intersections - road safety in urban transport, sustainable modes and their safety.

Unit V   Traffic Management Systems for Road Safety   9

Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

TOTAL - 45 Periods

Course Outcomes:

After successful completion of this course, the students will be able to,

- Investigate the causes of the accidents using collision diagram and other tools . *(A)-Cognitive*
- Prepare the condition and collision diagrams by visualizing the traffic and crash data. (Psychomotor)
- Analyse the role and characteristics Vehicle, road users and drivers using statistical methods.
- Suggest suitable strategies to solve the road accidents analyzing the Vehicle and road users characteristics. (*(A)-Cognitive)*
- Analyse and design the horizontal and vertical sectional elements of the road considering the safety conditions and ITS. (*(A)-Cognitive*)
- Design and implement road safety audit to assess the level of safety management implemented in a road section. (Affirmative)

Text Books:
1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers.
2. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall, McGraw Hil,

Reference Books:
1. (IRC:119-2015 : guidelines for traffic safety barriers).
2. Elvik Rune, The Handbook of Road Safety Measures (2009-10-20).
3. S.S Randhawa,"Textbook of Enviornmental Education with Road Safety and Traffic Rules (as per standard adopted by UGC) PV Books,2016.

L T P C

3 0 0 3

Course Learning Objectives:
- To impart the knowledge and skills to identify and assess the waste storage, collection, transfer, handling and disposal measures.
- To provide the knowledge on issues of solid waste management.
- To give an overview of legislation and regulations of solid waste management.

Unit I INTRODUCTION TO SOLID WASTE MANAGEMENT   9

Need and objectives – waste management hierarchy – Functional elements – Environmental impact of mismanagement – solid waste: Sources, types, composition, quantities, physical, chemical and biological properties.

Unit II STORAGE, COLLECTION & TRANSFER   9

General considerations for waste storage at source – factors affecting storage and collection - collection services – collection system, equipments, time and frequency of collection – labour requirement - collection routes – preparation of master schedules - Need for transfer operation - – transfer stations – types: Transfer stations – selection of location, types & design requirements, operation & maintenance.

Unit III PROCESSING & DISPOSAL OF MUNICIPAL SOLID WASTE   9

Processing technologies: composting, incineration and pyrolysis. Energy recovery from solid waste – Bio-methanation. Disposal: Landfill and its introduction – Essential components – site selection – Land filling methods – Leachate analysis and landfill gas management – treatment and disposal. Municipal solid waste management rules 2016.

Unit IV BIOMEDICAL WASTE MANAGEMET & HEALTH ASPECTS   9

Biomedical waste: sources and generation – classification of biomedical waste – management technologies. Health Aspects: handling, processing, segregation, recovery, recycling and reuse of solid waste. Public involvement and participation in solid waste management practices. Biomedical waste management rules 2016.

Unit V INDUSTRIAL & E-WASTE MANAGEMENT   9

Industrial waste: sources – types – collection and disposal – control measures – recycling.   E-waste: sources – types – recycling – disposal. Dangers of E-waste. E – Waste management Rules 2016.

TOTAL - 45 Periods

Course Outcomes:
After successful completion of this course, the students will be able to,
- Explain the waste management hierarchy and identify opportunities to minimize solid waste production.(Understand)
- Identify the suitable site for landfill and processing facility. (Apply)
- Carry out physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.(Apply)

- Integrate technical solid waste management options and imposed environmental legislation to develop legal and safe solutions.(Analyse)
- Prepare a route optimization for a solid waste collection and transport system. (Analyse)

TEXT BOOKS:
1. Cherry P M, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018.
2. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management – Science and Engineering , Butterworth-Heinemann, 2016.

REFERENCES:
1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill India, First edition, 2015.
2. CPHEEO, "Manual on Municipal Solid waste management, Vol I, II and III, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2016.
3. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering - A Global Perspective, 3rd Edition, Cengage Learning, 2017.
4. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc-Graw Hill International edition, New York,2010.
5. John Pitchtel,Waste Management Practices, CRC Press, Taylor and Francis Group,2014.
6. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010.

ONE CREDIT COURSES

19UCE861   **GREEN BUILDING CONCEPTS**   **L T P C**
                                                                                     1 0 0 1

Course Learning Objectives:

- To understand the necessity of adopting the basic green buildingconcepts.

Introduction to Global Warming - Sources of global warming - Green buildings: Concepts - Rating – Rating by various agencies - Materials used and their Efficiency - Comparison of conventional & green buildings - Environment friendly and cost effective building technologies - Buildings with cost and energy efficient roofing systems - Building in different climaticregions

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Adopt green building concepts inbuildings.

Reference Books:
1. Jerry Yudelson,"The green building revolution", Island press,2010.
2. Abe Kruger and Carl Seville, "Green building: principles and practices in residential construction", Cengage learning,2012.

15UCE862   **PRACTICAL ASPECTS OF ARCHITECTURE**   L   T   P   C
                                                          1   0   0   1

Course Learning Objectives:

- To give exposure about architectural principles in the design of buildings.
- To impart knowledge in the national traditions and the local regional heritage in architecture, landscape design including the vernacular tradition.
- To demonstrate competency in the technical, practical skills of landscape architecture and their role in investigating complex and innovative ideas.

Orientation and Planning of Buildings - factors affecting orientation – Sun – Wind – Rain – orientation criteria for Indian conditions – Planning– Specifications and standards-planning of buildings –case studies – Interior Design - Decorative materials – Cement bonded boards, water proof cement – paint - industrial glazing and roofing- masonry - Plaster and dry wall- wall surface materials - effect of colour – Home furnishing – Preparation of interior design plans - case studies- Landscape Design - Principles - Site planning - Design – Styles - Elements and materials - Plant characteristics and design - Landscape planning - case studies.

TOTAL - 15 Periods

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Introduce the architectural principles in the design of buildings and interior spaces.
- Make plan for the buildings by considering our Indian climatic conditions..
- Choose the various building material as per the interior design aspects..
- Perform landscape architecture according to the environmental conditions..

REFERENCES:

1. Francis D.K.Ching, "Architecture: Form, Space and Order", John Wiley & Sons, Inc. 2007.
2. Mohmohan, MuthuShoba G, "Principles of Architecture" Oxford University Press, New Delhi,2009.
3. Edward D.Mills, "Planning and Architects Handbook", Butterworth London,1995.
4. Paul Alan Johnson, "The Theory of Architecture: Concepts, Themes & Practices", John Wiley & Sons, Inc.1994.

19UCE863   **WATER CONSERVATION TECHNIQUES**   **L T P C**
                                                                                      1 0 0 1

Course Learning Objectives:
- To emphasis the importance of ground water conservation

Need of planned utilization of water resources - economics of water resources utilization Water conservation - water harvesting - rainfall- run off relation - water storage in ponds, lakes, reservoirs and aquifers –Types of Pond - selection of pond site – Seepage control - methods-evaporation control-Recycling of harvested water - conservation forestry-water shed management - groundwater recharge through wells - check dams and storage works –. Renovation of water bodies.(Case Study)

TOTAL - 15 Periods

Course Outcomes:
        After the successful completion of the course, Students will be able to,
- Adopt appropriate rainwater harvesting techniques .

Reference Books:
1. Santhosh Kumar Garg, Hydrology and water resources engineering, Khanna Publishers,
2. New Delhi. – 2019.
3. G.L.Asawa,Irrigation and Water Resources Engineering ,New Age International (P) Ltd.,
4. Publishers, New Delhi – 2008.

19UCE864	CONSTRUCTION SAFETY	L	T	P	C
		1	0	0	1

Course Learning Objectives:
- The objective of this course is to study various faces of construction safety and cause of major injury.

Safety Management

Construction Safety Management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, Safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety Checklists and inspection reports.

Safety operations AND Safety equipment

Safety in construction operations – Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used. Various safety equipment and gear used on site. First aid on site, Safety awareness program. Labor laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices. Study of safety policies, methods, equipment, training provided on any ISO approved construction Company ,safety in office, working on sites of high rise construction, deep excavation.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Understand the principles of management and safety procedure in construction.

Text Books:
1. Construction safety manual published by National Safety Commission of India.
2. Safety Management in Construction Industry – A manual for project managers. NICMAR Mumbai.

Reference Books:
1. Construction Safety Handbook – Davies V.S.Thomasin K, Thomas Telford, London.
2. ISI for safety in Construction – Bureau of Indian Standrads.
3. Safety managementǁ –Girimaldi and Simonds, AITBS, New Delhi.

15UCE865	**EFFLUENT TREATMENT PLANT**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

Course Learning Objectives:

- To give sound knowledge with understanding of waste water treatment technologies to the students.

Domestic Wastewater Treatment, - Wastewater characteristics; Primary, secondary and tertiary treatment- Physical Unit Processes: Screening; Commutation; Grit Removal; Equalization; Sedimentation - Biological Unit Processes - Aerobic vs. anaerobic processes - Aerobic treatment; Suspended growth aerobic treatment processes; Activated sludge process and its modifications; Attached growth aerobic processes; Tricking filters and Rotating biological contactors - Anaerobic treatment; suspended growth, attached growth, fluidized bed and sludge blanket systems; nitrification, denitrification; Phosphorus removal - Sludge Treatment - Characteristics of sewage sludge- Sludge thickening, sludge digestion, dewatering, drying, Aerobic sludge stabilization- Anaerobic stabilization of sludge and Composting - Water Treatment Plant Characteristics, Plant layout -Operations and maintenance of Treatment plants, Trouble Shooting, - Filtration, Softening of Water, Defluoridation, Removal of Odors -Treated Municipal Wastewater Discharge Systems, Post treatment techniques- - Visit to a municipal wastewater treatment plant and a small plant.

TOTAL : 15 PERIODS

After successful completion of this course, the students will be able to

- Design and maintain waste water treatment plant based on the characteristics of waste water.

REFERENCES:

1. Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi, 2013.
2. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi, 2012.
3. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
4. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993.
5. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
6. Metcalf and Eddy, M.C., "Wastewater Engineering – Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003.

19UCE866	**CORROSION OF STEEL IN CONCRETE AND PREVENTIVE MEASURES**	**L T P C**
		1 0 0 1

Course Learning Objectives:

- The course will provide the students with in-depth knowledge of corrosion and corrosion control techniques.

Corrosion of steel in concrete **-** Causes and mechanisms of corrosion and corrosion damage in concrete – Carbonation - Chloride attack - Corrosion damage - Vertical cracks and horizontal cracks- Preliminary survey - Detailed survey. - Visual inspection – Delamination – Cover - Half cell potential measurements - Carbonated depth measurement - Chloride determination - Resistivity measurement - Corrosion rate measurement-Basic principles of electrochemical techniques - Cathodic protection - design. Control criteria -System installation - Cathodic protection of prestressed concrete - Cathodic protection of epoxy coated reinforcing steel-Cathodic Protection in Concrete Structures - Laboratory and field studies.

TOTAL - 15 Periods

<mark>**Course Outcomes:**</mark>

After the successful completion of the course, Students will be able to,
- Apply various types of corrosion control techniques in field (Understand / Remember).

Reference Books:

1. Corrosion of Steel in Concrete by Broomfield John P. (Taylor & Francis).
2. Corrosion of Steel in Concrete Structures (Wood head Publishing Series in Civil and Structural Engineering) Hardcover – Import, 15 February 2016).

I9UCE867 **BUILDING PLANNING AND BYELAWS** L T P C
                                                  1 0 0 1

Course Learning Objectives:
* To create awareness about building bye laws and development control rules.

Objective and principle of planning – Types of building – residential, apartment, commercial, public and industrial – Space standards for buildings – Approval plans and layout preparation and online submission – Field measurement book preparation - General building codes - regulation and Byelaws – Necessity, objects and importance of byelaws – Function of local body authority – Responsibility of building owner – Implementation and applicability of byelaws – Necessity of Setback – Light plane – Plot coverage – Built up area, plinth area, carpet area, Floor space index – Maximum height of buildings and width of street – Off-street parking, Fire protection – Ventilation, lighting, sanitation, rain water harvesting system, STP, compound wall, playground, amenities as per local body authority byelaws – Building Insurance - Real estate Act 2016 - DTCP, CMDA rules**.**

TOTAL - 15 Periods

Course Outcomes:
    After the successful completion of the course, Students will be able to,
* Prepare the building plans and layouts as per byelaws.
* Solve the real estate distributes.
* Handle the arbitration issues in buildings.

Reference Books:
1. Sane Y. S., "Planning and Design of buildings", Malik & May, New Asian Publishers, New Delhi.
2. Tamilnadu Combined Development and building rules-2019.
3. Development Control Rules, CMDA, 2010.
4. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
5. "National Housing Policy", Government of India, 1994.
6. Shah M G., "Building Planning & Drawing", Tata Mc Graw hill.
7. National Building Code of India 2016, Volume 1&2.
8. Model building byelaws – 2016.

19UCE868	AUTOMATION IN CONSTRUCTION	L	T	P	C
		1	0	0	1

Course Learning Objectives:

- To get knowledge about application of automation and use of robots in constructio.

Concept and application of Building Management System (BMS) and Automation - art in construction automation- Field sensors actuators, controllers, non-destructive evaluation, data acquisition , examples of sensors in existing automated equipment-Off- site automation in construction Information processing (computer applications), materials processing , case study (concrete batch plant) - Existing and prototype equipment for construction – case study (concrete placement and finishing), final product design session - Automation and robotic technologies for customized component, module and building prefabrication-- Site automation - robotic on site factories.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Understand the application of building management system and automation in on and off site projects.
- Solve the construction issues through robotic techniques.

Textbooks:

1. Javad Majrouhi Sardroud, (2011),"Automated Management of Construction Projects" LAP Lambert Academic Publishing.
2. Wang Shengwei, (2010), "Intelligent Buildings and Building Automation" Taylor & Francis Group.

Reference Books:

3. Majrouhi Sardroud Javad, (2014), "Automation in Construction Management" Scholars' Press.
4. HongleiXu and Xiangyu Wang, (2014), "Optimization and Control Methods in Industrial Engineering and Construction (Intelligent Systems, Control and Automation: Science and Engineering)" Springer.

19UCE869	**BUILDING ENERGY AUDIT**	L	T	P	C
		1	0	0	1

Course Learning Objectives:
* To create awareness among students about the importance of energy conservation and the need of energy audit.

Introduction:

Energy scenario-Role of Energy Managers-Energy Monitoring- Energy Audit - Economics of various energy conservation schemes - Total Energy system.

Case studies: Energy conservation in steam systems-Energy conservation in cooling towers &spray ponds-Energy efficiency in lighting.

Energy Efficient Buildings:

Architecture- Building Science and its significance- Human Comfort- Classification of building materials based on energy intensity- Microclimate - Energy Management of Buildings and Energy Audit of Buildings-Energy Efficient Landscape Design.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
* Suggest various energy conservation schemes.
* Explain various case studies on energy conservation.

Textbooks:
1. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN-0-582-03184, 1990.

Reference Books:
1. SodhaM., Bansal, N.K., Bansal,P.K., Kumar, A.. and Malik, M.A.S.,"Solar Passive Buildings", Pergamon Press, 1986.
2. Koenigsberger, O.H., Ingersoll, T.G., Mayhew Alan and Szokolay, S. V., "Manual of Tropical Housing and Building part 1: Climatic Design", OLBN 0 00212 0011, Orient Longman Limited, 1973.

HEALTH MONITORING OF STRUCTURES **L T P C**
1 0 0 1

Course Learning Objectives:

- The course will provide the students with in-depth knowledge of technologies in structural health monitoring using smart materials as sensing and actuating elements to interrogate the structures. Damage detection techniques such as wave, impedance, and vibration-based damage detection techniques will be discussed and applied to different types of structures.

Introduction and Concepts of SHM- Various Measures-Structural Safety in Alteration- Factors affecting Health of Structures-Causes of Distress-Regular Maintenance-Assessment of Health of Structure- Types of Static Tests-Types of Dynamic Field Test.-piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique- Damage detection techniques **-Applications of structural health monitoring** in airspace including sandwich composite structures, civil infrastructures, pipelines, rotating machinery- Case Studies (Site Visits).

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Implement fundamental concepts in structural health monitoring, sensors and classify various diagnostic methods of structural health monitoring (Understand / Remember).
- Analyze damage assessment of existing or failure structures (Analyse).
- Select a viable structural health monitoring methodology for a given application based on available technology (Modern tool usage).
- Make an effective communication and presentation as a Individual / team in damage assessment problems(Communication).

Reference Books:

1. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components_Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan,Taylor and Francis Group, London, UK, 2006.
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc,2007.

19UCE871   **ARTIFICIAL INTELLIGENCE IN CIVIL ENGINEERING**   **L T P C**
                                                                                                      1 0 0 1

Course Learning Objectives:
- To impart the students with Artificial Intelligence concept to solve Civil Engineering problems.

Introduction to Artificial Intelligence-Necessities-Development of Artificial intelligence – Potential application of Artificial Neural Network Intelligent- Optimization methods in civil engineering-Genetic algorithms- Application of Artificial Intelligence- Structural Health Monitoring- durability evaluation – Waste management- Concrete Mix Design –Estimation – Neuromodex, Decision making – Modelling initial Design process   using ANN-Planning of construction projects- construction Robots – application of GIS –Tidal forecasting- Earthquake Induced liquefaction-Introduction to fuzzy logic – Advantages.

TOTAL - 15 Periods

Course Outcomes:
After the successful completion of the course, Students will be able to,
- Apply AI to solve basic and complex Civil Engineering problems.

Reference Books:
1. ”Artificial Intelligence –A practical approach”, Rajiv Chopra, S CHAND & Company Limited, 2012.
2. “Optimization and Artificial Intelligence in Civil and Structural Engineering” B.H.V.Topping, Springer Science Business Media.

19UCE872	**DESIGN OF SCAFFOLDING**	L	T	P	C
		1	0	0	1

Course Learning Objectives:
- To impart knowledge to plan, prepare and design the scaffolding.

Definition –Requirements and Principles of scaffolding- Types of scaffolding: Standing Scaffolds – Timber Scaffolding –Tube Scaffolding in steel / Aluminium – Scaffolding with Proprietary Equipment –Free standing scaffolds –Suspended Scaffolds - Putlog and Independent scaffold, Single pole scaffolds –Special Scaffolds for tunnel, chimney, open well, oil well, cooling towers, deep foundation, sky scrapper buildings, precast structures, prefabricated structures and composite structure scaffolding – Rigging for Scaffolders - Erection, Alteration and Dismantling – Performance Requirements for Scaffold planks – Design of scaffolding – Maintenance of scaffolding – Formworks.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Explain the types of scaffolding based on requirements (Understand)
- Discuss the various materials used in scaffolding. (Understand)
- Describe the erection process of scaffolding (Remember)
- Describe the concepts of alteration and dismantling of scaffolding (Understand)
- Explain the maintenance of scaffolding (Understand)

TEXTBOOKS:
1. B.T. Batsford, "Temporary structure design ", Fb & c Limited 2016.
2. Willey. "scaffolding ", John villey sons , 2012.

Reference Books:
1. Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 1997.
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2001.
3. SP:70, BIS, "Hand Book on Construction Safety Practices", 2001
4. Rajput.R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
   Shetty, M.S, "Concrete Technology, Theory and Practice", Chand Publishing, New Delhi, 2018.

19UCE873	**APPLICATION OF ROBOTICS IN CIVIL ENGINEERING**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

Course Learning Objectives:

* To study possible applications of robotics to the various building construction tasks.

Objective and Introduction – Applications-automated systems in construction-Need for robots--ways of Transformations by robotics-Automated technology-Altered workforce-3Dprinting-Demolition-Brick laying-Off-site prefabrication systems, - On-site automated and robotic systems, - Drones and autonomous vehicles-Exoskeletons-Fire proofing spray robot -Steel-beam positioning manipulator-Ceiling-panel-positioning robot Wall-finishing robot -Spray-coating robot- challenges facing automation and robotics in construction.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

* To examine the general feasibility of robotic application at the present and future state of building .
* To outline a procedure for detailed planning and evaluation of robotic application .
* To identify the feasibility of using robots in building construction.

Reference Books:

1. Thomas Bock, Technische Universität München, Thomas Linner, Technische Universität Munchen , Volume 3 , Cambridge University Press,2016.
2. Robotics and Automation in Construction, Carlos Beleaguer, Mohamed Abderrahim,e book- 2008.

19UCE874	DRONE SURVEYING	L	T	P	C
		1	0	0	1

Course Learning Objectives:

- This course will give you the knowledge to start performing drone based surveying ,Visual images, maps, and models are the most common deliverables. By utilizing different sensors and capture methods, drones are able to provide useful data to a wide range of industries. This course will show you how to do this and more.

  Introduction to Drone Mapping-Types of Drone-Sensors and drone innovation – Potentional uses of drones- Photogrammetry ,Digital Photogrammetry Theory-Photography Principles in Photogrammetric Surveys-Controlling a Survey, Photo Capture- Data Processing-Data Extraction-Data Accuracy, Quality Assurance-Equipment, Planning Your Photogrammetry Survey –Drone regulation- Case Studies.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Identify Drone Mapping and Photogrammetry. (Understand / Remember)
- Acquire Knowledge on Data Extraction and Data Processing. (Understand / Remember)
- Apply Technical skills on Topographical and Mapping Surveying.(Understand / Remember)

Reference Books:

1. Baichtal, "Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs", Que Publishing, 2016.
2. Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment. Wiley, 2010.
3. Sebbane, Smart Autonomous Aircraft: Flight Control and Planning for UAV. CRC Press, 2015.
4. Zavrsnik, Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance. Springer, 2015.

19UCE875	**RECYCLED CONSTRUCTION MATERIALS**	L	T	P	C
		1	0	0	1

Course Learning Objectives:

- To provide students an exposure on manufacturing of concrete paver blocks.

Introduction – Types of Recycled Materials – Recycled Aggregates – Ceramic Waste Materials – Rubber Materials – Industrial Waste Materials – Fly ash Materials – E waste Materials – Recycled Plastic Materials – Light Weight Building Materials – Recycled Unfired Clay Bricks materials – Recycled glass Materials – Construction and demolition waste materials – Recycled Concrete Materials – Physical and Chemical Properties of Recycled construction Materials – Salient Features of Materials – Applications of Recycled Materials – Merits and Demerits – Case Studies.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Choose suitable sustainable waste materials used in concrete constructions for the application in field.**(Apply)**
- Investigate the recycled material characteristics for the real world constructions. **(Evaluate)**

TEXT BOOKS:

1. Muller, Recycling Building Materials, Springer Publishing Pvt Ltd, 2021.
2. Ravindra K.Dhir, Sustainable Construction Materials Recycled Aggregates, Woodhead publishing Pvt Ltd, 2019.
3. Alan Richardson, Reuse Materials and Byproducts in Construction, Kindle Edition , Springer Publishing Pvt Ltd, 2013.

Course Learning Objectives:

- To impart knowledge about BIM concept, standards, tools and techniques in the construction industry.

BIM Introduction – BIM uses – BIM dimensions – Understanding an Organisation requirement for BIM – Preparing a BIM briefing document to organisation – Understanding client requirement – BIM documents for initial stage of the project – Develop an Employer's Information requirement(EIR).

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Preparing a BIM briefing document for client, developing an EIR based on client requirement.
- Preparing a Pre and Post contract BIM Execution Plan.
- Preparing a Post-Handover report.
- Quantity extraction from BIM model using iTWOcostX.
- Detailed Estimate preparation for a BIM model.

Reference Books:

1. BIM and Construction management – Brad Hardin.
2. Understanding BIM – Jonathan Ingram.
3. iTWOcostX manual – INFINITY PMC SOLUTIONS PVT LTD.

19UCE877	**BUILDING SAFETY**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

Course Learning Objectives:
- To understand the operational safety.
- To understand the safety management.

Fire triangle-principles of fire extinguishing- various classes of fires- A, B, C, D types of fire extinguishers- Industrial fire protection systems. Sprinklers- Fire hydrants- Alarm and detection systems- other suppression systems- CO2 system, foam system and DCP system. Incident Recall Technique (IRT), disaster control, Job safety Analysis, Safety survey, safety inspection.Safety training programs, seminars, conferences, competitions- method of promoting safe practice motivation-creating awareness, awards, celebrations, safety posters, safety displays, safety incentive scheme- domestic safety and training.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Prepare the fire prevention and protection. **(Understand)**
- Summarize the safety management techniques. **(Understand)**

TEXT BOOKS:
1. John V. Grimaldi and Rollin H. Simonds, "Safety Management" , All India Travellers Book Seller, New Delhi, 2019.
2. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 2016.

Reference Books:
1. Dan Peterson, "Techniques of Safety Management", McGraw Hill Company, Tokyo, 2016
2. "Accident Prevention Manual for Industrial Operations", N.S.C. Chicago, 2015.

19UCE878   **BAR BENDING AND DUCTILE DETAILING**   **L T P C**
                                                                                  1 0 0 1

Course Learning Objectives:
- To provide adequate toughness and ductility to resist severe earthquake shocks without collapse.

Bar bending:

Introduction, General guidelines for preparing BBS, preparation of bar bending schedule, calculation of reinforcement shape, cutting and bending lengths, Hooks and bends in reinforcement, preparation of BBS for RCC beam and column, Advantages and uses of BBS.

Ductile Detailing:

Introduction, Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces (IS 13920: 2003), web reinforcement, vertical stirrups and lap splices, ties and hoops, transverse reinforcement for rectangular and circular column, Ductile detailing for flexural members and compression members.

TOTAL - 15 Periods

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Read/Understand routine drawings/sketches and bar bending schedule.

Reference Books:
1. Bar bending schedules of structural members in civil engineering structures Benjamin N Wobu.
2. IS13920: Ductile Detailing of RC Structures subjected to Seismic Forces.

19UCE879   **GLOBAL CLIMATE CHANGE AND VULNERABILITY ASSESSMENT**   L   T   P   C

                                                                                  1   0   0   1

Course Learning Objectives:
- To explain the basic concepts of climate change science.
- To import outline key elements of a vulnerability assessment.

Introduction - the basics of climate change science - climate, weather and the greenhouse gas effect- important greenhouse gases- impacts of climate change on surface temperature, precipitation, ocean pH, sea-level and Arctic sea-ice extent- policy framework to address climate change - highlights ways to measure vulnerability-framework for assessing climate vulnerability. - The political context to greenhouse gas emission-Integrate mitigation-Economic sectors for mitigation actions- elements of national planning for climate finance.

TOTAL - 15 Periods

Course Outcomes:
       After the successful completion of the course, Students will be able to,
- To explain the fundamentals of climate change science.(Understand)
- To analyse different climate change scenarios and their implications.(Analyse)
- To outline key elements of a vulnerability assessment.(Understand)
- To Identify main elements of national planning for climate finance.(Understand)

Reference Books:
1. Edmond A. Mathez and Jason E. Smerdon , Climate Change: The Science of Global Warming anOur Energy Future,2018.
2. Andreas Schmittner, Oregan State University ,Introduction to Climate Science, https://open.oregonstate.education/climatechange/,2017.

19UCE880   **PAVER BLOCK MANUFACTURING AS PER IS CODE**   **L T P C**
                                                                                       1 0 0 1

Course Learning Objectives:

- To provide students an exposure on manufacturing of concrete paver blocks.

Introduction – Terminologies – Specifications and types of concrete paving blocks – Mix design for concrete blocks pavements – Ingredients of paver blocks – Dimensions – Physical requirements – Mixing Process, Dry and Wet mix process – Making of concrete paver blocks – Curing process - Method of Testing as per IS code – Correction Factor.

TOTAL - 15 Periods

<mark>**Course Outcomes:**</mark>

      After the successful completion of the course, Students will be able to,

- Choose suitable environmental friendly materials for making concrete paver blocks.**(Apply)**
- Design and develop the effective concrete paver blocks as per IS standards. **(Create)**
- Investigate the strength and durability parameters of paver blocks for the application in Civil Engineering. **(Evaluate)**

TEXT BOOKS:

1. Wasantha Mampearachchi , Handbook on Concrete Block Paving, Springer in nature Singapore Pvt Ltd, 2019.
2. Handbook on advantages of interlocking paver block, Columbia machine Engineering Pvt Ltd, 2019.
3. IS 15658 (2006): Precast concrete blocks for paving - [CED5: Flooring, Wall Finishing and Roofing].
4. M.S.Shetty., "Concrete Technology, Theory & Practice", S.Chand and Co, New Delhi, 2004.
5. Varghese.P.C, Building Materials, second edition of Prentice Hall India Learning Pvt.Ltd, (2015).

INTER DISCIPLINARY COURSES

SMART BUILDINGS   **L T P C**

(Offering Departments: Civil & EEE)   **3 0 0 3**

Course Learning Objectives:

- To make the students understand the core challenges relating to the foundation of sustainable smart Buildings.
- To impart knowledge on understanding, and critical thinking related to smart energy management in buildings.
- To explore issues relating to the development and deployment of new and emerging technologies, that will create a thorough understanding of smart buildings and systems of the present and future.

UNIT I INTELLIGENT BUILDINGS   9

Concept, Definition Architecture and structure , evaluation of intelligent buildings, IB assessment criteria – intelligent homes.

UNIT II ENERGY MANAGEMENT IN DESIGN   9

Natural building design consideration – Energy efficient design strategies – contextual faction longevity and process Assessment – Renewable energy sources and design – Advanced building Technologies – Smart building.

UNIT III ENERGY MANAGEMENT IN SERVICES   9

Energy in building design- Energy efficient and environment friendly building – Thermal Phenomal – thermal comfort- Indoor Air quality- passive heating and cooling systems- Energy Analysis – As HVAC systems – Preliminary investigation – Energy audit – Types of energy audit- Energy flow diagrams – Energy consumption / unit production – Identification of wastage – priority of conservative measurement – Maintenance of management programme.

UNIT IV BUILDING ENERGY CONSERVATION TECHNOLGIES   9

Standards of energy efficiency in buildings, Trends in energy consumption energy audit: evolution energy performance of existing buildings, use of computer models, impact of people behavior, Energy efficiency measures in building : approaches, materials and equipments, operating starting evolution methods of energy savings, Optimum selection of energy sources, Air-to-air energy recovery.

UNIT V CONTROL SYSTEMS IN BUILDINGS   9

Introduction to autonomic control systems, control issues related to energy conservation interior quality and thermal comfort in buildings- ventilation, classification of HVAC control system: select and size of sensors, actuators and controllers. Practical HVAC control system Designing and turning controllers- Building automation systems, design for security.

TOTAL: 45 PEROIDS

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Describe the concepts and evaluation criteria for Intelligent buildings.(Understand)
- Explain the energy efficient design strategies (Understand)
- Summarise the energy management techniques in various building servies and perfect energy audits (Understand)
- Describe and suggest various energy efficiency measures in building (Understand)

- Intricate the automatic control systems and building automation systems (Understand)

TEXT BOOK:
1. Jim Sinopoli, "Smart building", Smart building publisher: 2006, ISBN 0978614402, 9780978614409
2. Nilesh Y.Jadhav, "Green and Smart Buildings", Springer Singapore Publisher: 2016.

REFENANCES :
1. Jaes Sinopoli, Advanced Technology for Smart Buildings, Aritech House, 2016.
2. James Kachadorian, Passive Solar House: The complete Guide to Heating and cooling Your Home, Cheisea Green Publishing : Revised and expanded second edition, 2006.
3. James M.Sinapli, Smart Buildings Systems for Architects, Owners and Builders Publisher: Butterworth-Heinemann, 2009.

19UGM655   **WASTE TO ENERGY CONVERSION**   **L T P C**
               (Offering Departments: Civil & Chemical)   **3 0 0 3**

Course Learning Objectives:
- To impart knowledge to classify the waste based on its nature and to assess their properties.
- To familiarize the fundamental concepts of waste minimization, treatment, recycling and energy Recovery.
- To understand thermo chemical and bio chemical concepts in energy recovery.
- To provide the knowledge on aerobic and anaerobic digestion of waste, composting, pyrolysis and Incineration of wastes.
  To acquire knowledge on impact assessment studies, rules and regulations involved.

Unit I INTRODUCTION TO WASTE & WASTE PROCESSING   **9**
Definitions, sources, types and composition of various types of wastes; Characterization of Municipal Solid Waste (MSW), Industrial waste and Biomedical Waste (BMW) ,Plastic waste, waste collection and transportations ; waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of MSW; Life Cycle Analysis (LCA), Material Recovery Facilities (MRF), recycling processes of solid waste

Unit II WASTE TREATMENT AND DISPOSAL   **9**
Aerobic composting, incineration, different type of incineration; medical and pharmaceutical waste incinerations- land fill classification, types, methods and sitting consideration, layout and preliminary design of landfills; composition, characteristics, generation, movement and control of landfill leached and gases, environmental monitoring system for land fill gases

Unit III ENERGY FROM WASTE-THERMO CHEMICAL CONVERSION   **9**
Sources of energy generation, incineration, pyrolysis, gasification of waste using gasifies, briquetting, utilization and advantages of briquetting – environmental and health impacts of incineration; strategies for reducing environmental impacts.

Unit IV ENERGY FROM WASTE BIO-CHEMICAL CONVERSION   **9**
Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues. Anaerobic digestion biogas production, land fill gas generation and utilization, present status of technologies for conversion of waste into energy, design of waste to energy plants for cities, small townships and villages.

Unit V ENVIRONMENTAL AND HEALTH IMPACTS-CASE STUDIES   **9**
Environmental and health impacts of waste to energy conversion, case studies of commercial waste to energy plants, waste to energy-potentials and constraints in india, eco-technological alternatives for waste to energy conversions – Rules to the handling, treatment and disposal of MSW and BMW in India.

                                               TOTAL - 45 Periods

Course Outcomes:
     After the successful completion of the course, Students will be able to,
- Describe the characterization process of wastes.(Understand)
- Explain the different waste treatment and disposal methods.(Understand)
- Summaries the energy generation using thermo chemical conversion methods.(Understand)

- Describe energy generation using Biochemical conversion methods.(Understand)
- Elaborate some case studies on Environmental and health impacts of waste to energy conversion.(Understand)

Text Books:
1. Shan, Kanti L., Basics of Solid & Hazaerdous Waste Management Technology, Prentice Hall, 2000.
2. Manoj Datta, waste Disposal in Engineered Landfills, Narosa Publishing, House, 1997.

Reference Books:
1. Municipal Solid Waste to Energy Conversion Processes; Economic, Technical, and Renewable Comparisons, by Gary C. Young, ISBN:9780470539675. Publisher: John Wiley & Sons Publication Date: June 2010.

2. Recovering Energy from Waste Various Aspects Editors: Velma 1. Grover and Vaneeta Grover, ISBN 978 -1 57808-200-1;2002.
3. .Rich, General et. Al., Hazardous waste Management Technology, Podvan Publishers, 1987.
4. Waste-to-Energy by Marc J. Rogoff, Dec-1987, Elsiever, and ISBN-13: 978-0-8155-1132-8, ISBN-10:0-8155-1132-9.
5. Parker, Coin, & Roberts, Energy from Waste – An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985.
6. Bhide A.D., Sundaresan B.B., Solid Waste Management in Deceloping Countries, INSDOC, New Delhi, 1983.
7. Robert Green, From Waste to Energy, Cherry Lake Pub. ISBN: 1602795096, 2009 [10] G, Evans, Biowaste Treatment, 2005.
8. Biogas from waste and renewable resources, by Dieter D, And Angelika S. Wiley-vch Publication 2010.

MANDATORY COURSES

	L	**T**	**P**	**C**
19UGM131 **INDUCTION PROGRAMME**	**0**	**0**	**0**	**P/F**

Course Learning Objectives:
- To rejuvenate the Body and Mind.
- To strengthen Attitude and soft skills.
- To practice Moral values of life.

Unit I PHYSICAL ACTIVITY   **10**

Zumba Bokwa Fitness – Yoga – Mediation – Fine Arts.

Unit II CREATIVE ARTS   **5**

Painting – Class Painting – Wall Painting – Art from waste.

Unit III UNIVERSAL HUMAN VALUES & EMINENT SPEAKERS   **5**

Ethical values – Ambition and Family Expectation, Gratitude, Competition and Excellence– Belief – Morality of life – Guest Lecture by Eminent personality.

Unit IV LITERARY   **15**

Toastmaster club meet.

Unit V PROFICIENCY MODULES   **15**

Toastmaster club meet.

Unit VI INDUSTRIAL &LOCAL VISIT   **8**

Vaigai Dam – Theni - VOC- Port-Tuticorin - Madurai Radio City-Madurai - Aavin Milk –Madurai-NSS Activities.

Unit VII FAMILIARIZATION OF THE DEPARTMENT AND INNOVATION   **2**

Department Introduction and Purpose of Course - Eminent speakers – Scope and Feature of the Course - Latest Innovation.

Total: 60 periods

(3 Weeks Model curriculum As per AICTE)

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Practice physical activities regularly.
- Implement creativity in drawing and waste material.
- Communicate their ideas effectively.
- Identify inputs and outputs of different industry process.
- Describe the scope and features of their programme of study.

Reference Books:

Student Induction Programme: A Detailed Guide by AICTE, New Delhi.

BIOLOGY FOR ENGINEERS
(Common To Agri, Civil, Chem, ECE, EEE& IT

L T P C

2 0 0 P/F

Course Learning Objectives:

- To provide a basic understanding of biological mechanisms of living organisms and the human biology from the perspective of engineers.
- To encourage engineering students to think about solving biological problems with engineering principles and tools.

Unit I INTRODUCTION AND CLASSIFICATION   **5**

Introduction to Biology – Comparison of Biology and Engineering – Eye and Camera – Bird flying and Aircraft – Brownian motion and Thermodynamics – Classification – Unicellular or multicellular – Unicellular: Bacteria, Protozoa, Yeast – Multi Cellular: Animals, Humans, Plants, fungi etc. – Ultra structure: prokaryotes or eukaryotes – Habitat: aquatic or terrestrial.

Unit II DIGESTIVE & RESPIRATORY SYSTEMS – ENZYME   **6**

Study of digestive – Respiratory systems and their functions –.Enzyme – Classification of Enzyme – Mechanism of Enzyme activity – Enzymes for Industrial Applications: Waste management – Food processing industry – Beverages – Pharmaceutical – Paper Industry etc.

Unit III GENETICS AND BIO MOLECULES (Basics only)   **7**

Basics of Genes – DNA structure – Genes and hereditary – Genetic Code – Coding and decoding Genetic information – Gene Mapping – Gene Interactions – Mutations – Genetic disorders – Gene therapy – Biomolecules: Carbohydrates, lipids, nucleic acids, proteins. Biological Applications in Engineering: Genetic Algorithm – Computer Application in Genetic Engineering – Genetic Programming – Genetic Computers.

Unit IV NERVOUS SYSTEM AND CELL SIGNALING   **7**

Central Nervous System: Brain and Spinal Cord – Peripheral Nervous System – Sensory Division – Motor Division – Neurons – sensory, motor, and interneurons – Signals –Transfer of Information – Bio Signals – Electrocardiography (ECG) – Electroencephalography (EEG) – Electromyography (EMG) – Electrooculography (EOG) – X-ray – CT Scan – MRI scan – Biological Applications in Engineering –Neurons and Neural Network.

Unit V BIOLOGY AND ITS INDUSTRIAL APPLICATION   **5**

Bioreactors – Biopharming – Recombinant vaccines – Cloning – Drug discovery –Bioremediation – Biofertilizer – Biocontrol – Biofilters – Biosensors – Biopolymers – Bioenergy – Biomaterials – Biochips.

TOTAL : 30 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,

- Explain the fundamentals of living things, their classification, cell structure and biochemical constituents.(Understand)
- Apply the concept of plant, animal and microbial systems and growth in real life situations. (Apply)
- Analyze biological engineering principles and procedures needed to solve societal issues.(Analyse).

Text Books:

1. R.C.Dubey, "A Text book of Biotechnology", S. Chand Higher Academic Publications, 2013.
2. R. Khandpur, "Biomedical instrumentation - Technology and applications", McGraw Hill Professional, 2004.

Reference Books:

1. Arthur T. Johnson, "Biology for Engineers", CRC Press, Taylor and Francis, 2nd Edition, 2019.
2. Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, "Cell Biology and Genetics (Biology: The unity and diversity of life Volume I)", Cengage Learning, 12th Edition, 2008.
3. Gerard J. Tortora and Bryan H.Derrickson, "Principles of Anatomy and Physiology",15thEdition,Wiley publications, 2016.

19UGM431	**GENDER EQUALITY**		**1**	**0**	**0**	**P/F**

Course Learning Objectives:
- To introduce basic concepts relating to gender and to provide logical understanding of gender roles.

Unit I GENDER SENSITIZATION 10

Definition of gender, Perspectives-Gender sensitive approach- Gender and sex- Social construction of gender and gender roles- Socialisation- institutions of socialization- changing content and context of gender-need for re-socialization. Gender Stereotyping and Gender Discrimination.

Unit II GENDER EQUALITY AND CONSTITUTION 10

Indian constitution related to equality - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation - cultural and educational rights - the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counselling Centres- Internal Complaints Committee - Legal AID cells, Help line, State and National level Commission.

Unit III GENDER ROLES & EQUALITY 10

Gender & Morality – Structural and functionalist views of Gender- Gender in the Classroom- Beyond access for girls and boys- Gender equality in schools- Gender equality and adult basic education- Developing capacity to achieve gender equality in education- Individuality and removal of gender stereotypes- Respect for each other's-Promote equal Opportunity.

TOTAL: 30 PERIODS

Course Outcomes:

After the successful completion of the course, Students will be able to,
- Describe the social construction of gender and sexuality and their influence in social context. (Understand)
- Analyze how the concepts of gender equality are created, maintained, and/or challenged. (Analyse)
- Apply concepts of gender roles and equality in classroom, school, disciplinary or interdisciplinary creative, scholarly, and/or activist project. (Apply).

Text Books:
1. Sheila Aikman and Elaine Unterhalter, "Practising Gender Equality in Education", Oxfam GB, 2007.
2. Pasadena and Hackensack, "Gender roles and Equality", Salem Press 2011.

INDIAN CONSTITUTION   L T P C
                                                                                           1 0 0 P/F

Course Learning Objectives:

* The students will be exposed to fundamental rights &duties in Indian Constitution.
* The students will be given knowledge on the components of the parliamentary system to prepare for the process of their career development.
* The student will have knowledge on powers and functions of Local bodies and Indian polityto appear for various competitive exams such as UPSC,TNPSC and RRB…
* The student will know about the functions of judiciary and electoral process followed in the country.

Unit I INTRODUCTION ON INDIAN CONSTITUTION

Preamble - Salient features of the Constitution of India. Fundamental Rights - its restriction and limitations in different Complex Situations.Directive Principles of State Policy (DPSP) - Fundamental Duties: its Scope and significance in Nation building - Constitution components: schedule,parts and articles of constitution- important Amendments of constitution.

Unit II PARLIAMENTARY SYSTEM

Parliamentary System–parliamentary system of other countries- Indian parliamentary system-Federal System – LS and RS,Centre-State Relations-Election of member of parliaments-Union Executive - President, Prime Minister, Union Cabinet. State Legislature -State Executives –election of MLA- Governor, Chief Minister, State Cabinet.

Unit III JUDICIARY AND ELECTION COMMISSION

Supreme Court of India: Structure, Power and Functions of Supreme Court-- Judicial Reviews - Judicial Activism. High Court and Subordinate Courts: Structure, Power and Functions. – Lok adhalats. Elections- Electoral Process - Election Commission of India - Election Laws – Emergency Provisions - types of Emergencies and its consequences.

UnitI V LOCAL ADMINISTRATION

Local Administration: Powers and functions of Municipalities and Panchayats System-Panchayat Raj- Co–operative Societies and Constitutional and Non-constitutional Bodies.

Course Outcomes:
After the successful completion of the course, Students will be able to,

* CO1:able to apply knowledge of the fundamental rights and duties prescribed by Indian Constitution to prepare for various competitive examinations.
* CO2: able to manage complex societal issues in society with the knowledge o fjudiciary and local administration.
* CO3: able to interpret the societal, health, safety, legal and cultural issues with understanding of parliamentary system and electoral process through self-learning skills.
* CO4:able to understand the ethical responsibilities of municipalities, panchayats and co-operative societies.
* CO5: able to understand and distinguish the functioning of the parliamentary system followed in

various countries.

Text Books:

1. Shubham Singles, Charles E. Haries, et al., "Constitution of India and Professional Ethics" byCengage Learning India Private Limited, 2018.
2. 2) Subhash C. Kashyap,"Our Constitution: An Introduction to India's Constitution and constitutional Law", NBT, 2018.
3. 3) Brij Kishore Sharma,"Introduction to the Constitution of India", PHI Learning Pvt. Ltd.,
4. New Delhi, 2011.
5. 4) M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
6. 5) Durga Das Basu, "Introduction to the Constitution on India",Prentice Hall, 2001.

	L	**T**	**P**	**C**
19UGM731 **PROFESSIONAL ETHICS & HUMAN VALUES**	**2**	**0**	**0**	**P/F**

OBJECTIVES :

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others

UNIT I   HUMAN VALUES   7

Morals- Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage - Valuing Time - Co-operation – Commitment – Empathy- self-Confidence –Character.

UNIT II   ENGINEERING ETHICS   7

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues –Uses of Ethical Theories.

UNIT III   ENGINEERING AS SOCIAL EXPERIMENTATION   4

Engineering Harmony in the family – Harmony in the society – Trust and Respect – Universal harmonious order

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS   6

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V   GLOBAL ISSUES   6

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development– Engineers as Managers – Consulting Engineers – Honesty – Moral Leadership – Sample Code of Conduct.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

After successful completion of this course the students will be able to:
1. Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.

2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

4. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003

5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.

6. World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.