KLEF

2021-22 COURSE STRUCTURE

SNO	COURSE CODE	COURSE NAME	L	T	P	S	Cr	Pre requisites	CE
I		**HUMANITIES & SOCIAL SCIENCES**							
1	20UC1101	Integrated Professional English	0	0	4	0	2	NIL	2
2	20UC1202	English Proficiency	0	0	4	0	2	NIL	2
3	20UC2103	Professional Communication Skills	0	0	4	0	2	NIL	2
4	20UC2204	Corporate Communication Skills	0	0	4	0	2	NIL	2
5	20UC3005	Aptitude Builder	0	0	4	0	2	NIL	2
6	21 FL3054	Foreign Language Elective	2	0	0	0	2	NIL	2
Total Credits									12
II		**BASIC SCIENCES**							
7	20MT1101	Mathematics For Computing	2	2	0	2	4.5	NIL	4.5
8	20UC1101	Design Thinking And Innovation-1	1	0	0	4	2	NIL	2
9	20UC1203	Design Thinking And Innovation-2	1	0	0	4	2	NIL	2
10	20SC2104	Design Thinking And Innovation	1	0	0	4	2	NIL	2
11	21BT1001	Biology For Engineers	2	0	0	0	2	NIL	2
12	21MT2102	Mathematics For Engineers	2	1	0	0	3	NIL	3
13	21MT2007	Probability And Optimization Techniques	2	1	0	0	3	NIL	3
		SCIENCE ELECTIVE - 1							
14	20PH1010	Mechanics	3	1	0	0	4	NIL	4
		SCIENCE ELECTIVE - 2							
15	21CE2205	Geology	3	0	2	0	4	NIL	4
Total Credits									26.5

III		**ENGINEERING SCIENCES**							
16	20SC1101	Computational Thinking For Design	3	0	2	6	5.5	NIL	5.5
17	20ME1103	Design Tools Workshop - I	0	0	4	0	2	NIL	2
18	20CS1202	Data Structures and Algorithms	3	0	2	4	5	NIL	4.75
19	21SC1209	Design Tools Workshop - II	0	0	4	0	2	NIL	2
20	21CS1203	Object Oriented Programming	3	0	2	3	4.75	NIL	4.75
21	21CE1002	Engineering Graphics For Civil Engineers	0	0	2	0	1	NIL	1
22	21CE2105	AI & ML Applications in Civil Engineering	2	0	0	4	3	NIL	3
23	21CE2101	Solid Mechanics	3	0	2	0	4	NIL	4
24	21CE2102	Fluid Mechanics	3	0	2	0	4	NIL	4
Total Credits									31
		PROFESSIONAL CORE COURSES							
25	21CE2103	Surveying	3	0	2	0	4	NIL	4
26	21CE2104	Construction Materials & Concrete Technology	3	0	2	0	4	NIL	4
27	21CE2201	Structural Analysis	3	1	0	0	4	NIL	4
28	21CE2202	Building Planning, Drawing & Construction Management	3	0	2	0	4	NIL	4
29	21CE2203	Hydraulics & Hydraulic Machines	3	0	2	0	4	NIL	4
30	21CE2204	Environmental Engineering	3	0	2	0	4	NIL	4
31	21CE3101	Design Of Reinforced Concrete Structures	3	0	2	0	4	19CE2201	4
32	21CE3103	Transportation Engineering	3	0	2	0	4	NIL	4
33	21CE2206	Geotechnical Engineering	3	0	2	0	4	NIL	4
34	21CE3201	Quantity Surveying Estimation	3	0	2	0	4	NIL	4
35	21CE3102	Water Resources Engineering	3	1	0	0	4	NIL	4
36	21CE3203	Design Of Steel Structures	3	1	0	0	4	19CE2201	4

Total Credits									48
		SKILLING COURSES							
37	20TS3101	Technical Proficiency / Entrepreneurial Incubation	0	0	0	12	3	NIL	3
38	20TS3202	Technical Proficiency / Technopreneurship	0	0	0	12	3	NIL	3
39	20TS4103	Technical Proficiency / Entrepreneural Skilling	0	0	0	12	0	NIL	0
40	20TS4204	Technical Proficiency / Entrepreneural Skilling	0	0	0	12	0	NIL	0
Total Credits									6
		PROJECT							
SNO	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**S**	**CREDITS**		
41	20IE2050	Social Internship	0	0	0	8	2	NIL	2
42	20IE3050	Technical Internship	0	0	0	8	2	NIL	2
43		Design Studio Elective	0	0	0	10	2.5	NIL	2.5
44	20IE3150	Midgrade Capstone Project 1	0	0	0	8	2	NIL	2
45	20IE3250	Midgrade Capstone Project 2	0	0	0	8	2	NIL	2
46	20IE4150	Capstone Project 1	0	0	0	24	6	NIL	6
47	20IE4250	Capstone Project 2	0	0	0	24	6	NIL	6
48	20IE4050	Practice School	0	0	0	24	6	NIL	6
49	20IE4051	Internship	0	0	0	24	6	NIL	6
Total Credits									22.5

		FLEXI-CORE								
50	FC-1	FLEXI-CORE-1	0	0	0	0	0		0
51	FC-2	FLEXI-CORE-2	0	0	0	0	0		0
52	FC-3	FLEXI-CORE-3	0	0	0	0	0		0
Total Credits									0
		PROFESSIONAL ELECTIVES								
53	PE1	PROFESSIONAL ELECTIVE-1	3	0	0	0	3		3
54	PE2	PROFESSIONAL ELECTIVE-2	3	0	0	0	3		3
55	PE3	PROFESSIONAL ELECTIVE-3	3	0	0	0	3		3
56	PE4	PROFESSIONAL ELECTIVE-4	3	0	0	0	3		3
57	PE5	PROFESSIONAL ELECTIVE-5	3	0	0	0	3		3
Total Credits									15
		OPEN ELECTIVES								
58	OE1	Open Elective -1	3	0	0	0	3		3
59	OE2	Open Elective -2	3	0	0	0	3		3
Total Credits									6
		MANAGEMENT ELECTIVES								
60	ME1	Modelling Business Systems	2	0	0	0	2		2
61	ME2	Entrepreneurship Essentials	2	0	0	0	2		2
Total Credits									4
Grand Total Credits									**171**

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K L E F (Deemed to be University)
Department of Civil Engineering
Curriculum Structure of B. Tech in Civil Engineering for 2021-22 Admitted Batch

S.No	Course Code	Course Name	Category	L	T	P	S	Credits	CH	Pre requisite
S E M E S T E R - 1										
1	20MT1101	Mathematics for Computing	BS	2	2	0	2	4.5	6	
2	20SC1101	Computational Thinking for Design	ES	3	0	2	6	5.5	11	
3	20UC1101	Integrated Professional English	HSS	0	0	4	0	2	4	
4	20ME1103	Design Tools Workshop - I	ES	0	0	4	0	2	4	
5	20SC1102	Introduction to Design	BS	1	0	0	4	2	5	
6	20PH1010	Mechanics	SE1	3	1	0	0	4	4	
Total				9	3	10	12	20	34	
S E M E S T E R - 2										
1	20UC1202	English Proficiency	HSS	0	0	4	0	2	4	
2	21CS1203	Object Oriented Programming	ES	3	0	2	3	4.75	8	
3	21MT2102	Mathematics for Engineers	ES	2	1	0	0	3	3	
4	20CS1202	Data Structures and Algorithms	ES	3	0	2	4	5	8	
5	21CE1002	Engineering Graphics for Civil Engineers	ES	0	0	2	0	1	2	
6	21SC1209	Design Tools for Workshop-II	BS	0	0	4	0	2	4	
Total				9	1	14	6	17.5	30	
S E M E S T E R - 3										
1	21BT1001	Biology For Engineers	BS	2	0	0	0	2	2	
2	20UC1101	Design Thinking And Innovation-1	BS	1	0	0	4	2	5	
3	21MT2007	Probability and Optimization Techniques	ES	2	1	0	0	3	3	NIL
4	20UC2103	Professional Communication Skills	HSS	0	0	4	0	2	4	NIL
5	21CE2101	Solid Mechanics	PC	3	0	2	0	4	5	NIL
6	21CE2102	Fluid Mechanics	PC	3	0	2	0	4	5	NIL
7	21CE2103	Surveying	PC	3	0	2	0	4	5	NIL
8	21CE2104	Construction Materials & Concrete Technology	PC	3	0	2	0	4	5	NIL
9	20IE2050	Social Internship	Project	0	0	0	8	2	4	NIL

		Total		17	1	12	12	27	38	
		S E M E S T E R - 4								
1	20UC1203	Design Thinking And Innovation-2	BS	1	0	0	4	2	5	NIL
2	20UC2204	Corporate Communication Skills	HSS	0	0	4	0	2	4	
3	21CE2201	Structural Analysis	PC	3	1	0	0	4	4	NIL
4	21CE2202	Building Planning, Drawing & Construction Management	PC	3	0	2	0	4	5	NIL
5	21CE2203	Hydraulics & Hydraulic Machines	PC	3	0	2	0	4	5	NIL
6	21CE2204	Environmental Engineering	PC	3	0	2	0	4	5	NIL
7	21CE2205	Geology	SC-2	3	0	2	0	4	5	NIL
8	20IE3050	Technical Internship	project	0	0	0	8	2	4	
		Total		19	1	10	12	26	42	
		S E M E S T E R - 5								
1	20UC3005	Aptitude Builder	HSS	0	0	4	0	2	4	NIL
2	21CE3101	Design of Reinforced Concrete Structures	PC	3	0	2	0	4	5	19CE2201
3	21CE2206	GeoTechnical Engineering	PC	3	0	2	0	4	5	Nil
4	21CE3102	Water Resources Engineering	PC	3	1	0	0	4	4	NIL
5	21CE3103	Transportation Engineering	PC	3	0	2	0	4	5	NIL
6	20TS3101	Technical Proficiency / Entrepreneurial Incubation	TS	0	0	0	12	3	6	NIL
7	21FL3054	French Language	HSS	2	0	0	0	2	4	NIL
8	20IE3150	MIDGRADE CAPSTONE PROJECT 1	project	0	0	0	8	2	4	NIL
9		Design Studio Elective	project	0	0	0	10	2.5	5	NIL
		Total		11	1	8	30	27.5	37	
		S E M E S T E R - 6								
1	21CE2105	AI & ML Applications in Civil Engineering	ES	2	0	0	4	3	6	NIL
2	21CE3201	Quantity Surveying Estimation	PC	3	0	2	0	4	5	NIL
3	21CE3202	Design of steel Structures	PC	3	1	0	0	4	4	19CE2201
4	20IE3250	MIDGRADE CAPSTONE PROJECT 2	project	0	0	0	8	2	4	NIL

5	20TS3202	Technical Proficiency / Technopreneurship	TS	0	0	0	12	3	6	NIL
6	PE-1	Professional Elective - 1	PE	3	0	0	0	3	3	NIL
7	PE-2	Professional Elective-2	Prof. Elec	3	0	0	0	3	3	NIL
8	PE-3	Professional Elective-3	Prof. Elec	3	0	0	0	3	3	NIL
		Total		17	1	2	24	25	34	
		S E M E S T E R - 7								
1	PE-4	Professional Elective-4	Prof. Elec	3	0	0	0	3	3	
2	PE-5	Professional Elective-5	Prof. Elec	3	0	0	0	3	3	
3	ME-1	Management Elective	ME	2	0	0	0	2	3	
4	20TS4103	Technical Proficiency / Entrepreneural Skilling	TS	0	0	0	12	0	6	NIL
5	20IE4150/	CAPSTONE PROJECT 1		0	0	0	24	6	12	
6	20IE4050	Practice School	project							
		Total		8	0	0	36	14	27	
		S E M E S T E R - 8								
1	OE-1	Open Elective-1	OE	3	0	0	0	3	3	
2	OE-2	Open Elective-2	OE	3	0	0	0	3	3	
3	ME-2	Management Elective	ME	2	0	0	0	2	2	
4	20TS4204	Technical Proficiency / Entrepreneural Skilling	TS	0	0	0	12	0	6	
5	20IE4250/20IE4050 /20IE4051	CAPSTONE PROJECT 2/ Practice School/ Internship	project	0	0	0	24	6	12	
		Total		8	0	0	36	14	26	
		GRAND TOTAL		**98**	**8**	**56**	**168**	**171**	**264**	

LIST OF PROFESSIONAL ELECTIVES

	Structural Engineering		L	T	P	Cr	Prerequisite
PE1	Advanced Structural Analysis	21CE3211	3	0	0	3	
PE2	Advanced Design of Reinforced Concrete Structures	21CE3221	3	0	0	3	
PE3	Prestressed concrete	21CE3231	3	0	0	3	
PE4	Bridge engineering	21CE4141	3	0	0	3	
PE5	Precast and Prefabricated structures	21CE4151	3	0	0	3	

	Geotechnical Engineering		L	T	P	Cr	Prerequisite
PE1	Foundation engineering	21CE3212	3	0	0	3	
PE2	Ground improvement techniques	21CE3222	3	0	0	3	
PE3	Design of earth retaining structures	21CE3232	3	0	0	3	
PE4	Geotechnical earthquake engineering	21CE4142	3	0	0	3	
PE5	Forensics in Civil Engineering	21CE4153	3	0	0	3	
	Environmental Engineering		**L**	**T**	**P**	**Cr**	**Prerequisite**
PE1	Sustainable engineering & technology	21CE3213	3	0	0	3	
PE2	Environmental impact assessment and life cycle analyses	21CE3223	3	0	0	3	
PE3	Solid Waste Management and Landfills	21CE3233	3	0	0	3	
PE4	River engineering	21CE3214	3	0	0	3	
PE5	Urban water hydrology and hydraulics	21CE3224	3	0	0	3	
	Construction Technology & Management		**L**	**T**	**P**	**Cr**	**Prerequisite**
PE1	Projects& Contract management	21CE3216	3	0	0	3	
PE2	Quality and Safety Management	21CE3226	3	0	0	3	
PE3	Form Work	21CE3236	3	0	0	3	
PE4	Construction Economics	21CE4146	3	0	0	3	
PE5	Sustainable Construction Technology	21CE4156	3	0	0	3	

	Transportation Engineering		L	T	P	Cr	Prerequisite
PE1	Intelligent transportation systems	21CE3215	3	0	0	3	
PE2	Pavement materials &design	21CE3225	3	0	0	3	
PE3	Traffic engineering and management	21CE3235	3	0	0	3	
PE4	Urban transportation systems planning.	21CE4145	3	0	0	3	
PE5	Railway engineering airport planning and design	21CE4155	3	0	0	3	

LIST OF OPEN ELECTIVES

S.No	Course Code	Course Name	Credits	L-T-P	Pre-requisites
1	21BT40A1	IPR & Patent Laws	3	3-0-0	NIL
2	21CE40A2	Environmental Pollution Control Methods	3	3-0-0	NIL
3	21CE40A3	Solid and Hazardous waste management	3	3-0-0	NIL
4	21CE40A4	Remote Sensing & GIS	3	3-0-0	NIL
5	21CE40A5	Disaster Management	3	3-0-0	NIL
6	21CS40A6	Fundamentals of DBMS	3	3-0-0	NIL
7	21CS40A7	Fundamentals of Software Engineering	3	3-0-0	NIL
8	21CS40A8	Fundamentals of Information Technology	3	3-0-0	NIL
9	21EC40A9	Image Processing	3	3-0-0	NIL
10	21EM40B1	Linux Programming	3	3-0-0	NIL
11	21EM40B2	E-Commerce	3	3-0-0	NIL
12	21EE40B3	Renewable Energy Sources	3	3-0-0	NIL
13	21ME40B4	Robotics	3	3-0-0	NIL
14	21ME40B5	Mechatronics	3	3-0-0	NIL
15	21ME40B6	Operations Research	3	3-0-0	NIL
16	21PH40B7	Nano Materials & Technology	3	3-0-0	NIL
17	21PE40B8	Subsea Engineering	3	3-0-0	NIL
18	21PE40B9	Oil and Gas Management	3	3-0-0	NIL
19	21GN40C1	Photography	3	3-0-0	NIL
20	21GN40C2	History of Sculpture	3	3-0-0	NIL
21	21GN40C3	Web Technologies	3	3-0-0	NIL
22	21GN40C4	Self Development	3	3-0-0	NIL
23	21GN40C5	Emotional Intelligence	3	3-0-0	NIL
24	21GN40C6	Behavioral Sciences	3	3-0-0	NIL

LIST OF MANAGEMENT ELECTIVES

S.No	Course Code	Course Name	Credits	L-T-P	Pre-requisites
1	21MB4051	Paradigms in Management thought	2	2-0-0	NIL
2	21MB4052	Indian Economy	2	2-0-0	NIL
3	21MB4053	Managing Personal Finances	2	2-0-0	NIL
4	21MB4054	Basics of Marketing for Engineers	2	2-0-0	NIL
5	21MB4055	Organization Management	2	2-0-0	NIL
6	21MB4056	Resources Safety and Quality Management	2	2-0-0	NIL
7	21MB4057	Economics for Engineers	2	2-0-0	NIL
8	21MB4058	Construction project Management	2	2-0-0	NIL

LIST OF FOREIGN LANGUAGE ELECTIVES

S.No	Course Code	Course Name	Credits	L-T-P	Pre-requisites
1	21FL3051	Arabic Language	2	2-0-0	NIL
2	21FL3052	Bengali Language	2	2-0-0	NIL
3	21FL3053	Chinese Language	2	2-0-0	NIL
4	21FL3054	French Language	2	2-0-0	NIL
5	21FL3055	German Language	2	2-0-0	NIL
6	21FL3056	Hindi Language	2	2-0-0	NIL
7	21FL3057	Italian Language	2	2-0-0	NIL
8	21FL3058	Japanese Language	2	2-0-0	NIL
9	21FL3059	Kannada Language	2	2-0-0	NIL
10	21FL3060	Russian Language	2	2-0-0	NIL
11	21FL3061	Simhali Language	2	2-0-0	NIL
12	21FL3062	Spanish Language	2	2-0-0	NIL

INTEGRATED PROFESSIONAL ENGLISH

Course code: 20UC1101 L-T-P: 0-0-4-0

Pre-Requisite: NIL Credits: 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the concepts of grammar to improve communication, reading, and writing skills	PO10	2
CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.	PO9	2
CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices	PO9	2
CO4	Apply the concepts of writing to draft corporate letters, emails, and memos	PO10	3

Course Objective:

- To express themselves in English with greater fluency, accuracy and confidence
- To communicate with others in practical, business-oriented situations
- To handle variety of business contexts, from negotiating, to using telephone, making presentation.

Syllabus:

COMPETENCY: 1

A)Basic Grammar - Countable and uncountable nouns, present simple and continuous, past simple and continuous – classroom practice – Understand and interpret Texts and work place situations B)Structural Pattern - Present continuous for future arrangements State verbs, Regular and irregular verbs, Voice, Modal verbs – Reporting on going tasks in the corporate world C)Descriptive and Qualitative Patterns: Adjectives and Adverbs classroom practice) Time Expressions, Comparatives and superlatives, Pronouns, Conditionals, Phrases and clauses (Including Relative)

COMPETENCY: 2

a) Formal contexts: Being a PA, describing changes in a company Taking orders over the phone

b) Listening & Speaking: Participate in conversation with proper contextual language markers and turn taking. Classroom practice - Presenting context, reason, problem – Case analysis (short).

c) Body Language: Dos and Don'ts of one to one interaction, Telephone interaction Video/ web conferencing. Culture specific practices.

d) Work Etiquette- situation, ambience, team skills, time management and leadership ability.

COMPETENCY: 3

a) Understand and assimilate main ideas and specific details. (250-300 words text of moderate difficulty)

b) Read for general understanding, interpreting, factual or specific information, for grammatical accuracy and information transfer.
c) Understand the general meaning of corporate context and office correspondence.
d) Understand short reports of predictable nature.

COMPETENCY: **4**

a) Internal Correspondence. Making notes on routine matters, such as, taking/ placing orders
b) Emails: Types of emails, salutations, vocabulary used in formal and informal (Including beginnings and endings)
c) Writing straight-forward, routine letters of factual nature

Reference Books:

1. Business Benchmark Book- Preliminary- 2nd edition Cambridge Press 2019.
2. Business Benchmark Book- Pre Intermediate to Intermediate- 2nd edition Cambridge Press 2019

Web Links:

1. https://www.cambridgeenglish.org/
2. https://learnenglish.britishcouncil.org,https://apps.apple.com/in/app/bec-from-cambridge/id1351207688https://play.google.com/store/apps/details?id=com.liqvid.bec

ENGLISH PROFICIENCY

Course code: 20UC1202 L-T-P: 0-0-4-0

Pre-Requisite: NIL Credits: 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	Demonstrating different interpersonal skills for employability	PO 8	2
CO2	Distinguishing business essential skills	PO9	2
CO3	Classifying social media and corporate communication skills	PO 12	2
CO4	Applying analytical thinking skills	PO 12	3

Course Objective:

- To communicate with others in practical, business-oriented situations
- To express themselves in English with greater fluency, accuracy, and confidence
- To handle themselves in English in a variety of business contexts, from negotiating, to using the telephone, to making presentations, to socializing

Syllabus:

COMPETENCY 1:

Job description- Advice on job applications – getting the right job- importance of doing a job interview -Launching and promoting a new product-Persuasive and negotiation skills -Types of emails: giving information, making an enquiry, answering enquiries -Marketing Report

COMPETENCY 2:

Becoming an entrepreneur- buying a franchise- franchising start -up -presenting business idea- signaling parts of presentation - arranging business travel- business conferences and meetings- spending sales budget

COMPETENCY 3:

Social media and business- introducing company using social media- staff survey- survey report- off-shoring and outsourcing- customer satisfaction and loyalty- communication with customers- corresponding with customers- business across cultures

COMPETENCY 4:

Underlying assumptions, finding the conclusions, Argument strengthening, Argument weakening, finding the fallacies

Reference Books:

1. Business Benchmark Book- Upper Intermediate - 2nd edition Cambridge Press 2019.
2. Business Benchmark Book- Pre-Intermediate to Intermediate- 2nd edition Cambridge Press 2019.
3. Business Benchmark Book-Upper Intermediate: 2nd Edition Cambridge Press, 2019
4. Pillai, Sabina, et.al, Soft Skills and Employability Skills, New Delhi: CUP. 2018. Print.
5. Peterson, Reading Skill, New York: Peterson. 2007
6. Verbal and Non-Verbal Reasoning, R. S. Aggarwal, S Chand Publications.
7. R S Agarwal, S Chand, 'A modern approach to Logical reasoning'
8. GRE Barron's, Mc Graw Hills
9. Logical Reasoning, Edgar Thorpe, Pearson Publications

Web Links:

1. https://www.cambridgeenglish.org/
2. https://learnenglish.britishcouncil.org,
3. https://apps.apple.com/in/app/bec-from-cambridge/id1351207688

4. https://play.google.com/store/apps/details?id=com.liqvid.bec
5. https://www.cambridgeenglish.org/exams-and-tests/business-preliminary/exam-format/
6. https://www.cambridgeenglish.org/exams-and-tests/business-preliminary/preparation/
7. www.bbclearningenglish.com
8. www.indiabix.com
9. www.freshersworld.com
10. www.managementparadise.com
11. www.coolavenues.com
12. www.indiaedu.com/entrance-exams/cat.../books.html
13. www.mycatprep.com

PROFESSIONAL COMMUNICATION SKILLS

Course code: 20UC2103 L-T-P: 0-0-4
Pre-Requisite: NIL Credits: 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	Developing critical and analytical reading skills	PO12	2
CO2	Discovering different interpersonal skills to develop people skills	PO12	2
CO3	To enhance the problem-solving skills of the students through the concepts of Simple Equations, Ratio, Proportion &Variation, Percentages, Profit & Loss, Averages, Allegations, Simple & Compound Interest.	PO5	2
CO4	Apply diagrammatic representation of the given data to find the possible outcomes in the topics of Deductions, Cubes, Venn Diagrams and Arrangements	PO2	2

Course Objective:

- To develop comprehending skills
- To discover core thinking skills for problem solving
- To interpret logical thinking skills for better thinking ability

Syllabus:

COMPETENCY-1: Verbal Ability

- Reading for Gist & Summarizing
- Reading for Information & Inference
- Critical Reading
- Analytical Reading
- Logical Reading

COMPETENCY-2: Critical Thinking Skills

- Core Thinking Skills
- Categories of Thinking
- Problem Solving
- Decision Making

COMPETENCY -3: Quantitative Aptitude:

- Simple Equations, Ratio
- Proportion &Variation
- Percentages
- Profit & Loss
- Averages
- Alligations
- Simple & Compound Interest

COMPETENCY -4: Reasoning

- Deductions
- Cubes

- Venn Diagrams
- Linear arrangements
- Circular arrangements
- Ordering and Sequencing
- Selections

Reference Books:

1. Soft Skills by Dr. Alex S CHAND Publications
2. Objective English by Showarick Thrope, Pearson
3. Quantitative Aptitude by R S Agarwal, S CHAND Publications.
4. Quantitative Aptitude by Abhijit Guha, Mc Graw Hills.
5. Verbal and Non-Verbal Reasoning, R. S. Aggarwal, Schand Publications.
6. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning' GL Barrons, McGraw Hills

Web References / MOOCs:

1. Online resource: cssklu.bolgspot.com
2. www.indiabix.com
3. www.freshersworld.com
4. www.managementparadise.com
5. www.coolavenues.com
6. www.indiaedu.com/entrance-exams/cat.../books.html
7. www.mycatprep.com

CORPORATE COMMUNICATION SKILLS

Course code: 20UC2104 L-T-P: 0-0-4-0
Pre-Requisite: NIL Credits: 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	To distinguish product and process and quote them in speaking and writing activities	PO12	2
CO2	To apply interpersonal skills	PO12	2
CO3	To enhance the problem-solving skills of the students through the concepts of Numbers, Time & Work, Time & Distance, Permutations & Combinations, Probability which will enable them to improve their problem solving abilities which in turn improve their programming skills.	PO 5	2
CO4	To apply known facts to find the unknowns in the topics Clocks, Calendars, Binary Logic. Identify the rule set by analyzing the given observations in the topics Series, Analogy, Odd Man, Coding-Decoding	PO2	2

Course Objective:

- To demonstrate speaking, and writing skills
- To apply interpersonal skills
- To develop logical thinking skills for better thinking ability

Syllabus:

COMPETENCY-1: Verbal Ability

Speaking from the script, Product & Process Description, Presenting Arguments, Paragraph writing.

COMPETENCY-2: Soft Skills

Goal Setting, Team Building, Leadership, Time Management, Managing Stress

COMPETENCY -3: Quantitative Aptitude:

Numbers, Time & Work, Time & Distance, Permutations & Combinations, Probability

COMPETENCY -4: Reasoning

Clocks, Calendars, Binary logic, Number and letter series, Number and letter analogy, Finding the odd man, Coding-Decoding, Direction sense

Reference Books:

1. Soft Skills by Dr. Alex S CHAND Publications
2. Objective English by Showarick Thrope, Pearson
3. Quantitative Aptitude by R S Agarwal, S CHAND Publications.
4. Quantitative Aptitude by Abhijit Guha, Mc Graw Hills.
5. Verbal and Non-Verbal Reasoning, R. S. Aggarwal, Schand Publications.
6. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning' GL Barrons, McGraw Hills.

Web References / MOOCs:

1. Online resource: cssklu.bolgspot.com
2. www.indiabix.com

3. www.freshersworld.com
4. www.managementparadise.com
5. www.coolavenues.com
6. www.indiaedu.com/entrance-exams/cat.../books.html
7. www.mycatprep.com

APTITUDE BUILDER

Course code: 20UC3005 L-T-P: 0-0-4

Pre-Requisite: NIL Credits: 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	To discuss and interpret English language skills necessary for placements	PO12	2
CO2	To demonstrate skills to get selected in interviews and retain job	PO12	2
CO3	To enhance the problem-solving skills of the students through the concepts of Mensuration, Quadratic Equations & Inequalities, Progressions, Logarithms, Data Interpretation, Data Sufficiency which will enable them to improve their problem-solving abilities which in turn improve their programming skills.	PO5	2
CO4	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles.	PO2	2

Course Objective:

- To identify different components of verbal ability and interview skills
- To apply the skills acquired in the placement tests to succeed.
- To develop logical reasoning for better thinking ability

Syllabus:

COMPETENCY-1:

a) Verbal Ability: Sentence Completion, Idioms & Phrases, One Word Substitutes, Sentence Improvement, Sentence Equivalence, Analogies

b) Life Skills: Attitude for Success, Connecting with People, Employment Communication (CV & Interview), Workplace Etiquette

COMPETENCY-2:

a) Attitude for Success: Stimulus and Response, Choosing the Response, Determinisms, Changing the attitude for success, Proactive and reactive Attitude

b) Connecting with People: Empathy, Assertiveness, Saying what you want to say, Saying what you do not want to say – saying 'No'

COMPETENCY-3: Quantitative Aptitude

Mensuration, Quadratic Equations & Inequalities, Progressions, Logarithms, Data Interpretation, Data Sufficiency

COMPETENCY-4: Reasoning

Connectives, Blood relations, Ranking and time sequence, Symbols and notations, Non-verbal reasoning (Picture puzzles), Data sufficiency

Reference Books:

1. Soft Skills by Dr. Alex S CHAND Publications
2. Objective English by Showarick Thrope, Pearson
3. Quantitative Aptitude by R S Agarwal, S CHAND Publications.
4. Quantitative Aptitude by Abhijit Guha, Mc Graw Hills.
5. Verbal and Non-Verbal Reasoning, R. S. Aggarwal, Schand Publications.
6. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning' GL Barrons, McGraw Hills.

Web References / MOOCs:

1. Online resource: cssklu.bolgspot.com
2. www.indiabix.com

3. www.freshersworld.com
4. www.managementparadise.com
5. www.coolavenues.com
6. www.indiaedu.com/entrance-exams/cat.../books.html
7. www.mycatprep.com

MATHEMATICS FOR COMPUTING

Course code: 20MT1101 L-T-P-S: 3-1-0-4

Pre-Requisite: NIL Credits: 5

Mapping of Course outcomes with Program Outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Explain the basic structures, relations, permutations, combinations, probability.	PO1	2
CO2	Demonstrate the system of equations and game theory through matrix algebra.	PO1	2
CO3	Demonstrate the rules of propositional logic to establish validity of argument, induction, recurrence relations and lattices.	PO1	2
CO4	Interpret the problems associated with graphs, trees, correlation and regression.	PO1	2
CO5	Demonstrate the Aptitude & Reasoning skills (Tests in skilling hours)	PO1	2

Syllabus:

Foundations of Computational Mathematics-I

Basic Structures: Sets, Functions, Sequences and Summations, Cardinality of Sets, Relations and their Properties, Equivalence Relations. P**ermutations and combinations probability**: Linear Permutation, Circular Permutation and combinations, addition theorem, conditional probability, multiplication theorem.

Foundations of Computational Mathematics-II

Matrix Algebra: Introduction, Types of Matrices, Rank of matrix, Solutions of linear Equations - Gauss elimination, Jacobi and Gauss Seidal, Eigen values, Eigen vectors. **Game Theory:** Pay off Matrix, Mini-Max criteria, objective function, Saddle points, Optimal Strategy, Mixed Strategy, Value of a game and Decision under uncertainty.

Discrete Mathematics-I

Logic and Proofs: Propositional Logic, Applications of Propositional, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference Predicate logic, Consequences, Introduction to proofs, Proof methods and strategy. **Applications of Number theory**: Fermat's theorem, Euclidean Algorithm,

Counting Techniques: Recursive definitions, Solving Linear Recurrence Relations, Fibonacci series, Divide-and-Conquer Algorithms, Generating Functions, Inclusion–Exclusion, **Lattices:** Introduction, Properties of Lattices, Sub lattices, Partial order relation, Homomorphism and Isomorphism, Hasse diagrams.

Discrete Mathematics-II& Statistics:

Graphs & Trees: Terminology, Types of Graphs, Bipartite graphs, Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path, Planar Graphs , Trees, Tree traversal and application of trees, spanning trees and Minimal spanning trees. **Statistics**: Curve fitting, Correlation, Linear Regression

Skilling: {Tests in skilling hours} 4 hours per week [60 hours]

LOGIC AND REASONING: Deductions, Logical Connectives, Linear and circular arrangements, Ordering and sequencing, Clocks, Calendars, Blood Relations, Cubes, Direction sense, Number and letter series, Number and letter Analogy, Odd man out, Coding and Decoding, Symbolic representations of given data, Binary Logic, Non Verbal reasoning.

Foundations in Arithmetic: Numbers, Ratio, Proportion, Variation, Averages, Percentages, Profit & loss, Time & Distance, Time & Work.

Geometry: Lines, Triangles, Quadrilaterals, Polygons, Practical applications of common solids, irregular solids and their application in various engineering problems.

Text Books:

1. Basic Engineering Mathematics**,** John Bird, sixth Edition, Elsevier, ISBN:978-1-1380 5382-3
2. Advanced Engineering Mathematics, ISV Tenth Edition, John Wiley & sons,Erwin KreyzigISBN: 978-81-265-5423-2

Reference Books:

1. Quantitative Aptitude, R. S. Aggarwal, Schand Publications. ISBN: 978-81-219-2498-6
2. Quantitative Aptitude - G. L. Barrons. ISBN: 13:978-1438009049
3. Quantitative Aptitude - Abhijit Guha, Mc Graw Hills. ISBN: 978-93-5260-437-1

DESIGN THINKING AND INNOVATION – 1

COURSE CODE : 20UC1102 L-T-P-S: 1-0-2-4

Pre-requisite: NIL Credits : 2

COURSE OUTCOMES (CO – PO MAPPING):

CO No	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the basics of design thinking and its implications in product or service development	PO1	2
CO2	Understand and Analyse the requirements of a typical problem	PO2	4
CO3	Plan the necessary activities towards solving the problem through ideation and prototyping	PO4, PO5, PO11	4
CO4	evaluate the solution and refine them based on the customer feedback	PO3, PO9	5

SYLLABUS:

Overview of Design Thinking: Define Design Thinking, Differentiate Design Thinking from Design, Get an Overview of the Design Thinking Process,

Empathize and Understand: Explain how empathy influences the outcomes of Design Thinking, List Different Empathy Research Techniques, Define the Guidelines for an Empathetic Research,

Defining Needs: Explain how PoV can be used in defining the design problem, Use a structured approach to arrive at a PoV,

Ideation for Solutions: List the best practices for conducting a successful ideating session, Describe the techniques for evaluating and prioritizing ideas, Prototyping: Define prototyping, Explain how prototyping aids in communicating ideas effectively, List various tools for prototyping,

Testing the Solution: Define the steps of a successful testing approach, Demonstrate the process of gathering and responding to user feedback.

REFERENCE BOOKS:

1. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems

DESIGN THINKING AND INNOVATION - 2

COURSE CODE: 20UC1203 L-T-P-S: 1-0-2-4

Pre-requisite: NIL Credits : 2

COURSE OUTCOMES (CO – PO MAPPING):

CO No	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the problem statement, requirements and formulating approaches to solve real world problems.	PO1, PO2	2
CO2	Designing the solution by taking the user interactions & ease of use into consideration	PO3	5
CO3	Applying the design principles in building sustainable and environment friendly solutions.	PO7	3
CO4	Manage the Innovation effectively interms of resources, finances, copyright, IPR, Trademark, Patent and license agreement policies for protecting own R&D innovations and enhancing brand image.	PO8, PO11	2

Problem Solving Mindset: Understanding Problem Statements, Recapping Design Principles, Design Thinking Toolsets, Formulating approaches to Solutions, Applications of Design Thinking: Case Study.

Human Centered Design : Services Development process and lifecycle, Product Vs Services, Innovation in Services, Service Experience Lifecycle, Human Computer Interaction, Usability Engineering - Heuristic Evaluation.

Design for the Environment : Design Considerations, Environmental Issues, Sustainable Development, Green Design – Design for Process, Design for Product, Qualitative and Quantitative Methods for DFE, Design for Disassembly, Design for Recyclability, Design for Energy Efficiency. The relevance of 4Rs - reduction, reuse, recycling and recovery in Environmental friendly design. Sustainable Development.

Design Thinking and Innovation Management Culture: Project Management - Project Planning, Business Plan, Planning the resources, Effective Communication, Team Management, Benchmarking the Development, Cost Estimation, Interpreting the Feedback and Troubleshooting, Pitching the idea, Revenue Model.

Intellectual property and protection of ideas: Concepts of copyright, Intellectual Property, Trademark, Service mark Patent and typical business benefits, Applying for patent, Product license agreement, Open-source license, need for protecting own R&D innovations, Enhancing brand image with IP.

REFERENCE BOOKS:

1. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems

BIOLOGY FOR ENGINEERS

Course Code: 21BT1001 L-T-P-S: 2-0-0-0

Pre-requisite: NIL Credits: 2

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Acquire the Knowledge of basic biology	6, 7	2
2	Acquire the Knowledge of Human Biological Systems	6, 7	2
3	Acquire Knowledge on Microorganisms and Biosensors	6, 7	2

Syllabus:

Basic Biology: Introduction, Living organisms, Cell structure and Organelles, Organogenesis, Human Anatomy.

Systems of Life: Digestion, Respiration, Circulation, Excretion, Reproduction, Thinking and coordination and Defense.

Diet and Nutrition: Macro (Carbohydrates, proteins, lipids) - and Micronutrients (vitamins), Essential minerals and their role; deficiency symptoms; and their role; deficiency symptoms. Micro-organisms: Classification of Microorganisms, beneficial and harmful effects of Bacteria, Fungi and Viruses.

Biosensors, biomechanics and Medical Imaging technology, Applications of Biosensor in Food and Agriculture.

Text Books:

1. Dr RC Dubey, “Advanced Biotechnology”, S Chand Publications.
2. P K Gupta, “Elements of Biotechnology”, RASTOGI Publications.

MATHEMATICS FOR ENGINEERS

Course code : 21MT2102 L-T-P-S: 2-0-2-0
Pre-requisite : NIL Credits: 3

Course Outcomes (CO):

CO No:	Course out come	PO	BTL
1	Apply differential and integral calculus to find maxima & minima of functions and evaluate the integrals	**1**	**2**
2	Model and solve the relevant phenomena as a differential equation .	**1**	**3**
3	Demonstrate Fourier series and Analytic functions	**1**	**2**
4	Describe probability , Random Variables and Algebraic structures	**1**	**2**

Syllabus

Calculus:

Differential and Integral calculus: Taylors series for function of variables, Maxima and Minima for functions of two variables, Evaluation of double integrals – Change of order of Integration, Change of Variables , Polar coordinates [5 hours]

Vector calculus: Scalar and vector point functions, Gradient , Directional Derivative, Divergence and Curl, Evaluation of line integrals – Greens theorem. [5 hours]

Ordinary Differential Equations: Solution of first order equations and their applications- Newton law of cooling, Growth and decay , Solution of Second Order Differential equations.[4 hours]

Partial Differential Equations: Formation of PDE, Solution of first order linear equations – Lagrange's method, Solution of second order PDE by separation of variables.[4 hours]

Laplace Transforms: Laplace and Inverse Laplace transforms and their properties . [5 hours]

Fourier Series: Definition, Dirchelt conditions, Fourier series for simple functions [4 hours]

Complex Variables : Complex functions- Exponential, Logarithmic and Trigonometric functions ,Analytic function – Cauchy - Riemann equations - Milne Thomson method [6 hours]

Probability and Random Variables: Probability –Addition, Multiplication and Baye's theorem. Random variables – Probability distributions – Binomial, Poisson and Gaussian distributions, Markov process. [9 hours]

Algebraic Structures: Structure of Algebras, Semi groups, Monoids and Groups, Homomorphism's, Normal subgroups and congruence Relations, Rings[4 hours]

Text books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Willey& Sons, Inc, Newyork

Reference books

1. Probability and Statistics for engineers and scientist, R.E.Walpole, R.H.Myers, S.L.Myes,K.E.Je, Pearson learning

2. Mott, J.L., Kandel, A. and Baker, T.P., Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall India Pvt Ltd
3. Tremblay J P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill.

PROBABILITY AND OPTIMIZATION TECHNIQUES

Course code : 21MT2007 L-T-P-S: 2-1-0-0
Pre-requisite : NIL Credits: 3

Syllabus:

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Baye's theorem. Random variables, joint and marginal probabilities, Mathematical Expectation.

Standard discrete and continuous distributions: Definitions and simple properties of Binomial, Poisson, Geometric, Hyper-Geometric, Uniform, Exponential, Weibull, and Normal distributions, Applications of the above distributions.

Correlation and Regression: Correlation coefficient for grouped and ungrouped data, Rank correlation. Linear and Non-Linear regression.

Linear Programming: Formulation of LPPs, Graphical solution of LPP, Simplex method, Big-M method, duality in LPP and dual simplex method.

Nonlinear programming: Convex sets and convex functions, Kuhn-Tucker conditions. Convex quadratic programming: Wolfe's and Pivot complementary algorithms. Separable programming.

TEXT BOOKS:

1. Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.

2. H A Taha, Operations Research: An Introduction, Prentice Hall Pub.

REFERENCE BOOKS:

1. Richard A. Johnson, Miller & Freund's Probability & Statistics for Engineers, 11th Edition PHI, New Delhi.

2. Jay L. Devore, Probability and Statistics for Engineers, CENEAGE learning.

3. S. C. Gupta and V. K. Kapoor,"Fundamental of Mathematical Statistics" Sultan Chand & Sons Publication, 11th Edition.

4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley Pub.

5. S D Sharma, Operations Research, Kedar Nath Ram Nath & Co

MECHANICS

Course code: 21PH1010 L-T-P-S: 3-1-0-0

Pre-Requisite: NIL Credits: 4

Course Outcomes for

CO#	Course Outcome	PO/PSO	BTL
CO1	Develop familiarity with the physical concepts and facility with the mathematical methods of classical mechanics	PO1, PO2	3
CO2	Analyze planar and spatial systems and analyze the forces in the members of trusses, frames.	PO1, PO2	4
CO3	Determine first moment and second moment for a given cross sections and problems related to friction	PO1, PO2	3
CO4	Analyze the motion characteristics of a body subjected to a given force system.	PO2	4

Syllabus:

Two-Dimensional Force Systems: Introduction, Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, force laws, Resultant of two dimensional concurrent and Non-Concurrent Force systems, Free body diagrams, Applications. Equilibrium of Rigid bodies– Equilibrium and Equations of Equilibrium, Lame's theorem, Type of supports and their reactions, Moments and couples, Varignon's theorem, Resultant moment and applications.

Spacial Force System & Trusses: Spatial force systems – Forces in space, resultant and equilibrium of spatial force system**.** Truss Analysis-Trusses -Assumptions involved in the Method of joints and sections.

Friction And Properties of Areas: Friction**:** Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Applications-ladder friction, wedge friction.

Centriod And Moment of Inertia: Centroids, center of gravity, Moment of inertia - Area and Mass- polar moment of inertia, Parallel axis theorem**.**

Kinematics Of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational motion**.**

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D-Alembert's Principles and Dynamic Equilibrium.

Text books:

1. Engineering Mechanics-Statics and Dynamics by R**.** C**.** Hibbler / Pearson
2. Engineering Mechanics **(**in SI Units**)** / S**.** Timoshenko, D**.** H**.** Young, J**.**V**.** Rao/ Tata McGraw Hill**.**
3. Vector Mechanics for Engineers -Statics &Dynamics / F**.**P**.** Beer and E**.**R**.** Johnston/ Tata McGraw Hill**.**
4. (http://kisi.deu.edu.tr//mehmet.cevik/Dynamics/Slides/CHAP11_Kinematics_of_particles.pdf)
5. Engineering Mechanics staticsand Dynamics /MeriamandKraige

Reference books:

1. Engineering Mechanics / S. S. Bhavikatti/ New Age.
2. Engineering Mechanics- NH Dubey/ Tata McGrawHill.

GEOLOGY

Course Code: 21CE2204 L-T-P: 3-0-2-0

Prerequisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No:	CO	PO	BTL
1	Understand the significance of engineering geology, basics of geological processes that modify the surface of the earth, earthquakes, landslides.	**1,8**	**1**
2	Understand the basics of minerals and rocks, geological structures exhibited by rocks and their influence ,	**1,8**	**1**
3	analyze the geological conditions to identify suitable site for civil engineering projects.	**1,8**	**2**
4	analyze the geological conditions to identify potential sites for groundwater, sites for dam and reservoir and tunnels	**1,8**	**2**
5	analyze the geological conditions for suitability of the site for a major civil engineering project	**2,8**	**2**

SYLLABUS:

INTRODUCTION: Importance of geology from Civil engineering point of view,

PHYSICAL **GEOLOGY:** Introduction; Weathering Process, types of weathering and its importance in civil engineering; Soil formation, Soil profile, soil conservation measures; Geological action of Rivers, stages in a river system, features of river erosion and deposition.

EARTHQUAKES AND SEISMIC HAZARDS: Terminology; Classification, Causes and effects of earthquakes; seismic waves, measuring instruments, seismic zones of India, Seismic belts, seismic hazards in India ; Civil Engineering considerations in seismic areas. A step towards urban earthquake vulnerability reduction.

LAND SLIDES: Classification; Causes and effects of Landslides; Preventive measures of Landslides.

MINERALOGY: Definition of mineral; physical properties of minerals. Study of common rock forming minerals - Quartz, Feldspar, Muscovite, Asbestos calcite, Talc, Kaolin

PETROLOGY: Introduction; Rock Cycle, major rock types, formation of Igneous rocks; Structures of Igneous rocks. Formation of Sedimentary rocks; Structures of Sedimentary Rocks. agents of metamorphism, Structures of Metamorphic rocks, distinguisition of major rock types,

ENGINEERING PROPERTIES OF ROCKS: Different Engineering property of rocks. Description of some important Rocks – Granite - Basalt – Dolerite – Sand Stone – Lime Stone – Shale – Laterite - Granite gneiss – schist – Marble – K hondalite – Charnockite.

STRUCTURAL GEOLOGY: Introduction; Strike and Dip; Outcrop. Parts and classification of Folds; Faults; Joints; and their importance in Civil Engineering constructions.

SITE INVESTIGATION TECHNIQUES FOR CIVIL ENGINEERING PROJECTS: Introduction, Different stages of site investigation, toposheets/topographic maps; Geological

maps and their interpretation in site investigation; Geophysics in civil engineering, electrical resistivity investigations, seismic survey, remote sensing , Geographical information systems and their application

GROUND WATER: sources of ground water, factors controlling ground water, water bearing properties of rocks and soils, types of aquifers, exploration of ground water

DAMS: Dams terminology; Types of dams and suitable foundations; guidelines for major dam and reservoir investigations;

TUNNELS: Purpose of tunneling; types of tunnels, tunnels and underground excavations – methods of site selection, tunnel excavation in various rock types, geological problems, Geology of some tunnel sites;

Text books:

1. Engineering Geology by D.Venkat Reddy; Vikas Publishing House Pvt.Ltd., Noida
2. Engineering and General Geology by Parbin Singh; S. K. Kataria & Sons, New Delhi.

Reference Books:

1. Engineering Geology and Geo techniques by Krynine and Judd, Mc Graw – Hill Book Company.
2. Engineering geology by Subinoy Gangopadhyay: Oxford University Press
3. Principles of Engineering Geology by K.M. Bangar, Standard Publications, Distributors, 1705-B, Nai sarak, New Delhi.
4. A text Book of Engineering Geology by N. Chennakesavulu; Macmillan India Ltd., Delhi.
5. Rock Mechanics for Engineers by Dr. B.P.Varma, Khana Publishers, Delhi-6.
6. Principles of Engineering Geology by KVGK Gokhale, B.S. Publications, Hyderabad

COMPUTATIONAL THINKING FOR DESIGN

Course Code : 20SC1101 L-T-P-S: 3-0-2-6

Pre-requisite : NIL Credits: 5.5

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.	PO1,PO2	3
CO2	Translate computational thinking into Logic Design for Solving real world problems.	PO1,PO2	3
CO3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations.	PO1,PO2	4
CO4	Apply and Analyse CRUD operations on Linear Data Structures using Asymptotic Notations.	PO4	4
CO5	Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.	PO1,PO2, PO4	3

Syllabus:

Structured Programming Paradigm: Problem Solving Approach, Algorithms and Algorithm Analysis, Program Development Steps, Structure of C Program, Pre-Processor Directives,
Design of Building Blocks for solving real world problems: Modularization: Functions, Scope of Variables and Storage classes.
Data Types: Primitive, Extended and Derived Including Pointers,
Operators: Types of operators, Precedence, Associativity.
User I/O: Formatted I/O, Command line arguments, Redirecting I/O: Files and File Operations.

Logic Design for Computational Thinking:
Control Flow Statements:
Decision making using conditional statements, Definite and indefinite Iterative statements.
Recursion, logic building using complex building blocks.

CRUD operations on Basic Data Structures:
Basic Data Structure: Arrays, 2-D Arrays, Dynamic Memory Allocation
Searching: Linear Search and Binary Search
Sorting: Bubble Sort
CRUD operations on Linear Data Structures: Stacks, Queues and Single Linked List. Introduction to Trees.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language: ANSI C Version", 2/e, Prentice-Hall/Pearson Education-2005.
2. E. Balagurusamy, **"**Programming in ANSI C" 4th ed.,Tata McGraw-Hill Education, 2008.
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition-2005.

Reference Books:

1. Mark Allen weiss, Data Structures and Algorithm Analysis in C, 2008, Third Edition, Pearson Education.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of Data structures in C", 2nd Edition-2007.
3. Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, "Data structures and Program Design in C", 4th Edition-2007.
4. C for Engineers and Scientists – An Interpretive Approach by Harry H. Cheng, Mc Graw Hill International Edition-2010.
5. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 7/e, Pearson Education-2004.
6. Jean Paul Trembly Paul G.Sorenson, "An Introduction to Data Structures with applications", 2nd Edition.

Web References / MOOCS:

- www.hackerrank.com
- www.codechef.com
- www.spoj.com

Independent Learning:

1. Computational Thinking with Beginning C Programming
https://www.coursera.org/specializations/computational-thinking-c-programming

2. CISCO NetAcad Course
https://www.netacad.com/courses/programming/cla-programming-c

DESIGN TOOLS WORKSHOP -I

Course Code : 21ME1103 L-T-P-S: 0-0-4-0

Pre-requisite : NIL Credits : 2

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO/PSO	BTL
CO1	Practice design thinking by developing artistic skills	PO-3	2
CO2	Visualize and practice innovative design by final drafting using photogrammetric and model the design using prototyping technique	PO-4	3
CO3	Apply the concept of AI & Data analytics & finalize the requirements to design his idea	PO-5	3
CO4	Draft a report of his project from the initial stage & make a report which include scope, time and cost management of his project	PO-4	3

Syllabus:

Introduction to Design thinking: Design thinking, usage of visualization tool, Physics and preparation for Innovation, Idea generation and mind mapping, Strategic opportunities, Storytelling tool. **Photogrammetry:** Basic concepts of photogrammetry, types of photogrammetric techniques and measurements. **Prototyping:** Prototyping, including paper and tool-based prototyping,design principles and patterns, 3D Modeling, 360 Prototyping, 3DPrinting. **Engineering Project Management:** Scope, Time and Cost Management. **Data Analytics:** Introduction, Basics of Statistical Analysis System (SAS)**,** Logistic regression using SAS. **Artificial Intelligence:** Introduction, Turing Test, Breadth first Search techniques, Depth first Search techniques using python. **Machine Learning:** Linear regression, Naive Bayes, gradient descent algorithms using python.

Text Books:

1. **"Complete Design Thinking Guide for Successful Professionals" by Daniel Ling**
2. "Project Management" by K.Nagarajan, 7th Edition, New Age International Publishers.
3. "Augmented Reality and Virtual reality" by Timothy Jung, M.Claudia Tom Dieck, Springer.
4. "Rapid Prototyping: Principles and Applications"by Chua C.K., Leong and Lim. C.S, 2nd Edition, World Scientific.
5. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall.

Web References:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?
2. https://www.coursera.org/learn/introduction-virtual-reality?specialization=virtual-reality
3. https://www.coursera.org/learn/scope-time-management-cost

DATA STRUCTURES AND ALGORITHEMS

Course code: 21CS1202 L-T-P-S: 3-0-2-0

Pre-Requisite: NIL Credits: 4

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Apply measures of efficiency on algorithms and Analyse different Sorting Algorithms.	PO1, PO2, PSO1, PSO2	4
CO2	Analyse and compare stack ADT and queue ADT implementations using linked list and applications.	PO1, PO4, PSO1, PSO2	4
CO3	Analyse the linked implementation of Binary, Balanced Trees and different Hashing techniques.	PO1, PO4, PSO1, PSO2	4
CO4	Analyse different representations, traversals, applications of Graphs and Heap organization.	PO2, PO4, PSO1, PSO2	4
CO5	Develop and Evaluate common practical applications for linear and non-linear data structures.	PO1, PO2, PSO1, PSO2	5

Syllabus

Algorithm Analysis: Mathematical Background, Model, Analyse, Running Time Calculations, Lists**.**

Stacks and Queues: Abstract Data Types (ADTs), The List ADT, The Stack ADT, The Queue ADT.

Trees: Preliminaries, Binary Trees, The Search Tree ADT—Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals (Revisited), B-Trees, Red black trees

Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables without Linked Lists, Rehashing, Hash Tables in the Standard Library, Extendible Hashing.

Priority Queues (Heaps): Model, Simple Implementations, Binary Heap, Applications of Priority Queues.

Sorting: Preliminaries, Insertion Sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, Quick sort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting.

Graph Algorithms: Definitions, Topological Sort, Shortest-Path Algorithms, Minimum Spanning Tree.

Text books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2010, Second Edition, Pearson Education.
2. Ellis Horowitz, Fundamentals of Data Structures in C: Second Edition, 2015

Reference books

1. A.V.Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint 2003.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of data structures in C", Second Edition-2007.
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India Edition, 2005.
4. Robert Kruse, C.L. Tondo, Bruce Leung, Shashi Mogalla, "Data Structures& Program Design in C", Fourth Edition-2007.

List of Lab Experiments:

1. Develop a set of programs to implement Linear and Binary searching techniques (both iterative and recursive)
2. Develop a set of programs to find the solution for the maximum subsequence sum problem with different time complexity solutions.
3. Develop a set of programs to implement below sorting techniques
    a. Insertion Sort
    b. Shell sort
    c. Selection Sort
4. Develop a set of programs to implement below sorting techniques (Divide and conquer method)
    a. Quick sort with median of three.
    b. Merge Sort
5. Develop a Program to implement operations of doubly linked list
    a. Create
    b. Insert
    c. Display
    d. Delete
    e. Search
6. Develop a program to perform operation on stack using linked list
7. Develop a program to perform operations on queue using linked list
8. Develop a program to implement Circular Queue using Array
9. Develop a program to implement Binary Search Tree with Traversal Operations
10. Develop a program to perform following operations on AVL tree
    a. Insertion
    b. Deletion
11. Develop a program to implement the following
    a. Separate chaining for collision handling
    b. Open Addressing Technique
12. Develop a program to implement Heap sort
13. Develop a program to implement
    a. Breadth First Search
    b. Depth First Search
    c. Dijkstra's Algorithm

14. Program to implement Minimal Spanning by
    a. Prim's algorithm
    b. Kruskal's algorithm

DESIGN TOOLS WORKSHOP -II

Course Code : 21SC1209 L-T-P-S: 0-0-4-0

Pre-requisite : NIL Credits : 2

CO No.	Course Outcome	PO/PSO	BTL
CO1	Practice the design ideology by artistic skill	PO-3	2
CO2	Visualize the design ideology by using VR technology	PO-4	3
CO3	Visualize the design ideology by incorporating VR technique	PO-5	3
CO4	Visualize and present his design idea by applying AR technique	PO-4	3

Syllabus:

Design Thinking in Modern Art & Ideas: Modern Art & Ideas, Transforming everyday objects, Abstract painting, clay modeling, poetry and literary.

Virtual Reality: Hardware and History, VR Applications, Psychology of VR: the three illusions, challenges in virtual reality, Future of Embodiment in VR, Realism, Graphics, Real-Time 3D Graphics in Games, Basic Concepts in 3D Computer Graphics, Realism Animation, Navigation, Nausea.

Room Scale VR, Holography, Mirror Reality: Setting up room scale VR, Simulation of virtual environment, Stereoscopic Vision, Perspective, Interference and Diffraction, Laser Viewable Holograms, Real and Virtual Images, Introduction to mirror reality.

Augmented Reality: Augmented Reality, characteristics of AR systems and main components of an AR architecture, Augmented Reality with Geolocation,Customizing an augmented reality game.

Text Books:

1. "Complete Design Thinking Guide for Successful Professionals" by Daniel Ling
2. "Project Management" by K. Nagarajan, 7th Edition, New Age International Publishers.
3. "Augmented Reality and Virtual reality" by Timothy Jung, M.Claudia Tom Dieck, Springer.
4. "Rapid Prototyping: Principles and Applications"by Chua C.K., Leong and Lim. C.S, 2nd Edition, World Scientific.
5. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall.

Web References:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?
2. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?
3. https://www.coursera.org/learn/modern-art-ideas?

OBJECT ORIENTED PROGRAMMING

Course code: 21SC1203 L-T-P-S: 3-0-2-3
Pre-requisite: NIL Credits: 4

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter passing.	PO3, PO5, PSO2	3
CO2	Apply access control, Inheritance, Packages.	PO3, PO5, PSO2	3
CO3	Apply Interfaces, Exception Handling, multi- threading, I/o.	PO3, PO5, PSO2	3
CO4	Apply collection framework and event driven programming.	PO3, PO5, PSO2	3
CO5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.	PO7, PO9, PO10, PSO1	4

Syllabus

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program.
Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data,
Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes.
Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, String handling functions.
Packages and Interfaces: Packages, Class path, Importing packages, differences between classes and interfaces, Implementing & Applying interface.
Exception Handling: Exception Handling fundamentals, Collections Framework.

Text books

1. Herbert Schildt, "The Complete Reference Java", 7th edition TMH.

2. Timothy A. Budd, "An Introduction to Object-Oriented Programming", 3/e, Pearson, 2008.

Reference books

1. Deitel&Deitel, "'Java – How to program", 6th edition, PHI, 2007
2. Cay.S.Horstmann and Gary Cornell "Core Java 2, Vol 1, Fundamentals", Seventh Edition, Pearson Education.

List of Lab Experiments:

Every student must complete minimum 12 experiments and one Lab based Project.

1. Java program to implement nested if
2. Java program to generate a multiplication table using for- loop
3. Java program to find out second largest number
4. Java program on array – bubble sort
5. Java program on constructor over loading
6. Java program on method overloading
7. Java program on inheritance and method overriding
8. Java program on access specifiers
9. Java program on packages
10. Java program with two interfaces
11. Java program on exception handling
12. java programs on collection Frame work-1
13. java programs on collection Frame work-2

ENGINEERING GRAPHICS FOR CIVIL ENGINEERS

Course Code: 21CE1002 L-T-P-S:0-0-2-0
Prerequisite: NIL Credits: 1

Mapping of Course outcomes with student outcomes: The students are able to

CO No.	Course Outcomes	PO	B T L
1	Understand the principles of drawing and use of drafting instruments	1, 10, 12	2
2	Draw engineering curves	1, 10, 12	2
3	Draw the projections of points, lines, planes and solids	1, 10, 12	2
4	Draw the total surface of solids by development of surfaces and the sections of Solids.	1, 10, 12	2
5	Understand the principles of Design.	1, 12	2

Syllabus:

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance- Drawing Instruments and their Use - Conventions in Drawing -Lettering - BIS Conventions.

Geometrical Constructions-Division of Lines, Angles, Polygons

Engineering Curves used in Engineering Practice & their Constructions:

Conic Sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola – General and other methods.

Special Curves: Cycloid, Epicycloid, Hypocycloid and Involute.

Orthographic Projection in First Angle Projection: Principles of Orthographic Projections - Conventions - First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

Projections of Planes & Solids: Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes - Auxiliary Views

Sections and Sectional Views: -Right Regular Solids - Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Development Solids: Development of Surfaces of Right, Regular Solids -Prisms, Cylinder, Pyramid Cone and their parts.

Isometric Projections: Principles of Isometric Projection - Isometric Scale - Isometric Views Conventions - Isometric Views of Lines, Plane Figures, Simple and Compound Solids - Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts

Transformation of Projections: Conversion of Isometric Views to Orthographic Views – Conventions

Design Principles: Engineering Design process, Types of Engineering design, Societal considerations in engineering design.

Text Books:

1. N.D. Bhatt "Engineering Drawing" Charotar publishing House
2. Saeed Moaveni "Engineering Fundamentals- An Introduction to Engineering" Cengage Learning.

Reference Books:

1. Engineering Drawing and Graphics, Venugopal / New age.
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Engineering Drawing, K L Narayana and Kannaiah / Scitech publishers.

AI & ML APPLICATIONS IN CIVIL ENGINEERING

Course Code: 21CE2105 L-T-P-S :2-0-0-4
Prerequisite: NIL Credits: 3

Syllabus:

CO1: Python for AI-ML: Python Basics, Datatypes and Operators, Conditional Statements, Loops, Standard Libraries, Built-in Functions, Scope of Variables, OOPS, Data Pre-processing, Data Manipulation, Data Visualization.

CO2: Predictive Analytics: Descriptive statistics and Inferential Statistics, exploratory data analysis, Linear & Non – Linear Regression, Logistic Regression, Multiple Linear Regression.

CO3: Machine Learning: Introduction to Machine Learning, Supervised Learning - Decision Tree, Random Forest, Naive Bayes, KNN, SVM, Model Selection and Boosting. Unsupervised Learning, Dimensionality Reduction, Principal Component Analysis, Time Series Analysis.

CO4: Deep Learning: Introduction to Deep Learning, Perceptron, Single Layer Perceptron, Multilayer Perceptron.Artificial Neural Networks, PNN, GA and Fuzzy neural networks.

Text Books :1. Pradhan Manaranjan, Machine Learning Using Python, Wiley India Pvt. Ltd.

Web Links :https://pytorch.org/deep-learning-with-pytorch

MOOCS :https://www.youtube.com/watch?v=JMUxmLyrhSk&t=1620s

SOLID MECHANICS

Course Code: 21CE2101 L-T- P-S: 3-0-2-0

Pre-requisite: Nil Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand and apply the concepts of stress, strain and mechanical properties of solids	2	4
2	Determine Shear force and Bending moment of the determinate beams	2	4
3	Determine the bending, Shear and Principal stresses in beams	2	4
4	Analyse buckling of columns, and torsional members	2	4
5	Demonstrate experimental verification of various material strengths	2	4

Syllabus:

Simple stresses and strains: Elasticity and plasticity; Types of stresses and strains; Hooke's law; stress strain diagram for mild steel and HYSD-bars Working stress; Factor of safety; Lateral strain, Poisson's ratio and volumetric strain; Elastic constants and the relationship between them Bars of varying section; composite bars; Temperature stresses. Resilience-Gradual, sudden, impact and shock loadings simple applications.

Shear Force and Bending Moment: Diagrammatic conventions for supports; Diagrammatic conventions for loading; Classification of beams; Concept of shear force and bending moment; relationship between load, shear force and bending moment, Shear force and bending moment diagrams for statically determinate beams.

Pure Bending and Shearing Stresses of Beams: The flexure formula; Computation of the moment of inertia; Remarks on the flexure formula. Flexural strength of composite Beams, Shearing stress formula for beams; Shear stress distribution for various sections; Unsymmetrical Bending and Shear centre.

Theories of Failure: Introduction-Various theories of failure-maximum principal stress theory, Maximum principal strain theory, Strain energy and Shear strain energy theory (Von Mises Theory).

Analysis of Plane Stress: Equations for the transformation of plane stress; Principal Stresses; Principal planes; Maximum shearing stresses; Mohr's circle of stress; Construction of Mohr's circle of stress.

Torsion: Torsional deformations of a circular bar, circular bar of elastic materials, stresses and strain in pure shear, relationship between E and G.

Columns: Stability of equilibrium; The Euler's formula for columns with different end restraints; Limitations of the Euler's formulas; Generalized Euler buckling - load formulas; Rankine's empirical formula.

Text Books:

1. Ferdinand P Beer, E. Russell Johnston, Jr. John T. Dewolf, David F. Mazurek, Mechanics

of materials sixth edition, Mc Graw Hill education.
2. J.M. Gere, Thomsom brooks/Cole India edition, Mechanics of materials Sixth edition, 2006.

Reference Books:

1. Strength of materials by R. Subramanian, Oxford University Press.
2. S P Timoshenko. Strength of Materials Part I & II CBS Publishers and distributors, New Delhi, 3rd Edition.
3. Riley, Strurges and Morris, Mechanics of Materials John Wiley and Sons Inc. fifth Edition.
4. Andrew Pytel & F. L. Singer, Strength of Materials Harper Collin Publisher's Pvt. Ltd. New Delhi, Fourth edition.
5. Strength of materials by S.S.Ratan, Tata Mc Graw Hill Education Pvt Ltd.

List of Experiments:

1. Tests on Mechanical and Elastic properties of HYSD Bars
2. Tests on Wood and Aluminum Section Profiles
3. Hardness test on metals like Steel, Brass, Copper and Aluminum
4. Torsion test on steel reinforcement
5. Impact test on Steel Specimen - Charpy and Izod test
6. Test on Closely coiled helical springs.
7. Compression tests on concrete cubes
8. Bending test on cantilever beam and simply supported beam.

FLUID MECHANICS

Course Code: 21CE2102 L-T-P-S:3-0-2-0

Pre-requisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Analyze the properties of fluid	PO1, PO2	4
2	Analyze fluid kinematic states	PO1, PO2	4
3	Analyze fluid dynamic states	PO1, PO2	4
4	Analyze dimensional analysis and model simulations	PO1, PO2	4
5	Analyze the flow through notches and pipes	PO1, PO2	4

Syllabus:

Fluid properties: Definition of fluid, classification of fluids, properties of fluid density, specific weight, specific gravity, viscosity, surface tension and capillarity, vapour pressure and cavitation. **Fluid statics:** Introduction, pressure, Pascal's law, hydrostatic law, measurement of pressure-simple and differential manometers, Total pressure and centre of pressure on vertical, horizontal and Inclined surfaces. **Fluid statics-buoyancy and floatation:** Buoyancy, centre of buoyancy, Meta-centre, Meta-centric height**. Fluid kinematics:** Introduction, types of fluid flow, Discharge, Continuity equation, Continuity equation in three-dimensional flow, velocity potential function and stream function **Fluid dynamics:** Introduction, Euler's equation of motion, Bernoulli's equation and applications, Venturimeter, Orificemeter, Pitot-tube, the coefficient of discharge, Introduction to orifices and mouth pieces, Notches -V and Rectangular. **Momentum equation:** Impulse-momentum equation, Force exerted by flowing fluid on pipe-bend. **Flow through pipes:** Introduction, major and minor energy losses, hagen-poiseuille law, Hydraulic gradient and total energy line, pipes in series, parallel and Water hammer.: **Dimensional analysis & model similitude:** Introduction, Buckingham's PI theorem, Model analysis, Types of similarities, Dimensionless numbers, Classification of models, Model laws-Reynolds and Froude model law.

TEXTBOOKS:

1. Fluid Mechanics by John F. Douglas, Tata McGraw Hill publications
2. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
3. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi

Reference Books:

1. Fluid Mechanics and machinery by Manish Kumar Goyal: PHI Publishers, Delhi.
2. Fluid Mechanics and machinery by C.S.P.Ojha: Oxford Higher Education Publishers, Chennai.
3. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi.
4. Fluid Mechanics by G. S Sawhney, IK International Publishing house (P) Ltd. New Delhi
5. Fluid Mechanics by Edward J. Shaughnessy, Oxford University Press, USA.

Lab Experiments

1. Determination of coefficient of discharge of Rectangular notch.
2. Determination of coefficient of discharge of Triangular notch.
3. Determination of coefficient of discharge of Orifice.
4. Determination of coefficient of discharge of Mouth piece.
5. Determination of Meta-Centric height.
6. Determination of coefficient of discharge of Venturi meter.
7. Determination of coefficient of discharge of Orifice-meter.
8. Fluid flow analogy using Reynolds apparatus.
9. Verification of Bernoulli's theorem.
10. Determination of Darcy friction factor due to friction in a pipe flow.
11. Determination of minor losses due to sudden expansion and contraction in a pipe flow.

SURVEYING

Course code: 21CE2103 L–T–P-S: 3-0-2-0

Pre-requisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No:	CO	PO/PSO	BTL
1	Apply the knowledge of plane surveying for computation of bearings in a traverse.	**1,5/1**	**3**
2	Calculate the difference in elevation by using differential leveling techniques and prepare a contour plan.	**1,5/1**	**3**
3	Compute area of the field and volume of earthwork.	**1,5/1**	**3**
4	Calculate the height of building by using theodolite and tacheometric survey, and total station surveying	**1,5/1**	**3**
5	Conceptualize the project by applying surveying techniques	**11/1**	**3**

SYLLABUS

Surveying: Introduction to surveying, Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications.

Distances and Direction - Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

Leveling and Contouring - Concept and Terminology, adjustments- method of leveling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

Computation of Areas and Volumes - Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Theodolite - Theodolite, description, uses and adjustments, measurement of horizontal and vertical angles. Principles of Electronic Theodolite, Trigonometrical leveling, Traversing.

Tachometric Surveying - Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

Curves - Types of curves, design and setting out of simple curves.

Total Station: Introduction – Accessories with description - Features of total station – Onboard software electronic data reading - Summary of total stations characteristics - Field procedure of total stations in topographic survey, Global positioning system, Introduction to Geographic information system (GIS).

Text Books:

1. Surveying and Levelling by R.Subramanian, Oxford University Press, 2nd edition, 2012
2. Surveying Vol - I, II, III - Dr. B.C . Punmia Laxmi publications, Delhi-6

Reference Books:

1. Surveying and levelling part I & II by Kanetkar.T.P. & S.V.Kulkarni, Puna vidyarthi girha, Prakashan,23rd edition,1993.
2. Arora K. R, "Surveying Vol-I", Rajsons Publications Pvt. Ltd, 10th Edition, 2008.

LIST OF EXPERMENTS

1. Determination of area of a polygon by a ranging and taking offsets.
2. Measuring distance between two stations by indirect ranging when they are obstacles.
3. Measuring of bearing of sides of the traverse and preparation of map.
4. Determination of elevation of various points with a level by (a) collimation method (b) rise & fall method
5. Measurement of horizontal and vertical angles using theodolite
6. Determination of a given area using total station.
7. Calculation of volume of earthwork using total station
8. Staking out the points in an area using total station
9. Measurement of height of the tower/building using total station
10. Measuring and plotting using Auto cad of a given area of land by total station

CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY

Course Code: 21CE2104 **L-T-P-S**:3-0-2-0

Prerequisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand and explain the characteristics, classification of Engineering materials	1,4	2
2	Understand and explain the specifications of lime, cement, aggregates and mortar.	1,4	2
3	Understand and explain the specifications, properties and uses of timber and paints	1,4	2
4	Understand and explain the manufacturing process, types, properties and testing of concrete. Apply the guidelines of BIS method of mix design	1,4	3
5	Demonstrate and apply knowledge experiments in the project-based laboratory	1,4	3

Syllabus:

Brick Masonry: Technical terms; Types of bonds in brickwork and their suitability. **Stone Masonry**: Technical terms; Classification of stone masonry. Dampness and Damp Proofing: Introduction, Methods of preventing dampness; Damp proofing materials and their classification; Methods of providing DPC under different situations.

Floors: Technical terms; Different types of floors – concrete, mosaic, terrazzo, stone floors, ceramic tile floors, vinyl floors and wood floors. Roofs: Technical terms; Classification of roofs; Steel sloping roofs; Roof covering materials; Types of flat roofs. Scaffolding, Shoring, Under Pinning and Form Work: Types of scaffolding; Types of shoring; Methods of underpinning; Types of formwork; Centering

Building Planning: Introduction to Buildings, Classification of Buildings, National Building Code Building Planning: Selection of Site, Orientation, Ventilation, Furniture requirements, Roominess, Sanitation, Lighting, Space for equipment for air–conditioning, Space for machinery etc.; Aspect and prospect, Privacy, Elegance and economy; Climatic considerations; Materials selection, Wall thickness and Scales

Building Bye–Laws & Regulations: Objectives of Building Bye–Laws, Building regulations; Calculation of Plinth Area (PA), floor area and carpet area; Floor Area Ratio (FAR), Floor Space Index (FSI), Height of Buildings as per local code book

Construction Management: Introduction, Construction projects, Objectives of Construction management; Steps involved in Project management, Project failures. Planning: Steps involved in planning; Objectives of planning; Principles of planning; Advantages and Limitations of planning, Stages of planning. Scheduling: Scheduling, Methods of scheduling; Bar charts; Mile

stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down; Activities involved.

Project Management Through Networks: Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Advantages of network techniques over conventional techniques. Program Evaluation and Review Technique (PERT): Introduction; Time estimates; Earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project.

Critical Path Method (CPM) & Cost Control: Introduction; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path; Difference between CPM and PERT, Direct cost; Indirect cost; Total project cost

Resource Management (Man Power, Materials & Machinery):

Introduction; Resource smoothing; Resource Leveling, Establishing workers productivity; Objectives of material management;Functions of material management department; ABC classification of materials; Inventory of materials; Material procurement; Storage management

Construction Equipment: Classification of construction equipment; Concreting plant and equipment; Factors affecting the selection; Factors affecting cost of owning and operating the equipment.

Text Books:

1. Varghese P.C," Building construction", Prentice hall of India (P) Ltd, New Delhi 2nd Edition 2008
2. Seetharaman.S," Construction Engineering and Management", Umesh Publications, Nai Sarak, Delhi, 2008
3. Shah MG, "Building Drawing", Tata McGraw-Hill, New Delhi, 2006.

Reference Books:

1. Punmia B. C, " Building construction", Laxmi Publications, New Delhi 5th Edition
2. Sengupta.B & Guha.H "Construction Management & Planning", Tata McGraw – Hill Publishing Co. Ltd., New Delhi.
3. Peurifoy R. L,"Construction Planning, Equipment & Methods", McGraw – Hill International Book Company.
4. Srinath.L. S, "PERT & CPM Principles and applications" Affiliated East West press.

List of Experiments:

1. Draw the Sign Conventions for Engineering Materials, Water supply & Sanitary fixtures and Electrical Installations etc. using Auto cad.
2. Draw the English bond & Flemish bond for one, one and half brick walls using Auto cad.
3. Draw the Doors, Windows and Ventilators using Auto cad.
4. Draw the Residential Building and School Building line diagrams using Auto cad.
5. Draw the Commercial Building and Hospital Building line diagrams using Auto cad.
6. Draw the Sloped roof building with Load Bearing walls using Auto cad

7. Draw the Flat Roof Building with Framed construction using Auto cad
8. Draw the Stair Case Plan, Sectional elevations including T- Beam, Landing Beam & landing slab using Auto cad
9. Draw the Plan, section & elevation for given line plans of Single storied building using Auto cad
10. Draw the Plan, section & elevation for given line plans of Double storied building using Auto cad

STRUCTURAL ANALYSIS

Course Code: 21CE2201 L-T-P-S: 3-1-0-0

Pre-requisite: Nil Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Determine the deflection of determinate beams	2	4
2	Analyse the Propped cantilever and fixed beams	2	4
3	Analyse the Continuous beams and Portal frames using Theorem of three moment equation and Slope Deflection method	2	4
4	Analyse continuous beams and portal frames by moment distribution method.	2	4

Energy Theorems: Principle of superposition, Maxwell's reciprocal theorem, Betti's theorem, Principles of virtual work, Application of virtual work, Castigliano's theorems, Applications of Castigliano's theorem.

Deflection: Relation between curvature, slope and deflection, Deflection curves, Deflection of beams by Double integration, Macaulay's method, Moment area, conjugate beam method, unit load method.

Propped Cantilevers and Fixed Beams: Analysis of propped cantilevers with point load, partially loaded udl and uniformly varying load, fixed beam with point load, udl, Unsymmetrical concentrated load and varying load,

Analysis of Continuous beams: Clapeyron's theorem of three moments, analysis of beam with constant EI for all spans, varying EI for different span, sinking of supports.

Analysis of Structure by Slope Deflection Method: Difference between force method and displacement method. Advantage of displacement method. Analysis of indeterminate beams, Beams with uneven support settlement, rigid frames by slope deflection method.

Analysis of Structure by Moment Distribution Method: Advantage of moment distribution method, stiffness, carry over and distribution factor, analysis of indeterminate beams and rigid frames, uneven settlement of support for beam and rigid frame by moment distribution method.

Text Books:

1. Intermediate Structural Analysis by C. K. Wang, McGraw Hill Book Company, 2010.
2. Structural analysis by R.C. Hibbler, Pearson, New Delhi.
3. S.P. Timoshenko and D.H. Young, "Theory of Structures", 2nd Edition, 1965.

Reference Books:

1. Basic Structural Analysis by C S Reddy, Tata McGraw Hill publishing Company ltd. Delhi. 2nd edition 2010.
2. Fundamentals of Structural Mechanics and Analysis by M L Gambhir, PHI learning private limited, New Delhi, 2011.

BUILDING PLANNING, DRAWING & CONSTRUCTION MANAGEMENT

Course Code: 21CE2202 L–T–P-S: 3-0-2-0

Pre-requisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand about the different types of masonry and flooring	1,4	1
2	Understand about building bye-laws for construction of buildings, different types of buildings and walls	1,4	1
3	Understand the project management fundamentals and scheduling techniques	1,4	1
4	Understanding the resource and machinery management	1,4	1

Syllabus:

Brick Masonry: Technical terms; Types of bonds in brickwork and their suitability. **Stone Masonry**: Technical terms; Classification of stone masonry. Dampness and Damp Proofing: Introduction, Methods of preventing dampness; Damp proofing materials and their classification; Methods of providing DPC under different situations.

Floors: Technical terms; Different types of floors – concrete, mosaic, terrazzo, stone floors, ceramic tile floors, vinyl floors and wood floors. Roofs: Technical terms; Classification of roofs; Steel sloping roofs; Roof covering materials; Types of flat roofs. Scaffolding, Shoring, Under Pinning and Form Work: Types of scaffolding; Types of shoring; Methods of underpinning; Types of formwork; Centering

Building Planning: Introduction to Buildings, Classification of Buildings, National Building Code Building Planning: Selection of Site, Orientation, Ventilation, Furniture requirements, Roominess, Sanitation, Lighting, Space for equipment for air–conditioning, Space for machinery etc.; Aspect and prospect, Privacy, Elegance and economy; Climatic considerations; Materials selection, Wall thickness and Scales

Building Bye–Laws & Regulations: Objectives of Building Bye–Laws, Building regulations; Calculation of Plinth Area (PA), floor area and carpet area; Floor Area Ratio (FAR), Floor Space Index (FSI), Height of Buildings as per local code book

Construction Management: Introduction, Construction projects, Objectives of Construction management; Steps involved in Project management, Project failures. Planning: Steps involved in planning; Objectives of planning; Principles of planning; Advantages and Limitations of planning, Stages of planning. Scheduling: Scheduling, Methods of scheduling; Bar charts; Mile stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down; Activities involved.

Project Management Through Networks: Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Advantages of network techniques over conventional techniques. Program Evaluation and Review Technique (PERT): Introduction; Time estimates; Earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project.

Critical Path Method (CPM) & Cost Control: Introduction; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path; Difference between CPM and PERT, Direct cost; Indirect cost; Total project cost

Resource Management (Man Power, Materials & Machinery):

Introduction; Resource smoothing; Resource Leveling, Establishing workers productivity; Objectives of material management;Functions of material management department; ABC classification of materials; Inventory of materials; Material procurement; Storage management

Construction Equipment: Classification of construction equipment; Concreting plant and equipment; Factors affecting the selection; Factors affecting cost of owning and operating the equipment.

Text Books:

4. Varghese P.C," Building construction", Prentice hall of India (P) Ltd, New Delhi 2nd Edition 2008
5. Seetharaman.S," Construction Engineering and Management", Umesh Publications, Nai Sarak, Delhi, 2008
6. Shah MG, "Building Drawing", Tata McGraw-Hill, New Delhi, 2006.

Reference Books:

2. Punmia B. C, " Building construction", Laxmi Publications, New Delhi 5th Edition
2. Sengupta.B & Guha.H "Construction Management & Planning", Tata McGraw – Hill Publishing Co. Ltd., New Delhi.
3. Peurifoy R. L,"Construction Planning, Equipment & Methods", McGraw – Hill International Book Company.
4. Srinath.L. S, "PERT & CPM Principles and applications" Affiliated East West press.

List of Experiments:

11. Draw the Sign Conventions for Engineering Materials, Water supply & Sanitary fixtures and Electrical Installations etc. using Auto cad.
12. Draw the English bond & Flemish bond for one, one and half brick walls using Auto cad.
13. Draw the Doors, Windows and Ventilators using Auto cad.
14. Draw the Residential Building and School Building line diagrams using Auto cad.
15. Draw the Commercial Building and Hospital Building line diagrams using Auto cad.
16. Draw the Sloped roof building with Load Bearing walls using Auto cad
17. Draw the Flat Roof Building with Framed construction using Auto cad
18. Draw the Stair Case Plan, Sectional elevations including T- Beam, Landing Beam & landing slab using Auto cad
19. Draw the Plan, section & elevation for given line plans of Single storied building using Auto cad
20. Draw the Plan, section & elevation for given line plans of Double storied building using Auto cad

HYDRAULICS AND HYDRAULIC MACHINES

Course Code: 21CE2203 **L-T-P-S**:3-0-2-0

Pre-requisite: NIL Credits: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Analyze open channels for most economical cross sections	PO1, PO2	4
2	Analyze Gradually Varied flow and Rapidly Varied Flow through open channels	PO1, PO2	4
3	Analyze the mechanics of impact of jets on various types of vanes and its components	PO1, PO2	4
4	Analysis of Centrifugal and Reciprocating pumps	PO1, PO2	4
5	Analyze Hydraulic characteristics and its applications	PO1, PO2	4

Syllabus:

Open Channel Flow: Definition, classification, and Comparison between open channel flow and pipe flow, Types of channels, Chezy's and Manning's equation, Flow through rectangular, Trapezoidal and Circular Channels Most efficient channel section -Rectangular, Trapezoidal. Specific energy, Specific energy diagram, Critical flow, critical flow in rectangular channel, critical slope, Froude's number Channel transitions. **Gradually Varied Flow (GVF)**: Gradually varied flow in rectangular channels-equation, Water surface slope w.r.t. channel bed and horizontal, Classification of channel slopes, classification of surface profiles, Backwater and draw down curves. **Rapidly Varied Flow (RVF):** Hydraulic jump, elements and characteristics of hydraulic jump, Types of hydraulic jump, Location and applications of hydraulic jump, Energy loss in a hydraulic jump. **Impact of Jets**: Force exerted by the jet on a stationary plate – vertical, inclined and curved, Force exerted by a jet on a hinged plate on moving plates, force exerted by jet on flat plates and series of vanes. **Turbines**: Introduction, classification of turbines, pelton wheel, velocity triangles and work done on Pelton wheel, Design of Pelton wheel. Reaction Turbines Radial flow reaction turbine, Velocity triangles and work done by water on runner, Francis turbine, Design of Francis turbine, Axial flow reaction turbine – Kaplan turbine, head and efficiency, Draft tube-types, draft tube theory, efficiency of draft tube, Specific speed, Unit quantities, Selection of turbines, Cavitation. **Centrifugal Pumps**: Manometric head; losses and efficiencies; work done, working principle; priming; velocity triangles; performance and characteristics curves; multistage and double suction pumps, Cavitation effects. **Reciprocating Pumps**: Classification of reciprocating pump, working principle, Discharge through reciprocating pump, Negative slip Discharge, work done, and power required to drive double acting pump.

TEXTBOOKS:

1. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi
2. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi.

Reference Books:

1. Open Channel flow by V.T.Chow, Mc Graw Hill book company
2. Subramanya K,"Flow in Open channels", Tata McGraw-Hill Publishing Company,1994.
3. Robert W.Fox and Alan T. Mc Donald, “Introduction to Fluid Mechanics” Fourth Edition, John Willey & sons, New York, 1995
4. Hydraulic Machines by Jagadhishlal; Metropoliton Company, Delhi.

Experimental List

1. Study of performance characteristics of a centrifugal pump at constant speed.
2. Study of performance characteristics of a centrifugal pump at different speeds.
3. Study of performance characteristics of a reciprocating pump at constant speed.
4. Study of performance characteristics of a gear pump at constant speed.
5. Study of performance characteristics of a Pelton wheel turbine at constant speed and head.
6. Study of performance characteristics of a Francis turbine at constant speed and head.
7. Study of performance characteristics of a Kaplan turbine at constant speed and head.
8. Determination of force exerted by a jet of water on a fixed vane.
9. Determination of coefficient of discharge of open channel flow measurement.
10. Study of performance characteristics of a Centrifugal Multi – Stage pump.

ENVIRONMENTAL ENGINEERING

Course Code: 21CE2204 **L-T-P-S**:3-0-2-0-0

Prerequisite: NIL **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand various aspects related to water supply and water treatment process	3	2
2	Analyze and design water treatment plant units.	3	3
3	Understand design of wastewater treatment units.	3	3
4	Understand impacts of air pollution and control techniques, from sources to disposal of solid waste	3	2
5	Test the water & wastewater, design of water, wastewater treatment plant & distribution system.	2	4

Syllabus:

Water Supply: Necessity of protected water supply. Role of Civil Engineer. Water demand, per capita consumption and factors affecting. Effect of variations of water demand. Design period – population forecasting, Sources of water - quality parameters and their significance. Drinking water quality standards in India. Intake structures design.

Water Treatment: Types and origin of impurities, Need for water treatment. Purpose, principles of operation and design considerations of plain sedimentation, sedimentation with coagulation, flocculation clarifier design. Design of filters. Disinfection methods.

Distribution systems -Design procedures- Hardy Cross and equivalent pipe methods– Layout of distribution system. Joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines.

Introduction to Sewerage system: Sewerage systems, Quantity estimation, Velocity in sewers, Storm water sewers-Strom water estimation by rational method. Sewerage system design, Objectives and extent of wastewater treatment, characteristics of sewage – examination of sewage – B.O.D. – C.O.D. equations.

Sewage Treatment: Purpose, principle and design considerations of Preliminary treatment -. Screens, grit chambers; Primary Treatment-Sedimentation – rectangular and circular tanks; Secondary treatment- Activated sludge process, Trickling filter and UASB. Septic tanks - design parameters and working principles.

Noise Pollution & Solid waste Management: Noise pollution, types, Impacts on environment and control measures. Solid Wastes - Types, sources and composition of solid wastes, Methods of collection and disposal

Air Pollution: Air Pollution-Types, Impacts on environment, and Principles of control techniques

Text Books:

1. Wastewater Engineering Treatment, Disposal & Reuse by Met Calf & Eddy, Tata McGraw – Hill publishing Co. Ltd., New Delhi.
2. Environmental Engineering (Vol I), Water Supply Engineering, S. K. Garg, Khanna Publishers, New Delhi, Twelfth Revised Edition, 2010

Reference Books:

1. Environmental Engineering by Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, Mc Graw-Hill International Editions, New York.
2. Water and Wastewater Technology, Mark. J Hammer and Mark. J Hammer, Eastern Economy Edition, PHI-Learning, New Delhi (2008).
3. Environmental Engineering by Davis Cornvel, McGraw Hill Book Co., New York. (2000).
4. Water and wastewater Engineering by G.M. Fair, J.C. Geyer, and Okun, John Wiley & Sons, New York (1998).
5. Wastewater Engineering by M.N Rao and A.K Dutta, Oxford & IBH Publishing Co. Ltd. (2000).
6. Environmental Engineering (Vol II), Sewage Disposal and Air Pollution Engineering, S. K. Garg, Khanna Publishers, New Delhi, Twenty-Second Revised Edition, 2010.

List of Experiments:

Determination of the following parameters present in the given water / wastewater sample:

1. a) pH b) Electrical Conductivity.
2. a) Turbidity b) Jar test.
3. Hardness.
4. a) Acidity b) Alkalinity.
5. Available chlorine and Residual Chlorine.
6. Fluoride.
7. Iron.
8. Total solids, Dissolved solids, Suspended solids & Settleable solids.
9. Dissolved Oxygen (DO).
10. Biochemical Oxygen Demand (BOD).
11. Chemical Oxygen Demand (COD).
12. Chlorides.

GEOTECHNICAL ENGINEERING

Course Code: 21CE2206 **L-T-P-S**:3-0-2-0

Prerequisite: Nil **Credits**: 4

Course Objective:

To develop fundamental understanding of Soil Mechanics through rigorous theoretical discussions, analytical examples, practical applications and computational projects, such that these theories, physical and engineering properties of soils can be effectively used for the design of suitable foundation for any structural design and will able to choose the suitable field and laboratory tests required for any foundation design.

Course Rationale:

The purpose of this course is to the study of soil as construction material, its behaviour and its engineering properties under stress, this course is intended to cover some of the most essential aspects of soil as an engineering material, and its engineering properties. In this course, the student will learn, soil formation, different phases of soil, different interrelations between soil properties, estimation of Index and Engineering properties of soil, soil classification, compaction of soil, consolidation of soil, the permeability of soil, effective stress principle, and shear strength of the soil.

COURSE OUTCOMES (COs):

CO No	Course Outcome (CO)	POs/PSOs	Blooms Taxonomy Level (BTL)
CO1	Describe soils and determine their physical characteristics such as grain size, water content, and void ratio, and their inter-relations, classify soils, determine compaction of soils, soil permeability and seepage analysis.	PO1, PO2, PSO1	**3**
CO2	Understand the concept of effective stress, determine total and effective stresses and porewater pressures and their distribution within a soil mass, determine the consolidation settlement and time required for consolidation, understand the stress–strain behavior of soils, and determine soil strength parameters from soil tests for “drained” and “undrained” conditions.	PO1, PO2, PSO1	**3**
CO3	Determine the lateral earth pressure, stability of slopes and retaining walls, Understand the importance and methods of soil investigations and be able to plan a soil investigation	PO1, PO2, PSO1	**3**
CO4	Understand Terzaghi’s shear failure criteria for soils and their limitations and determine the bearing capacity and settlement of structures founded on soils using shallow and pile foundations.	PO1, PO2, PSO1	**3**
CO5	Analyze the index and engineering properties properties of soils from various laboratory tests and prepare the soil investigation report.	PO3, PO4, PO5, PO9, PO10, PSO1, PSO2	**3**

SYLLABUS:

Introduction to the history of Geotechnical Engineering and its importance in Civil Engineering; ORIGIN OF SOIL & GRAIN SIZE: Rock Cycle, Soil formation due to weathering of rocks, Transported soils, soil classification based on size, clay minerals, Mechanical Analysis of soils, particle shape; WEIGHT – VOULME RELATIONS: Phase diagrams, Simple definitions of Index Properties, Inter relations among index properties; PLASTICITY & STRUCTURE OF SOIL: Atterberg Limits, Liquidity Index, Activity, sensitivity, Plasticity Chart, structure of soil; SOIL COMPACTION: Laboratory tests on compaction test, Factors affecting compaction, Structure and engineering behavior of Compacted cohesive soils; PERMEABILITY: Permeability of stratified soil deposits, Indirect methods, Factors affecting permeability; SEEPAGE: Laplace Equation, Estimation of seepage using flownet;

INSITU STRESSES: Total stress, Pore Water Pressure, Effective Stress, seepage forces, quicksand condition; STRESSES IN A SOIL MASS: Vertical stress distribution using Boussinq equation, Fadum Chart and Newmarks chart; COMPRESSIBILITY: Calculation of initial Settlement, consolidation settlement, laboratory consolidation test; Normally Consolidated Clay, Over Consolidated Clay, compressibility characteristics and estimation of primary consolidation Settlement and time – rate of consolidation; SHEAR STRENGTH OF SOIL: Determination of shear strength and shear strength parameters using Mohr–coulomb Failure Criterion, laboratory tests using Direct Shear, Unconfined Compression test, Vane Shear Test and Triaxial Shear Tests.

LATERAL EARTH PRESSURE: Types of Lateral earth pressure, Earth pressure at rest, Active and Passive pressure and estimation of lateral earth pressure using Rankine's theory, Coulombs wedge theory, and Culmann's graphical method; STABILITY OF SLOPES: Types of Slope failures, Factor of Safety against shear strength, cohesion and friction, Stability of an Infinite slope, Stability analysis by friction circle method, Taylor's Stability number; RETAINING WALLS – Types and Principles in the designing of a retaining wall; SUBSOIL INVESTIGATION: Depth of Exploration, Methods of Exploration, Borings for Exploration, Depth of Exploration, Methods of Exploration, Borings for Exploration, Field tests - Plate load test, Penetration test.

SHALLOW FOUNDATIONS: Types of foundations and choice of foundations, Bearing capacities, Terzaghi's bearing capacity theory, influence of water table on bearing capacity, safe bearing capacity of soil using IS Code; SETTLEMENT OF FOUNDATIONS: Settlement of shallow foundation, Allowable bearing pressure of granular soils based on standard penetration test value; PILE FOUNDATIONS: Types of piles, Necessity, pile driving, Load carrying capacity of piles – Static and dynamic formulae, Negative skin friction, Pile load tests, Load carrying capacity of group of piles.

Text Books:

1. Principles of geotechnical Engineering by BM Das and K. Shobhan, Cengage Publications, 8th edition, 2010
2. Geotechnical Engineering by C. Venkatramaiah, New Age Int Publications, 3rd Edition, 2006
3. Geotechnical Engineering Lab Manual - KL.

Reference Books:

1. Soil Mechanics and Foundations by Muni Budhu, John Wiley and Sons Inc, 2010

List of Experiments:

The Lab will be conducted as project based lab, and each student has to complete the below two projects as a team of four member:

Project 1: Estimation of Safe Bearing Capacity of Sandy soil and preparation of soil investigation report with all index and engineering properties of soils

Project 2: Estimation of Safe Bearing Capacity of Clayey soil and preparation of soil investigation report with all index and engineering properties of soils

DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Code: 21CE3101 **L-T-P-S**:3-0-2-0

Prerequisite: **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	WSM: Design of Singly Reinforced Beam & Doubly Reinforced Beam, LSM: Introduction, Design of singly Reinforced Beam & Doubly Reinforced Beam	1,5	6
2	Design of Flanged Beams (T- Beam & L – Beam), Design concepts of shear, development length and torsion for beams	1,5	6
3	Design of Reinforced concrete slabs and columns	1,5	6
4	Design of isolated footings (Square, Rectangular & Circular)	1,5	6
5	Analysis and Design of Structures using software such as ETABS/Staad Pro/CYPE CADD etc.	11	

Syllabus:

Introduction to working stress method: Introduction, Design for bending, Analysis and design of singly reinforced and doubly reinforced beams.

Introduction to limit state design: 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, Limiting moment of resistance.

Singly and doubly reinforced beams: Limit state analysis and design of singly reinforced, doubly reinforced beams. **Flanged sections**: Limit state design of T and L beam sections.

Shear, torsion and bond: 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.

Slabs: Design of one-way slabs, two-way slabs, Continuous slabs using IS coefficients.

Columns: Short and long columns Uni axial loads Uni - axial bending and bi-axial bending I.S code provisions.

Footings: Footings: Different types of footings–Design of isolated, square, rectangular and circular footings.

Text Books:

1. P.C. Varghese “Design of Reinforced Concrete Design.
2. Pillai & Devdas Menon, “Reinforced concrete design”, 3rd Edition, Tata McGraw Hill, New Delhi, 2009.
3. A.K. Jain, “Reinforced Concrete Design”, 5th Edition, Charotor Publications, 2010.

Reference Books:

1. N.C. Sinha and S.K Roy, “Fundamentals of Reinforced Concrete”, 4th Edition, S. Chand publishers, 2002

2. N. Krishna Raju and R.N. Pranesh, "Reinforced Concrete Design", 8th Edition, New age International Publishers, New Delhi, 2004.
3. M.L. Gambhir, "Design of Reinforced Concrete Structures" 6th Edition, PHI, Delhi, 2013.

WATER RESOURCES ENGINEERING

Course Code: 21CE3102 **L-T-P-S**: 3-1-0-0

Prerequisite: NIL **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO/PSOs	BTL
1	Analyze components of hydrological cycle, hydrograph, and its application.	1,2,3/1,2	4
2	Analysis of groundwater, groundwater movement and well hydraulics.	1,2,3/1,2	4
3	Analysis of soil water plant relationship and design of canal irrigation methods.	1,2,3/1,2	4
4	Analyze and design of Dams, embankment dams and reservoirs	1,2,3/1,2	4

Syllabus:

Introduction - Hydrologic cycle, Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, Abstractions from precipitation - evaporation process, interception, depression storage, infiltration, infiltration capacity, infiltration indices. Runoff - runoff volume, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, derivation of unit hydrograph, S-Curve and method of superposition methods. **Ground water and well hydraulics** - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifer, Pumping tests. Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. **Canal irrigation** and classification of canals, alignment of canals, canal losses, estimation of design discharge. Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. **Dams** - embankment dams: Classification, design considerations, control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis and spillways, Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

TEXTBOOKS:

1. Engineering hydrology by K. Subramanyam, TataMcGrawHill, New Delhi.
2. Irrigation Engineering and Hydraulic Structure by S.K. Garg; Khanna Publishers, Delhi.
3. Asawa, G. L . Irrigation and Water Resources Engineering, New Age International Ltd.

Reference Books:

1. Irrigation Water Resources and Water Power Engineering by, P. N. Modi, Standard book house, New Delhi.
2. Elementary Hydrology by V. P. Singh, PHI Publishers, New Delhi.
3. Applied Hydrology by VenTe Chow, McGraw-Hill Book Company.
4. Irrigation and Water Power Engineering by B. C. Punmia and Pandey; Laxmi Publications Ltd.

TRANSPORTATION ENGINEERING

Course Code: 21CE3103 **L-T-P-S**:3-0-2-0

Prerequisite: NIL **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	understand the Current road projects including highway project preparation	1	2
2	Design highway cross section elements	2	4
3	Design flexible and rigid pavement	1	4
4	Analyse the components of traffic stream parameters	2	3
5	Identify the suitable road construction materials following IRC codes	11	3

Syllabus:

Highway Network Planning: Different modes of transportation, role of highway transportation, classification, network patterns, planning surveys, preparation of plans, final report, master plan, evaluation by saturation system, 20 year road development plans, salient features, determination of road lengths, introduction to highway economics.

Highway Alignment And Geometric Design: Principles of highway alignment, requirements, controlling factors, engineering surveys, importance of geometric design, design controls and criteria, cross section elements, pavement surface characteristics, camber, carriageway, kerbs, road margins, formation, right of way, typical cross sections, sight distance, stopping sight distance, overtaking sight distance, sight distance at intersections, design of horizontal alignment, super elevation, transition curves, design of vertical alignment, gradients, vertical curves.

Pavement Materials and Mix Design: Types of pavement structures, functions of pavement component layers, materials used in pavements, basic soil properties relevant to pavement applications, properties of aggregate, blending of aggregates, tests on bitumen, grading of bitumen, bituminous mix design using Marshall method.

Design of Pavements: Stresses in flexible pavements: layered system concepts, stress solution for one, two and three layered systems, fundamental design concepts; variables considered in pavement design: axle types, standard and legal axle loads, ESWL, EWLF, vehicle damage factor, ADT, AADT, growth factor, lane distribution factor, directional distribution factor, tyre pressure, contact pressure, design life; design of flexible pavement using IRC method; stresses in rigid pavements: Westergaard's theory and assumptions, stresses due to curling, stresses and deflections due to loading, frictional stresses, design of joints; design of rigid pavement using IRC method.

Traffic Engineering Principles: Traffic characteristics; components of traffic stream: flow-speed Density, measurement and analysis, q-k-v relationships, design hourly volume, concept of EPCU, capacity and level of service, parking studies and road safety

Text Books:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.

Reference Books:

1. Partha Chakraborty, ' Principles of Transportation Engineering, PHI Learning,
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
3. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
4. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

CODES:

1. IRC 37 – 2012: Guidelines for the design of flexible pavements, Indian Road Congress Publications, New Delhi.
2. IRC 58 – 2011: Guidelines for the design of plain jointed rigid pavements for highways, Indian Road Congress Publications, New Delhi.
3. MORTH - Specifications for Road and Bridge works, Indian Road Congress Publication, New Delhi, Latest Edition
4. IRC 67 – 2001: Code of Practice for Road Signs, Indian Road Congress Publication, New Delhi
5. IRC 35 – 1997: Code of Practice for Road Markings, Indian Road Congress Publication, New Delhi
6. IRC 35 – 1997: Code of Practice for Road Markings, Indian Road Congress Publication, New Delhi.

LIST OF EXPERIMENTS:

1 To determine toughness of aggregate by using aggregate impact testing machine
2 To determine strength of the aggregate by using crushing value test.
3 To determine hardness of aggregate by using Los Angeles abrasion test
4 Shape tests
5 To determine specific gravity and water absorption of aggregate by using Buoyancy Balance
6 To determine grade of the bitumen by using penetrometer.
7 To determine elasticity of the bitumen by using ductility machine
8 To determine softening point of the bitumen by using Ring and ball apparatus.
9 To determine flash and fire point of the bitumen by using Pensky martin closed cup apparatus.
10 To determine percentage of bitumen by using Bitumen extractor.
11 To determine stability of bituminous mix by using Marshall Stability apparatus.

QUANTITY SURVEYING ESTIMATION & VALUATION

Course Code: 21CE3201 **L-T-P-S** 3-0-2-0
Prerequisite: NIL **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand the fundamentals of estimation and provide hands on experience on estimation of quantities of building.	1,5	2
2	Prepare detailed estimate of quantities and costs for R.C.C structures, Roads, Canals	1,5	2
3	Prepare detailed specifications and provide exposure to rate analysis for different items of work.	1,5	2
4	Recognize the P.W.D working procedures, Contracts and tenders of a project and carry out building valuation.	1,5	2
5	Practical estimations of buildings, road works etc. by using a software package (M.S Excel)	11	3

SYLLABUS:

Procedure of Estimating: Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy. **Methods of Building Estimates**: Individual wall method; Centre line method; Arch masonry calculation. **Estimate of RCC works**: Estimate of RCC slab; RCC beam and RCC column with foundation. **Road Estimating:** Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads. **Canal Estimate:** Earthwork in canals–different cases; Breached sections/Breach closures **Specifications:** Purpose and method of writing specifications; Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R. R. Stone Masonry. **Analysis of Rates**: Preparing analysis of rates for the following items of work: i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering. preparing lead statements. **PWD accounts and procedure of works:** Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate, cash flow allocations yearly. **Contracts:** Contract: types of contracts, Contract Law, EMD, Tenders, Acceptance of Contract, Breach of Contract, Cancellation of Contract, arbitration, Retendering – work order, running payment, Final Bill, Completion Certificate **Valuation:** Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for estimating cost depreciation; Valuation of building.

.**TEXT BOOKS:**

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors,New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.

REFERENCE BOOKS:

1. Estimating & Costing by M. Chakraborty, S Chand Publishing House.
2. Estimating and Tendering for Construction Work, By Martin Brook, Elsevier Ltd., Burlington, MA - 2004

List of Experiments

1. Estimation of a building using centre line method
2. Estimation of a building using individual wall method
3. Estimation of a building (with varying sections) using centre line method
4. Estimation of building (with varying sections) using individual wall method
5. Estimation of a r.c.c roof slab
6. Estimation of a r.c.c beam
7. Estimation of a r.c.c column with foundation
8. Estimation of earthwork in roadways
9. Estimation of earthwork in an irrigation channel
10. Rate analysis

DESIGN OF STEEL STRUCTURES

Course Code: 21CE3203 **L-T-P-S**: 3-1-0-0

Prerequisite: **Credits**: 4

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Design of connections and tension members	1,6	3
2	Design of compression members and beams	1,6	3
3	Design of beam-column connections	1,6	3
4	Design of roof truss	1,6	3

Syllabus:

Welded and bolted connections: Introduction, Advantages and disadvantages of welding-Strength of welds and bolts. Permissible stresses IS Code requirements. Design of bolted and welded connections subjected to moment acting in the plane and at right angles to the plane of the joints.

Tension members: General design of members subjected to direct tension.

Compression members: Effective length of columns, Slenderness ratio permissible stresses, Design of compression members, Struts etc. BUILT UP COLUMNS: Design of built up compression members Design of lacings and battens. Design Principles of eccentrically loaded columns and splicing of columns.

Beams: Introduction to plastic analysis, Design requirements as per IS Code Design of simple and compound beams-Curtailment of flange plates, check for deflection, shear, buckling and bearing, for laterally supported and unsupported beams. Web buckling strength and Web crippling strength.

Introduction to Beam-Column connections: types of beam-column connections

Design of column bases: Design of slab base and gusset base. Column bases subjected to moment.

Roof trusses: Different types of trusses, Design loads, Load combinations, IS Code:800-2007 recommendations, structural details. Design of simple roof trusses involving the design of purlins.

IS Codes:

1. IS -800:2007, "Codes of Practice for General Construction in Steel", BIS, 2007
2. IS 875 Part III, "Codes of Practice for Design Loads" (other than Earthquake, for Buildings and Structures), 1987.
3. Steel Tables.

Text Books:

1. Bhavikatti, "Design of Steel Structures", 6th Edition, University Press. Hyderabad, 2010.
2. S.K. Duggal, "Limit state design of steel structures", 1st Edition, TMH publication, 2011

3. N. Subramaniyan, "Design of Steel structures", 1st Edition, Oxford university press, 2008.

Reference Books:

1. B.C. Punmia, "Comprehensive Design of Steel structures", 10th Edition, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi, 2007.
2. P. Dayaratnam, "Design of Steel Structures", 2nd Edition, S. Chand Publishers, 2009.
V.L. Shah, Prof. Veena Gore, "Limit State Design of Steel Structures", 1st Edition, Structures Publications, 2009

ADVANCED STRUCTURAL ANALYSIS

Course Code: 21CE3211 **L-T-P-S**: 3-0-0-0
Prerequisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Analyze the determinate structures for various loads and load combinations	1,5	3
2	Analyze the indeterminate structures using matrix methods	1,5	3
3	Analyze cabled structures and hinged arches	1,5	3
4	Analyze indeterminate beams and frames using Plastic Analysis	1,5	3

Syllabus:

Basic concepts: Structural elements, joints and supports. Shear force, bending moment. Static indeterminacy, kinematic indeterminacy. Direct loading actions on the building, indirect loading actions on the building. Force-displacement relations. Applications of principle of virtual work and displacement-based and force-based energy principles. Approximate Analysis of Multi storeyed building subjected to lateral loads.

Influence Line Diagrams for Determinate Structures: Influence line for reactions of simply supported beams and overhang beams. Influence Line Diagram for shear force in cantilever and simply supported beams. Influence Line Diagram for bending moment in cantilever, over hang and simply supported beams. Position and magnitude of maximum shear force and bending moment for concentrated load and uniformly distributed load, series of concentrated loads. Absolute maximum shear force and bending moment. Influence Line Diagram for framed Structures.

Analysis of Structure by Flexibility Matrix Method: Matrix; vector; basic matrix operations; Concept of flexibility coefficients, analysis of truss, indeterminate beams and rigid frames by Flexibility Matrix method.

Analysis of Structure by Stiffness Matrix Method Concept of degrees of freedom, degree of indeterminacy and stiffness coefficients, analysis of truss, indeterminate beams and rigid frames by Stiffness Matrix method.

Analysis of Cabled Structures and Hinged Arches: Static analysis of cable structures, analysis of cables, and analysis of cables subjected to concentrated loads. Hinged Arches: types of arches, analysis of one hinge arch, analysis of two hinge arch, analysis of three hinged arch.

Plastic Analysis of Structures Idealized stress-strain diagram, Plastic Moment of resistance, plastic modulus, shape factors for different sections, load factor, Plastic hinge and mechanism, plastic analysis of indeterminate beams and frames

Text Book:

1. Advanced Structural Analysis by Devdas Menon, Narosa Publishing House Pvt. Ltd. - New Delhi,2009

Reference Books:

1. Basic Structural Analysis by C S Reddy, Tata McGraw Hill publishing Company ltd. Delhi. 2nd edition 2010.
2. Intermediate Structural Analysis by C. K. Wang, McGraw Hill Book Company, 2010
3. Structural analysis, A Matrix Approach by Pandit & Gupta, Tata McGraw Hill publishing Company Ltd. New Delhi.2008

PRESTRESSED CONCRETE

Course Code: 21CE3231 **L-T-P-S**:3-0-0-0

Prerequisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Basic terminology and concepts of prestressing**,** Need for High strength steel and high strength concrete; as material for prestressed concrete, pre-tensioning & post tensioning	1,5	5,6
2	Analysis of Prestress and Bending Stresses, Losses of Prestress	1,5	5,6
3	Short term deflections of un-cracked members; Effect of tendon profile on deflections, design of prestressed concrete beam	2,5	5,6
4	Design of end blocks: Transmission of prestress in pretensioned members, bursting tensile force stresses in end blocks-Methods	2,5	5,6

Syllabus:

Basic terminology and concepts of prestressing; Need for High strength steel and high strength concrete; as material for prestressed concrete Advantages of prestressed concrete. Prestressing Systems: pretensioning; Post tensioning; Thermoelectric prestressing; chemical prestressing.

Analysis of Prestress and Bending Stresses: Resultant stresses; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.

Losses of Prestress: due: to elastic deformation, shrinkage, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

Deflections: Factors influencing deflections; Short term deflections of un-cracked members; Effect of tendon profile on deflections. Ultimate flexural strength of simple sections using simplified IS code Recommendations.

Design of Prestressed Concrete Beam: Design of sections for flexure - stress condition - minimum section modulus - stresses at transfer - service loads - prestressing force - eccentricity - check for stresses - initial and final conditions - limit state of collapse in flexure - shear. IS Code recommendations: Ultimate shear resistance. Design of shear reinforcement.

Design of end blocks: Transmission of prestress in pretensioned members; Transmission Length; Anchorage stress in post tensioned members; Bearing stress and bursting tensile force stresses in end blocks-Methods. IS-Code provision for the design of end block reinforcement.

Design of Prestressed Precast Hollow Core Slabs: Application of Prestressing to poles, piles and sleepers.

Text Books:

1. N. Krishna Raju; Prestressed Concrete Tata McGraw - Hill Publishing Company Limited, New Delhi.

2. T.Y. Lin and Ned H. Burns Design of pre-stressed concrete structures - John Wiley & Sons, New York.
3. IS 1343:2012, "Code of practice for prestressed concrete", Bureau of Indian standards, New Delhi.

Reference Books:

1. N. Rajagopalan; Prestressed concrete, Narosa Publishing House.
2. P. Dayarathnam: Pre-stressed Concrete- Oxford and IBH Publishing Co.
3. N.C. Sinha & S.K. Roy Fundamental of pre-stressed concrete-

BRIDGE ENGINEERING

Course Code: 21CE4141 **L-T-P-S**:3-0-0-0

Pre-requisite: **Credits:** 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Explain about various types of Bridges and IRC Specifications for road bridges	1,3,5	2
2	Analyze the Solid Slab and T-Beam Bridges as per IRC guidelines	1,3,5	4
3	Examine the internal forces in Abutment and Elastomeric Pad Bearing subjected to loads as per IRC guidelines	1,3,5	4
4	Investigate the stresses induced in Piers and Well Foundations subjected to loads as per IRC guidelines	1,3,5	4

Syllabus:

Classification: Various types of bridges; IRC Specifications for road bridges.

Culverts: Design of RC slab culvert.

Deck Slab Bridge, T-Beam Bridge and Composite Bridge (Steel and PSC Girders): Pigeaud's method for computation of slab moments; courbon's method for computation of moments in girders;

Sub Structure for Bridges: Pier and abutment caps; Materials for piers and abutments' Design of pier; Design of abutment; Backfill behind abutment; approach slab.

Bearings for Bridges: Importance of bearings; bearings for slab bridge; bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Joints for Bridges: - Expansion Joints.

Foundations for Bridges: Scour at abutments and piers; Grip length; Design of well foundation.

Text Books:

1. Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBH publishing Co. Pvt. Ltd.
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.

Reference Books:

1. Design of Bridge Structures by T. R Jagadeesh, M.A Jayaram, Prentice Hall of India Pvt. Ltd.
2. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
3. Rajagopalan. N. "Bridge Superstructure", Alpha Science International, 2006.
4. Design of Bridges, by Krishna Raju Oxford and IBH Publishing
5. Cable supported bridges, concepts and design by N J Gimsing. John Willey and Sons
6. R. Rajagopalan, "Bridge Superstructure", Tata McGraw- Hills Publishing Company Limited.

7. Victor D.J - Essentials of bridge Engineering, Oxford and IBH Publishers.
8. Arya and Azmani - Design of steel structures, Nemchand Publishers.
9. I.R.C Codes, Railway bridge rules, Lucknow.
10. Jagadeesh, T.R. and Jayaram, M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013.

SUSTAINABLE CONSTRUCTION TECHNOLOGIES

Course Code: 21CE4151 **L-T-P-S**: 3-0-0-0

Pre-requisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand the construction basics of a Common building construction methods conventional	7,11	1
2	Understand the modern construction methods basics of construction Modular Construction Precast concrete.	7,11	1
3	Understand the sustainable construction materials technologies and project management strategies	7,11	1
4	Understand the LEED for New Construction rating system	7,11	1

Syllabus:

Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods conventional walls and slabs; conventional framed structure with blockwork as infill walls;

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, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.

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. Preparation for the LEED Green Associate professional licensing exam.

Text Books:

1. Sustainable construction; green building design and delivery by Charles J.Kibert edition 4
2. Sustainability in engineering construction by J K Yates 2015

Reference:

1. Sustainable Engineering Practice ASCE Publication 2010.
2. Hagger Sustainable Industrial Design and Waste Management, Techniz Book 2010.
3. Helmut Rechberger, Practical handbook of Material Flow Analysis, Taylor & Francis. 2010.
4. Michael Z. Hou, Heping Xie, Jeoungseok Yoon Underground Storage of CO2 and Energy Taylor & Francis, 2010.
5. LEED for India: Reference Guide, 2011.

FOUNDATION ENGINEERING

Course Code: 21CE3212 **L-T- P-S**: 3-0-0-0

Pre-requisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

C.O. No.	Course outcome	Mapped SO	BTL
CO 1	Carry out geotechnical field investigation and can prepare field reports and Thoroughly understand different geotechnical investigation methodologies and can handle individually	**a,e**	
CO2	Can compute stress distribution using different techniques and can carry settlement analysis in different soil types	**a,e**	
CO3	Compute bearing capacity of shallow and deep foundations in laboratory and field using different methods	**a,e**	
CO 4	Can analyze stability of slopes for finite and infinite in different soil conditions and methods, Carry earth pressure analysis and can design retaining walls	**a,e** **a,b,e**	

Syllabus:

Site Investigations: Various geotechnical field investigations, geotechnical field report.
Bearing Capacity Of Shallow Foundations: Introduction, Basic definitions, Principal modes of soil failures, Terzaghi's bearing capacity theory/ equation and its modifications for square, rectangular and circular foundation, Skempton's bearing capacity analysis for clays, Meyerhof's analysis, Hansen's bearing capacity theory, Vesic's bearing capacity theory, IS code recommendations for bearing capacity, Bearing capacity of granular soils based on SPT value and Static cone resistance, Bearing capacity of footings on layered soils, Factors influencing bearing capacity, Allowable bearing pressure. General requirements of foundations, Factors affecting location and depth of foundation, Choice of type of foundations, Steps involved in the proportioning of footings.
Pile Foundations: Use of piles, Types of piles, Construction, Selection of pile type, Types of foundations to suit subsoil conditions, Pile load capacity, Static formulae, Dynamic formulae, Load tests, on piles, Group action of piles, Load carrying capacity of pile groups, Negative skin friction, Piles subjected to uplift loads.
Well Foundations: Types of wells and caissons, components of well foundation, shapes of wells, depth of a well foundation, forces acting on a well foundation, lateral stability of well foundation, construction and sinking of a well.
Settlement Analysis: Consolidation settlement, immediate settlement, Corrections to settlement due to consolidation, Settlement in different soil types/Settlement from field tests, Allowable settlement, Settlement of pile group.
Stability Of Slopes: Infinite slopes and translational slides, Definitions of factor of safety, Finite slopes-Forms of slip surface, Limiting equilibrium method and Critical stages in stability, Total stress and effective stress methods of analysis, øu = 0 Analysis (total analysis), c ø analysis - method of slices, Location of the most critical circle, Friction circle method, Taylor's stability number.

Earth Pressure And Retaining Walls: Effect of wall movement on earth pressure, Earth pressure at rest, Rankine's theory of earth pressure, Coulomb's theory of earth pressure,

Coulomb's equation for c = 0 back fills, Cullman's graphical method, Passive earth pressures-Friction circle method, Design considerations retaining walls.

Text Books:

By Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics New Age International Publishers, Second Edition, 2007.

Reference Books:

1. J.E. Bowles, Foundation Analysis and Design MacGraw Hill, 1996.
2. V. N. S. Murthy, Soil Mechanics and Foundation Engineering CBS Publishers & Distributors, New Delhi.
3. Donald P. Coduto, Man-Chu Ronald Yeung and William A.Kitch, Geotechnical Engineering Principles and Practices PHI Learning Pvt. Ltd., Second Edition.
4. W. C. Teng, Foundation Design Prentice hall

GROUND IMPROVEMENT TECHNIQUES

Course Code: 21CE3222 **L- T- P-S**: 3-0-0-0

Pre-requisite: Nil **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Analyze the ground modification by vibro replacement, stone columns, preloading and prefabricated drains	1	4
2	Analyze the reinforced earth structures	1,3	4
3	Analyze different properties of geotextiles, geogrids, geonets, geomembranes, geotubes.	1,3	4
4	Analyze different grouting, deep mixing, PVDs, vacuum consolidation techniques.	1,3	4

Syllabus:

Analyze the ground modification by vibro replacement: Introduction, ground modification by vibro replacement, stone columns, preloading and prefabricated drains,

Analyze the reinforced earth structures: Reinforced earth structures, Introduction to geotextiles and geomembranes, applications of geotextiles,

Analyze different properties of geotextiles, geogrids, geonets, geomembranes, geotopes: Design methods using geotextiles, geogrids, geonets, geomembranes, geotubes.

Analyze different grouting, deep mixing, PVDs, vacuum consolidation techniques: Grouting, deep mixing, PVDs, vacuum consolidation.

Text Books:

1. Principles and Practice of Ground Improvement by Jie Han
2. Ground Improvement Techniques by P. Purushothama Raj
3. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.
4. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy.

GEOTECHNICAL EARTHQUAKE ENGINEERING

Course Code: 21CE3232 **L- T- P-S**: 3-0-0-0

Pre-requisite: Nil **Credits**: 3

Syllabus:

Seismology and Earthquakes: Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.

Strong Ground Motion: Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters.

Seismic Hazard Analysis: Identification and Evaluation of Earthquake Sources, deterministic seismic hazard analysis, probabilistic seismic hazard analysis.

Wave Propagation Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stress waves.

Artificial Ground Motion Generation: Modification of actual ground motion records, time domain generation, frequency domain generation.

Dynamic Soil Properties Representation of stress conditions by Mohr circle, measurement of dynamic soil properties using field and laboratory tests, stress strain behavior of cyclically loaded soils, strength of cyclically loaded soils.

Ground Response Analysis: One– Dimensional Ground response Analysis – Linear and Non-Linear Approaches. **Local Site Effects:** Effect of local site conditions on ground motion, design parameters, development of design parameters.

Liquefaction Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.

Soil Improvement for Remediation of Seismic Hazards: Densification techniques, Reinforcement Techniques, Grouting and Mixing techniques, Drainage techniques.

TEXTBOOK:

1. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall

REFERENCE BOOK:

1. Geotechnical Earthquake Engineering Handbook by Robert W. Day, McGraw-Hill

DESIGN OF EARTH RETAINING STRUCTURES

Course Code: 21CE4142 **L- T- P-S**: 3-0-0-0

Pre-requisite: Nil **Credits**: 3

Syllabus:

Retaining walls – Different types - Gravity, Cantilever-counterfort, and Crib types. Basement or foundation retaining walls. Design principles of retaining walls, Design and Construction of Reinforced Soil Walls, Reinforced Soil Wall (A Case Study), Geosynthetics for Warehouse Grade Slab and Retaining Wall, Geogrid-Reinforced Retaining Walls, Restoration of Wharf Road by Geosynthetic Reinforced Soil Wall, Abutments and wing walls and allowable bearing capacity settlement tilting. Safety against general slip failure. Type of Failures of Retaining Walls – Stability Requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

Braced cuts – Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts.

Sheet Pile Structures – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and fixed earth support methods – Row's moment Reduction method – Location of anchors, Forces in anchors.

Soil reinforcement – Reinforced earth - Different components – their functions – Mechanics of reinforced earth – Failure Modes-Failure theories – Design of Embankments on problematic soils.

Cofferdams – types, suitability, merits and demerits – Design of single-wall Cofferdams and their stability aspects – TVA method and Cummins' methods.

TEXTBOOKS:

1. Soil Mechanics and Foundation Engineering Dr.K.R.Arora, Standard Publishers Distribution, Sixth Edition, 2003
2. Gopal Ranjan and A.S.R. Rao "Basics and Applied soil mechanics", New age International Publishing, second edition, 2007
3. G Venkatapparao P.K. Banerjee, J.T.Shahu, G.V. Ramana By Geo-Synthetics-New Horizons - 2004
4. P.C.Varghese Foundation Engineering Prentice-Hall of India Pvt Ltd, New Delhi – 2006

REFERENCE BOOKS:

1. Principles of foundation engineering by Braja M. Das, PWS-KENT Publishing company, Boston
2. Foundation analysis and design- Bowles, JE- McGraw Hill
3. Analysis and design of foundation and retaining structures, Prakash, Saritha Prakashan, Mearut

FORENSICS IN CIVIL ENGINEERING

Course Code: 21CE4152 **L- T- P-S**: 3-0-0-0

Pre-requisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Apply forensic engineering to demonstrate structural and geotechnical failures	1,2,3,11/2	4
2	Understand reinforced concrete Structures and steel structure failures through case studies	1,2,3,11/2	4
3	Evaluate different geotechnical failures through case studies	1,2,3,11/2	4
4	Analyze reasons for geo-environmental and fluid and hydraulic failures	1,2,3/2	4

Syllabus:

INTRODUCTION

Definition of a Forensic Engineer, Typical Clients, Types of Damage, Civil litigation, Important legal terms, Causes of failure, Preliminary information about failure, Data collection, Hierarchy of forensic investigation.

A FORENSIC STRUCTURAL INVESTIGATION

Load tests, Instrumentation, Dimensional measurements, concrete and masonry tests, Metal tests, Wood tests, Weld tests, water and air penetration tests, Heat loss tests.

FORENSIC GEOTECHNICAL INVESTIGATION

Bore hole logs, Penetration tests (SPT, CPT), Test Pits, In-place strength tests, Instrumentation, Dimensional Measurements, Seismic tests.

REINFORCED CONCRETE STRUCTURES CASE STUDIES

Skyline Plaza in Bailey's Crossroads, Bombing of the Oklahoma City Murrah Federal Building, The Pentagon Attack, Harbour Cay Condominium

STEEL STRUCTURES CASE STUDIES

The World Trade Center Attacks, Pittsburgh Convention Center Expansion Joint Failure, Minneapolis I - 35W Bridge Collapse, Hartford Civic Center Stadium Collapse

GEOTECHNICAL CASE STUDIES

Leaning tower of Pisa, Teton Dam, Vaiont Dam Reservoir Slope Stability Failure, Excavation failure, Reclamation bund failure, High way failure

GEO-ENVIRONMENTAL CASE STUDIES

Love Canal, Valley of the Drums, String fellow Acid Pits, Kettleman Hills Waste Landfill, North Battleford, Saskatchewan Water Treatment Failure

FLUID MECHANICS AND HYDRAULICS CASE STUDIES: Johnstown Flood, Malpasset Dam, Schoharie Creek Bridge, New Orleans Hurricane Katrina Levee

Text Books:

[T1] Robert, W. D., *Forensic Geotechnical and Foundation Engineering*, Second Edition, McGraw-Hill, NY, US, 2011.
[T2] Delatte, N. J., *Beyond Failure –Forensic case studies for Civil Engineers*, ASCE, US, 2009.

Reference Books:

[R1] Kenneth, L. C., *Forensic Engineering*, CRC Press, 2nd Edition, NY, US, 2000
[R2] Rao, V.V.S. and Babu, G. L. S., *Forensic Geotechnical Engineering*, Developments in Geotechnical Engineering series, Springer, SG, 2016.
[R3] Paul, A.B., Pamalee, A. B., Norbert, J. D. and Kevin, M. P., *Failure case studies in civil Engineering-Structures, Foundations and Geoenvironment,*2nd Edition, ASCE, Virginia, US, 2013

SUSTAINABLE ENGINEERING & TECHNOLOGY

Course Code: 21CE3213 **L- T- P-S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the concept of sustainability, Challenges for Sustainable Development and Clean Development Mechanism	3	2
2	Understand the sources, impacts of solid waste, Global environmental issues and Water Act, Air Act.	3	2
3	Understand the Life Cycle Analysis, Procedures of EIA, green materials for building construction and Methods for increasing energy efficiency of buildings Sustainable cities	3	2
4	Understand the Conventional and non-conventional of Energy sources and Sustainable Urbanization, industrialization and poverty reduction	3	2

Syllabus:

Sustainability - Introduction, Need and concept of sustainability, Social environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM),
Environmental legislations in India - Water Act, Air Act.

Air Pollution, Effects of Air Pollution; Water pollution- sources, Sustainable wastewater treatment, Solid waste - sources, impacts of solid waste, Zero waste concept, 3 R concept. Global environmental issues- Resource degradation, Climate change, Global warming, Ozone layer depletion, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print.

Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) - Procedures of EIA in India.
Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainable cities, Sustainable transport.

Energy sources: Basic Concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy.
Green Engineering, Sustainable Urbanisation, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Reference Books:

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A. S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
4. Mackenthun, K. M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
5. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
6. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
7. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS). Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios publication

ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSES

Course Code: 21CE3223 **L- T- P-S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the Types and limitations of EIA and EIA in Project Cycle, Legal and Regulatory aspects in India	3	2
2	Understand the Software packages for EIA and Mathematical modeling for impact prediction	3	2
3	Understand the Relationship between social impacts and change in community and institutional arrangements and Documentation of EIA	3	2
4	Understand the Policy and guidelines for planning and monitoring programmes and Case Studies	3	2

Introduction: Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA –.EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA-EIA Consultant Accreditation.

Impact Identification and Prediction: Matrices – Networks – Checklists –Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment

Social Impact Assessment and EIA Documentation: Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials.

Environmental Management Plan EIA: Report preparation. Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies

Reference Books:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003
3. World Bank –Source book on EIA
4. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
5. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.

6. Raghavan K. V. and Khan A A., Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
7. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012. EN7001 ADVANCED OXIDATION PROCESS

SOLID AND HAZARDOUS WASTE MANAGEMENT

Course Code: 21CE3233 **L- T- P-S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the sources, types and Properties of solid wastes	3	2
2	Understand the Current Scenario and Challenges Engineered Systems for Solid Waste Management:	3	2
3	Understand the Conversion of Solid wastes and Recovery	3	2
4	Understand the Land Filling of Municipal Solid Wastes and MoEF rules, CPCB guidelines for hazardous waste land filling.	3	2

Syllabus:

Municipal Solid Wastes: Types of solid wastes, Sources of Municipal and Hazardous wastes, Properties of solid wastes-Physical and Chemical composition.

Solid Waste Management: An Overview, Introduction – Reduction, Reuse and Recovery, Waste Disposal Options, Current Scenario and Challenges Engineered Systems For Solid Waste Management: Functional Elements, Solid waste generation, On-site handling, Storage and Processing, Collection of solid wastes,

Transfer and Transport, Processing of Solid wastes, Ultimate disposal. Conversion of Solid wastes and Recovery: Mechanical processing and Material recovery systems. Biological Conversion-Composting, Anaerobic Digestion. Thermal Conversion- Combustion, Incineration, Gasification, Pyrolysis, Refuse Derived Fuel, Energy recovery systems.

Landfills for Municipal Solid Wastes: Land Filling of Municipal Solid Wastes, Site selection, Planning, Design and Operation. Landfill Gas- composition, Collection. Lechate-environmental effects, Lechate collection systems, Treatment of lechate, MoEF rules, CPCB guidelines for hazardous waste land filling.

Text Books:

1. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous (1985), Environmental Engineering, Mc Graw-Hill International Editions, NewYork.

Reference Books:

1. Solid waste Engineering by P. Aarne Vesilind, Willium Worrell and Debra Reinhart, (2004), Cengage Learning India Private Limited, New Delhi.
2. Environmental Science and Engineering by J.Glynn Henry, Gary W.Heinke,(2004),Low Price Edition, Pearson Education Inc, Singapore.
3. MoEF (2000) Municipal Waste Management and Handling Rules, Govt. of India.
4. CPCB (2001) Criteria for Hazardous Waste Landfill(HASWAMS/17/2000-01)

5. Solid and hazardous waste management by M.N. Rao and Razia Sultana, BS Publications, Hyderabad.
6. Venkatappa Rao. G and Sasidhar. R.S. (2009), Solid waste management and Engineered Landfills, Sai Master Geoenvironmental Services Pvt.Ltd, Hyderabad

AIR AND NOISE POLLUTION CONTROL

Course Code: 21CE4143 **L- T- P-S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the sources, classification and effect of Air pollution	3	2
2	Understand the Air sampling, pollution measurement methods and Air Pollution Act	3	2
3	Understand the Air pollution control techniques	3	2
4	Understand the sources, classification and effect of Noise pollution	3	2

Syllabus:

Introduction: Major Air pollutants; Pollution Sources and their classification; Combustion Processes and pollutant emission; Effects of air pollutants on Health, vegetation, materials and atmosphere.

Secondary air pollution: Reactions of pollutants in the atmosphere and their effects-Smoke, smog and ozone layer disturbance, Greenhouse effect.

Air pollution sampling: Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations.

Air pollution control: Control principles, Removal of gaseous pollutants by adsorption, absorption, reaction. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation etc. Biological air pollution control technologies, Indoor air quality.

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 of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods

Reference Books:

1. Richard W. Boubel et al, "Fundamentals of Air Pollution", Academic Press, New York, 2004.
2. Noel de Nevers, "Air Pollution control Engg." McGraw-Hill, New York,2005.
3. M.N. Rao et al, "Air Pollution", Tata McGraw Hill, 2009.
4. Peterson and Gross. E Jr., “Hand Book of Noise Measurement”, 7th Edn, 2003.
5. Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 2009.

PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTEWATER TREATMENT

Course Code: 21CE4153 **L- T- P-S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the parameters of water and Potable water standards	3	2
2	Understand the Primary, Secondary and Tertiary Treatment of water	3	2
3	Understand the Classification of filters and principle of working and design	2,3	4
4	Understand the Factors affecting disinfection and methods of Disinfection	3	2

Syllabus:

Water Quality: Physical, chemical and biological parameters of water- Water Quality requirement - Potable water standards -Wastewater Effluent standards -Water quality indices.
Water purification systems in natural systems: Physical processes-chemical processes and biological processes-Primary, Secondary and Tertiary Treatment-Unit operations-unit processes.
Sedimentation: Types, Aeration and gas transfer, Coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids transport of colloidal particles, Clariflocculation.
Filtration: theory of granular media filtration; Classification of filters; slow sand filter and rapid sand filter; mechanism of filtration; modes of operation and operational problems; negative head and air binding; dual and multimedia filtration, pressure filters, principle of working and design.
Theory of disinfection: Factors affecting disinfection, Disinfection - chlorine dioxide; chloramines; ozonation; UV radiation. Miscellaneous methods: Ion Exchange-processes, Application of Membrane Processes, Reverse Osmosis, Micro-filtration, Nano-filtration, Ultrafiltration and Electrodialysis.

Reference Books:

1. Weber, W.J., Physicochemical processes for water quality control, John Wiley and sons, Newyork, 1983.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.
3. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGrawHill Publication, New Delhi, 2003
4. Water & Waste Water Engineering by Fair and Gayer.
5. C.A.Sastry, Water Treatment Plants, Narosa Publishing House, Bombay, 1996

RIVER ENGINEERING

Course Code: 21CE3214 **L- T- P=S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand concept of river morphology	1,3	1, 2
2	Understand river regulation systems	1,3	1, 2
3	Understand sediment transport processes	1,3	1, 2
4	Understand various hydraulic modeling	1,3	1, 2

Syllabus:

River Morphology: Plan form variations and river channel pattern; Meandering and braided stream characteristics; River equilibrium, river dynamics and adjustments to stream power.

River Training Techniques: Principles of Stabilization and rectification of rivers, river bank stability analysis, spur / groyne, stream bank armouring, guide banks, submerged vanes, porcupine and jack jetty systems, gabions; Bandalling, surface and bottom panels.

Inland Navigation Channel Development: Fairway dimensions and maintenance, canalization, navigation locks and terminals.

Sediment Transport Processes: Incipient motion of sediment particles; Regimes of flow; Resistance to flow and velocity distribution in alluvial streams; transport of bed, suspended and total load. Flood control planning, flood plain zoning and other non – structural measures.

River Models: Mathematical modelling - types, mathematical formulation, numerical procedures, calibration and validation; Scale modelling – types, principles of similitude and dimensional analysis, model verification, limitations.

Text Books:

1. Chow, V.T. Open Channel Hydraulics. McGraw-Hill.
2. Garde, R.J., Raju, K.G.R. Mechanics of Sediment
3. Yang, C.T. Sediment Transport: Theory and Practice. McGraw-Hill.

Reference Books:

1. Garde, R.J., Raju, K.G.R. Mechanics of Sediment Transportation and Alluvial Stream Problems. (2nd Edition) Wiley Eastern Ltd.
2. Ashworth, P., Bennett, S., Best, J., McLelland.
3. Coherent Flow Structures in Open Channels. John Wiley and Sons.

URBAN WATER HYDROLOGY AND HYDRAULICS

Course Code: 21CE3224 **L- T- P=S**: 3-0-0-0
Pre-requisite: NIL **Credits**: 3
Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Understand the urban hydrological cycle & hydraulic process	1,3	1,2
2	Estimate the components of urban hydrological processes	1,3	3,4
3	Estimate runoff from highways, airports and urban areas	1,3	3,4
4	Plan and design of urban drainage systems for an urban area	1,3	3,4

Syllabus:

Urban hydrological cycle and components; Impact of urbanization on hydrological cycle; Anomalies & characterization of rainfall; Time and scale effects; Urban hydrological data requirements and analysis; Storm water runoff generation; return period; hydrologic risk; frequency analysis – IDF relationships.

Open channel flow in urban watersheds; interception storage, infiltration, depression storage; estimation of runoff rates from urban watersheds; flow routing; storm water drainage structures; storm water detention; structural and non-structural control measures; urban watershed modelling.

Overland and drainage channel flows; hydraulics of storm-drain systems and culverts; determination of design flow; runoff for highways, airports, and urban areas.
Planning and design aspects of storm water/drainage infrastructure; design of drainage gutters, channels, sewer networks, and culverts and storm water management.

Text Books:

1. Hall, M.J., Urban Hydrology, Elsevier, 1984.
2. Optimal Design of Water Distribution Networks, P. R. Bhave, Narosa Publishing House, 2003.
3. Butler, D. & Davies, J.W. Urban Drainage, Spon Press, 2nd Edn., 20004.

Reference Books:

1. Leonard, O.J. & Sherrif, J. Scope for the Control of Urban Runoff. Report 124, CIRIA, 1992.

2. DOE/NWC Design and Analysis of Urban Storm Drainage. The Wallingford Procedure. Dept. of the Environment, Standing technical Committee Report 28, 1981.
3. Shaw, E.M. Hydrology in Practice. 3rd Edn., Chapman & Hall, 1994

WATER RESOURCES FIELD METHODS

Course Code: 21CE3234 **L- T- P-S**: 3-0-0-0

Pre-requisite: NIL **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Measure and Estimate of different losses during rainfall	1,3	3,4
2	Estimate stream flow measurement and velocity using different methods	1,3	3,4
3	Measure and analysis the surface and ground water quality using different quality sampling techniques	1,3	3,4
4	Measure and estimate ground water flow and level using different methods	1,3	3,4

Syllabus:

Abstractions: Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrometers – Infiltration Equations - Infiltration Indices.

Surface-Water Measurements and Methods: Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site.

Water-Quality Measurements and Methods: Water-quality principles— Measurement principles, chemical compatibility, quality assurance, Sample Collection—flowing and nonflowing water sites, Sample preparation, Field Measurements

Groundwater Measurements and Methods: Groundwater Hydraulics and Principles, Well Construction, Hydraulic Tests and Measurements, determining aquifer parameters– steady and transient conditions - Slug test – Locating hydro geological boundaries – Image well theory – Determination of well characteristics and specific capacity of wells – Well characteristics of large diameter wells

Text Books:

1. Todd, D.K. (2004). Ground Water Hydrology. John Wiley & Sons, New York.
2. Chow, V.T. (1964). Hand Book of Applied Hydrology. Mc Graw Hill, New York.

Reference Books:

1. Raghunath, H.M. (2006). Hydrology-Principles, Analysis and design. New age International (P) Ltd
2. McCuen, R. H. (1989). Hydrologic Analysis and Design. Printice Hall.

DESIGN OF HYDRAULIC STRUCTURES

Course Code: 21CE4144 **L- T- P**: 3-0-0

Pre-requisite: **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
1	Design of lined and unlined channels	1,3	3,4
2	Design of cross regulators on channel, Barrages and surplus weirs	1,3	3,4
3	Design of Transitions and cross drainage works.	1,3	3,4
4	Design of Spillway, Design principle of gravity and earthen dam.	1,3	3,4

Syllabus:

Hydraulic Structures/Irrigation Engineering Syllabus: This course should discuss key issues in designing irrigation channels and hydraulic structures used in irrigation systems,

Canal: Introduction to design of lined and unlined channels (Triangular and Trapezoidal shape); Analysis for surface and sub-surface flow at hydraulic structures.

Regulation works: Design of head regulator, cross regulator and falls (Trapezoidal notch type falls) on canal.

Cross Drainage works: Design transitions and cross drainage works (Aqueducts; Super passage; Syphon Aqueducts.) on canal, Design of barrages and weirs on river.

Dam and spillways: Design principles for gravity and earthen dams, Design of spillway (ogee and chute spillway).

Text Books:

1. Water Resources Engineering Principles and Practice by Satya Narayana Murthy Challa, New Age International Publishers Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic Structures by Santosh Kumar Garg, Khanna Publishers, New Delhi.
3. *Hydraulic Structures*, P. Novak, A. I. B. Moffat, C. Nalluri and R. Narayanan, Taylor and Francis, U. K.

Reference Books:

1. Irrigation Water Resources and Water Power Engineering by P. N. Modi, Standard Book House, New Delhi.
2. Irrigation and Water Power Engineering by Dr. B.C. Punmia & Dr. Pande B.B. Lal; Laxmi Publications pvt. Ltd., New Delhi.

GROUND WATER HYDROLOGY

Course Code: 21CE4154 **L- T- P**: 3-0-0

Pre-requisite: NIL **Credits**: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able

CO No.	Course Outcomes	PO	BTL
CO 1	Analyze Ground Water Hydrology and well Hydraulics	1,3	3, 4
CO2	Analyze flow characteristics and governing equations	1,3	3, 4
CO3	Analyze surface and sub – subsurface investigation methods of geophysical explorations	1,3	3, 4
CO 4	Understand Groundwater and Basin Management	1,3	1,2

Syllabus:

Fundamentals of Groundwater Flow and Groundwater Wells: Basics of groundwater: aquifer, hydraulic head, storage characteristics, Darcy's law: hydraulic conductivity, heterogeneity and anisotropy, aquifer flow and transmissivity, Equations of groundwater flow, Radial flow to wells, pumping tests, Multiple well arrays, wells near hydrogeologic boundaries

Groundwater Resources Assessment: Groundwater exploration: reconnaissance survey, surface and subsurface geophysical investigation, test drilling, Hydrologic assessment: infiltration and groundwater recharge, water balance method, rainfall runoff models, and regional groundwater flow model. Overcharging, Over exploitation: groundwater mining, land subsidence due to pumping, Groundwater quality and contamination, Saltwater intrusion

Groundwater Management: Concepts of basin management: quantity and quality aspects Alternative basin yield, Evaluation of perennial yield, Modeling tools and techniques for management, Integrated use of surface water and groundwater, Artificial recharge

Groundwater Pollution: Pollution sources: point and non-point sources, Movement and attenuation of pollutants in aquifers, Transport processes: advection, dispersion, sorption and decay, mathematical treatment, Solute transport equation, initial and boundary conditions, Mathematical statement of pollution problems; solution approaches

Text Books:

1. Das Gupta, A. (1993): Groundwater Contamination, Environmental Systems Review No.34, Environmental System Information Center, AIT.
2. Kashef, A.I. (1986): Groundwater Engineering, McGraw Hill, New York.
3. Roscoe Moss Company (1990): Handbook of Groundwater Development, John Wiley & Sons.

Reference Books

1. U.S. Department of Interior, Bureau of Reclamation (1995): Groundwater Manual, Water resources Publication
2. LLC Fetter, C.W. (1993): Contaminant Hydrogeology, Macmillan Publishing Company, New York

INTELLIGENT TRANSPORTATION SYSTEMS

Course code: 21CE3215 **L-T-P**:3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand the Objectives ITS	1	1
2	Understand the Importance of telecommunications in the ITS system	1	1
3	Understand Advanced Traffic Management Systems	1	2
4	Understand Integration of Automated Highway Systems	1	2

Syllabus:

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location(AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Center (TMC). Vehicle – Road side communication – Vehicle Positioning System; ITS functional areas – Advanced Traffic Management Systems (ATMS),

Advanced Traveler Information Systems (ATIS),Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS),Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS); ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management; Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed

countries, ITS in developing countries.

Text Books:

1. Intelligent Transportation Systems – Problems and Perspectives (Studies in Systems, Decision and Control) by Aleksander Sladkowski , Wieslaw Pamula

Reference Books:

1. Advanced Technologies for Intelligent Transportation Systems (Intelligent Systems Reference Library) by Marco Picone , Stefano Busanelli , Michele Amoretti , Francesco Zanichelli , Gianluigi Ferrari

PAVEMENT MATERIALS AND DESIGN

Course code: 21CE3225 **L-T-P**:3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand the Soil Classification and characteristics & properties and tests on bitumen	1	1
2	Understand the characteristics of bituminous mixes & IRC and IS specifications and tests	1	1
3	Understand the Types and component parts of pavements & Understand the Stresses and deflections in homogeneous masses	1	2
4	understand the Pavement behaviour under transient traffic loads & Design the Pavements as per IRC	2	1

Syllabus:

Soil - Classification, characteristics, compaction, evaluation of soil strength; stabilized pavement materials; Aggregates: requirements, properties and tests on road aggregates for flexible and rigid pavements.

Bitumen: Origin, preparation, properties and tests, constitution of bituminous road binders; requirements; Criterion for selection of different binders. Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests.

Bituminous Mixes: Mechanical properties: Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes. bituminous mix design methods and specifications. Weathering and Durability of Bituminous Materials and Mixes. Performance based Bitumen Specifications; Superpave mix design method: design example problems. Cement Concrete for Pavement Construction: Requirements, and design of mix for CC pavement, IRC and IS specifications and tests, joint filler and sealer materials.

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements. Stresses and Deflections in Flexible

Pavements: Stresses and deflections in homogeneous masses. Burmister's two-layer theory, three layer and multi-layer theories; wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels. Repeated loads and EWL factors; sustained loads. Pavement behaviour under transient traffic loads. Flexible Pavement Design Methods for Highways and Airports: Empirical, semi-empirical and theoretical approaches, development, principle, design steps, advantages; design of flexible pavements as per IRC; Stresses in Rigid Pavements: Types of stresses and causes, factors influencing the stresses; general considerations in rigid

pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

Rigid Pavement Design: Types of joints in cement concrete pavements and their functions, joint spacings; design of CC pavement for roads and runways as per IRC, design of joint details for longitudinal joints, contraction joints and expansion joints. IRC method of design by stress ratio method. Design of continuously reinforced concrete pavements; Maintenance, repair and rehabilitation of pavements including design of bituminous and concrete overlays as per IRC

Text Book:

1. Characterisations of Base Course Materials for Flexible Pavements Paperback – by Komsun Siripun ,Hamid Nikraz , Peerapong Jitsangiam 4 Jan 2011.
2. Principles of pavement design – Yoder & wit zorac – Jhonwilley & Sons
3. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.
4. Partha Chakraborty, ' Principles of Transportation Engineering, PHI Learning,

Reference Book:

1. Highway Engineering: Pavements, Materials and Control of Quality Hardcover – by Athanassios Nikolaides 28 Nov 2014.
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
3. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
4. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

TRAFFIC ENGINEERING AND MANAGEMENT

Course code: 21CE3235 **L-T-P**:3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand about the Traffic Forecast	1	1
2	Understand about the Demand relationships, methods for future projection in transit development	2	2
3	Analysis of individual accidents and statistical data using mathematical tools	2	3
4	Understand the Formulation of system models	2	1

Syllabus:

Traffic Forecast: General travel forecasting principles, different methods of traffic forecast - Mechanical and analytical methods, Demand relationships, methods for future projection; Design Hourly Volume for Varying Demand

Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions. Determination of design hourly volume; critical hour concept; Highway Capacity: Factors affecting capacity, level of service;

Capacity studies - Capacity of different highway facilities including unsignalized and signalized intersections. Problems in Mixed Traffic flow; Case studies; Accident Analysis: Analysis of individual accidents and statistical data; Methods of representing accident rate; Factors in traffic accidents; influence of roadway and traffic conditions on traffic safety; accident coefficients; Driver strains due to roadway and traffic conditions; Traffic Flow

Theory: Fundamental flow relationship and their applications, Traffic flow theories and applications; Shock waves; Queuing theory and applications; Probabilistic Aspects of Traffic

Flow: Vehicle arrivals, distribution models, gaps and headway distribution models; gap acceptance merging parameters, delay models, applications; Simulation: Fundamental principle, application of simulation techniques in traffic engineering - formulation of simulation models, Case studies. Formulation of system models.

Text Books:

1. Partha Chakraborty, ' Principles of Transportation Engineering, PHI Learning,
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway
3. Engineering and Traffic Analysis', 4th Edition, John Wiley

Reference Books:

1. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
2. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

URBAN TRANSPORTATION PLANNING

Course code: 21CE4145 **L-T-P**:3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understand the role, purpose of urban transportation planning and systems.	1	1
2	Estimate the Trip generation and distribution concepts model	1,5	2
3	Understand the concepts of Modal split and traffic assignments.	1	1
4	Gain knowledge about the concepts of public transport planning and Intelligent Transportation Systems	1	1

Syllabus:

Transportation Planning: Introduction to transportation planning; systems approach to transportation planning; types of models; concept of travel demand and supply; socio-economic, land use, network, and transport system characteristics affecting transportation planning. **Transportation Survey:** Study area definition, zoning principles, cordon and screen lines, data collection through primary and secondary sources, sampling techniques. **Sequential modeling approach:** Four-stage sequential modeling approach; trip generation; trip distribution; modal split; trip assignment. **Planning For Public Transport:** Public transport planning, Fares and Subsidies Introduction to Intermediate Public Transport Type and Characteristics of IPT Modes in India, Integration of different modes. **Urban and intelligent transportation systems:** ITS, first generation of ITS and it's applications, ITS in Various Countries, Mature ITS Applications, Safety and Liability, Second Generation of ITS

Text Book:

1. Principles and practices of highway Engineering by Dr. L. R. Kadiyali & Dr. N. B. Lal Khanna publishers, 2003.
2. Introduction to Transportation Planning – M.J. Bruton; Hutchinson of London Ltd

Reference Book:

1. Principles of Transportation Engineering by Partha Chakroborty and Animesh Das. Prentice Hall of India, New Delhi, 2003.
2. Introduction to Urban System Planning – B.G. Hutchinson; McGraw Hill
3. Metropolitan transportation planning – John W. Dickey, Tata McGraw Hill, New Delhi, 1975.

RAILWAY, AIRPORT DOCK AND HARBOUR ENGINEERING

Course code: 21CE4155 **L-T-P**:3-0-0

Pre-requisites: 19CE3103 Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Versatile with history and various Components of Railway Engineering.	1	2
2	Understand about the Railway Track Geometric Elements and Turnouts	2	2
3	Understand the geometric elements of Airport Runway and Taxiway	2	2
4	To study about the types and components of docks and harbours	1	2

Syllabus:

Railway Engineering: Historical Development of Railways in India, Advantages of Railways, Classification of Railways, Permanent Way & its components, functions. Track volume and Track capacity. Rail Joints, Welding of rails and Creep of rails;

Track Geometric Design - Gradients, Horizontal and Vertical curves, super elevation, Negative Super elevation, Coning of Wheels. Turnouts: Left/ Right Hand Turnout, Track Junctions, Points and crossings, Tracks Drainage, Railway Stations and Yards, Signaling.

Airport Engineering: Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway –geometric design of taxiway, Wind Rose Diagram – Runway Lighting system.

Dock & Harbour Engineering: Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids. Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Text Book:

1. Railway Engineering by S.C. Saxena & S. Arora
2. Airport Engineering: Planning, Design and Development of 21st Century Airports Hardcover by Norman J. Ashford, Saleh Mumayiz, Paul H. Wright fourth edition

Reference Book:

1. Railway Engineering by Rangwala.
2. Airport Systems, Second Edition: Planning, Design and Management by Richard L. De Neuville, Amedeo R. Odoni, Peter Belobaba, Tom G. Reynolds, Second Edition.

QUALITY AND SAFETY MANAGEMENT IN CONSTRUCTION

Course Code: **L-T-P-S:3-0-0-0**
Prerequisites: - NIL **Credits: 3**

Course Objective: This course provides complete understanding on quality planning, quality assurance, quality control and safety management. The fundamental reason for the course is to impart knowledge and skill for the construction students to achieve success in quality management system (QMS) by understanding and evaluating quality management principles as a formalized system that has documents, processes, procedures, and authorities, responsibilities and for achieving quality policies and objectives

Course Outcomes (CO): students will be able to

CO No:	CO	PO	BTL
1	Understand the concepts of quality management and the factors influencing construction quality	1,3,4	2
2	Understand quality planning and programs in construction industry	3,4	2
3	Acquire knowledge of quality management systems and ISO 9000 family of standards.	1,3,4	2
4	Understand and analyses quality circle (QC) concepts for possible implementation to solve construction productivity and quality problems	1,3,4	3

Syllabus

Quality Management: Introduction – Definitions and objectives – Factors influencing construction quality –Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles.

Quality Systems: Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

Quality Planning: Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures -Processes and products – Total QA / QC programmed and cost implication.

Quality Assurance And Quality Improvement Techniques: Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, –Stability methods and tools, optimum design – Reliability testing, Reliability coefficient and reliability prediction - Life cycle costing – Value engineering and value analysis. Quality Improvement Tools and Techniques.

Safety Management Systems: Fundamental of safety management, construction safety, safety in scaffolding and working platform, welding and handling, excavation work, concreting and cementing work. Building construction, TAC and NBC rules, High rise building. Evolution of modern safety concept- Safety policy - Safety Organization. Safety survey, safety inspection, safety sampling, Safety Audit. Concept of an accident, Reportable and non reportable accidents, unsafe act and condition principles of accident prevention, Overall accident investigation process. Risk management

References:

Hutchins.G, ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.

James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van

Nostrand, 1997.
John L. Ashford, The Management of Quality in Construction, E &F.N.Spon, 1989.
Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001.
Kwaku.A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., 1985.
Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longm.

Technical Proficiency / Entrepreneurial Incubation-1(CAD Engineer)

Course code : 20TS3101 **(L T P):** 0-0-0-12

Pre Requisite : NIL **Credits : 3**

Course Outcomes

CO#	Course Outcome	PO/PSO	BTL
CO5	Design the structural elements with AutoCAD software and submission of project report	**3**	**5**

Syllabus:

CAD Engineer – RCC

1. Detailing of RCC Elements
2. Drawing Standards
3. List Routines for Drawings
4. AutoCAD tools and practice
5. Hands on practice: RCC Slabs
6. Hands on practice: RCC Beams
7. Hands on practice: RCC Columns
8. Hands on practice: RCC Foundations1
9. Hands on practice: RCC Foundations 2
10. Hands on practice: RCC Retaining walls
11. Hands on practice: RCC Staircase
12. Hands on practice: RCC Water Tanks
13. Hands on practice: RCC Flooring
14. Hands on practice: RCC Lintels, Chajja, RCM
15. Drawings Quality Checks & BBS

CAD Engineer - Steel

1. Detailing of Steel Elements
2. Drawing Standards
3. Lisp Routines for Drawings
4. AutoCAD tools and practice
5. Hands on practice: Steel Beams
6. Hands on practice: Steel Bracings
7. Hands on practice: Steel Columns
8. Hands on practice: Base Plate Foundations
9. Hands on practice: Roof Trusses, Portals
10. Hands on practice: Cladding, Gable End
11. Hands on practice: Steel Staircase
12. Hands on practice: Shop Drawings
13. Hands on practice: Heavy Built up Girders
14. Hands on practice: Special Structures
15. Drawings Quality Checks & BOQ

TEXTBOOKS:

1. P.C. Varghese "Design of Reinforced Concrete Design.
2. Pillai & Devdas Menon, "Reinforced concrete design", 3rd Edition, Tata McGraw Hill, New Delhi, 2009.
3. S.K. Duggal, "Limit state design of steel structures", 1st Edition, TMH publication, 2011
4. N. Subramaniyan, "Design of Steel structures", 1st Edition, Oxford university press, 2008.

Reference Books:

1. N. Krishna Raju and R.N. Pranesh, "Reinforced Concrete Design", 8th Edition, New age International Publishers, New Delhi, 2004.
2. M.L. Gambhir, "Design of Reinforced Concrete Structures" 6th Edition, PHI, Delhi, 2013.
3. B.C. Punmia, "Comprehensive Design of Steel structures", 10th Edition, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi, 2007.
4. P. Dayaratnam, "Design of Steel Structures", 2nd Edition, S. Chand Publishers, 2009.

IS Codes:

1. IS456 – 2000: Indian Standard specification for plain and reinforced concrete, 2011
2. IS -800:2007, "Codes of Practice for General Construction in Steel", BIS, 2007
3. IS 875 Part III, "Codes of Practice for Design Loads" (other than Earthquake, for Buildings and Structures), 1987.
4. Steel Tables.

Technical Proficiency / Technopreneurship (Planning Engineer)

Course code : 20TS3202 **(L T P):** 0-0-0-12

Pre-Requisite : NIL **Credits : 3**

Course Outcomes

CO#	Course Outcome	PO/PSO	BTL
CO5	Planning & Development of Various activities and resources pertaining to planning engineering and submission of project report	**3**	**4**

Syllabus:

1. Basic understanding of different types of Drawings.
2. Estimation of quantities for different materials.
3. Preparation of cost of materials, machinery and labour.
4. Scheduling of various activities
5. Preparation of Resource Plan
6. Purpose of various Equipment's used at site
7. Handling of resources (materials, machinery and labour)
8. Development of Mix Design
9. Site Investigation Techniques
10. Facilitation of various resources in site.
11. Preparation of Basic Site DPR's
12. Recycling of scrap and other garbage's used at site (Reuse-Reduce-Recycle)

Technical Proficiency / Entrepreneurialal Skilling (Supervising Engineer)

Course code : 20TS4103 **(L T P):** 0-0-0-12

Pre Requisite : NIL **Credits : 0**

Course Outcomes

CO#	Course Outcome	PO/PSO	BTL
CO5	Planning of Various activities, monitoring of QC pertaining to supervising engineering and submission of project report	**3**	**4**

Syllabus:

1. Daily Work Plan
2. Reports
3. RFI (Request for Information)
4. Method Statements
5. Quality Control
6. Quality Registers
7. Drawings Study
8. Billing MBs (measurement book)
9. Survey & Marking
10. Formwork plan,
11. Construction Planning
12. Contract Management
13. Change Management

Technical Proficiency / Entrepreneural Skilling
(Practical Approaches in Quantity Surveying and Estimation)

Course Code: 20TS4204 **L-T-P-S : 0-0-0-12**
Pre-Requisite: NIL Credits: 0

CO	Course Outcome	PO/PSO	BTL
CO5	To apply the fundamentals of Quantity surveying in practical applications various civil engineering fields and to propose detailed project reports.	3	4

Syllabus

1. **Rate Analysis:** To Prepare rate analysis for different items of buildings.
2. **Estimation of Buildings:** To prepare detailed estimation for existing and proposed multi storied buildings
3. **Estimation of Roads:** To prepare detail project report for a stretch of existing and proposed road of more than 2 km.
4. **Estimation of Canals:** To prepare detail project report for a stretch of existing and proposed canal more than 2 km.
5. **Bar bending schedule:** To prepare and study the bar bending schedule for an existing and proposed multi storied building.
6. **Tendering:** To prepare and submit a tender for bidding to a tender invited by Government bodies.
7. **Valuation:** To prepare detailed valuation report for an existing Building.

Tools : Microsoft Excel
A.L.M: Group Discussion
Activities: Field Visit
Text books:

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors,New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.

Reference books

1. Estimating & Costing by M. Chakraborty, S Chand Publishing House.
2. Estimating and Tendering for Construction Work, By Martin Brook, Elsevier Ltd., Burlington, MA - 2004

B.I.S Books:

1. SP-34 1987 Hand book on Concrete Reinforcement and Detailing.
2. IS:2502- 1963 Code of Practice for bending and fixing of bars for concrete reinforcement.
3. Standard schedules of rates by government of Andhra Pradesh.

BUILDING INFORMATION MODELING

Course Code: 20CE5124 **L-T-P-S: 3-0-2-0**
Prerequisite: NIL **Credits: 4**

Course Objective:

This course covers the essential knowledge a project manager should have to manage projects that are designed, delivered and constructed using Building Information Modeling tools, including Autodesk Revit. A project manager must know the differences between CAD and BIM and how to harness the power of BIM and the opportunities it creates for better design, collaboration, coordination and delivery.

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Become familiar with the trends, concepts of Building Information Modeling	1,4	2
2	Learn about Project BIM Execution Planning	4	2
3	Design the BIM execution process by creating process maps	4,5	4
4	Develop BIM information exchanges	4,5	4
5	Developing BIM Model using Revit Software and submission of project report	4,5	4

Syllabus:

Basics of BIM

Fundamentals of Building Information Modeling, BIM, Project Delivery Methods & Trends BIM Adoption & Perceived ROI BIM for FM Concept BIM Proficiency Project Execution Planning

The Uses of BIM

BIM use classification system and structure, the purposes and objectives of BIM, elaborating on the BIM use characteristics, level of development, selection of BIM uses

Project BIM Execution Planning

Overview of the project execution planning procedure for BIM, identifying BIM goals and uses for a project, designing the BIM project execution process

Developing information exchanges

Pulling the information through the project, information exchange worksheet

Define supporting infrastructure for BIM implementation

Project information, project BIM goals / BIM uses, organizational roles and staffing BIM and facility data requirements, delivery strategy / contract

Implementing the BIM project execution planning procedure

Meeting Structure for Developing a BIM Project Execution Plan, Planning Meeting Schedule, Monitoring Progress against the BIM Execution Plan

Tools:

AUTO DESK REVIT SOFTWARE

BIM Engineer Structural RCC

Rivet 3D Modelling with following hands on practice with creation of families for elements and extraction of BOQ, BIM Engineer Architecture

1. Rivet Architecture
2. Preparation of plans,
3. Coordinated Drawings,

4. Clash Reduction,
5. 3D Modelling,
6. Elevations,
7. Extraction of Sections and BOQ.

Reference Books:

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, C. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.
2. Hardin, B., & McCool, D. (2015). BIM and construction management: proven tools, methods, and workflows. John Wiley & Sons.
3. Krygiel, E., & Nies, B. (2008). Green BIM: successful sustainable design with building information modeling. John Wiley & Sons.
4. Issa, R. R., & Olbina, S. (Eds.). (2015, May). Building Information Modeling: Applications and Practices. American Society of Civil Engineers. •Teicholz, P. (Ed.). (2013). BIM for facility managers. John Wiley & Sons.
5. Kymmell, W. (2007). Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations (McGraw-Hill Construction Series). McGraw Hill Professional.
6. Eynon, J. (2016). Construction Manager's BIM Handbook. John Wiley & Sons.
7. Pittard, S., & Sell, P. (Eds.). (2016). BIM and Quantity Surveying. Routledge.
8. Duell, R., Hathorn, T, and Hathorn, T.R. (2015), Autodesk Revit Architecture 2016 Essentials, Wiley and Sons, Inc.

OPEN ELECTIVES
IPR & PATENT LAWS

Course code: 21BT40A1 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Intellectual Property Rights Patents and intellectual property rights (IPR): Definition, History of intellectual property; Types of intellectual property rights, copy rights, trade marks, geographical indication, Industrial design rights, patents. Sources of patent information, patent application procedures. **Principles, Scope and Functions Of GATT&WTO** GATT-Historical perspective, objectives and fundamental principles, impact on developing countries. WTO-Objectives, scope, functions, structure, status, membership and withdrawal, dispute settlement, impact on globalization, India-tasks and challenges.

Regulatory Affairs Indian contest-requirements and guidelines of GMP, understanding of Drugs and cosmetic act 1940 and rules 1945 with reference schedule M,U & Y. Related quality systems-objectives and guidelines of USFDA,WHO & ICH; Introduction to ISO series.

Documentation and Protocols Documentation: Types related to pharmaceuticals industry, protocols, harmonizing formulation development for global fillings, NDA, ANDA, CTD, Dealing with post approval changes-SUPAC, handling and maintenance including electronic documentation.

Case Studies on Patents

Case Studies on - Patents (Basumati rice, turmeric, Neem, and related medicinal plants and byproducts)

Textbooks:

1. S. H. Willig, Good manufacturing practices for Pharmaceuticals, Informa Healthcare (Oct 2000).

Reference books:

1. Industrial Property Rights: Vol. III-4, Kogan Pate, Kogan Pate, Kogan Page (May 1998)**.**

ENVIRONMENTAL POLLUTION CONTROL METHODS

Course code: 21CE40A2 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understanding about Air Pollution	1	2
2	Understanding about Measurement of pollution loads	2	2
3	Understanding about Low cost treatment unit processes	2	2
4	Understanding about Bioremediation	2	2

SYLLABUS :

Air pollution: Sources, Types, and effects and Fate of air pollutants. Meteorological factors and their impacts on pollutants dispersal. Sampling and measurement of air pollutants. Air quality standards. Air pollution control methods for particulates and gaseous pollutants. Emission Control equipments for particulate and gaseous matter. **Water pollution:** Sources, Types and Effects of Water pollutants. Measurement of pollution loads: DO, BOD, COD, TOC - Water quality and Effluent discharge standards. Role of Microorganisms in wastewater treatment. Bacterial population dynamics- growth kinetics. Pretreatment, primary treatment, secondary and tertiary treatment of wastewater. Low cost treatment unit processes. **Solid waste:** Sources and types of Solid wastes – Disposal methods: Land filling - Composting - Incineration – Pyrolysis. Reclamation of polluted and degraded soil by Bioremediation- Phyto-remediation. Human acoustics, Sound and its general features- Noise and its measurement - Noise pollution hazards -Control methods.

Text Books:

1. Environmental Pollution Control Engineering by C.S.Rao (2006), New Age International (P)Limited Publishers, New Delhi.
2. Environmental Engineering by Howard S. Peavy, Donald R. Rowe and George Tchobanoglous(1985), Mc Graw-Hill International Editions, NewYork.

ReferenceBooks:

1. Sewage Disposal And Air pollution Engineering by S.K. Garg, Khanna publishers, New Delhi, 2010.
2. Waste water Engineering by M.N Rao and A.K Dutta, Oxford & IBH Publishing Co.Ltd, 2000.
3. Air Pollution by M.N Rao and H.V.N Rao, Tata McGraw- Hill Publishing Company Limited,
New Delhi, 2000.
4. Environmental Engineering by Davis Cornvel, McGraw Hill Book Co., New York, 2000.
5. Waste Water Engineering by Met Calf &Eddy, McGraw Hill Book Co., New York, 2006.

SOLID AND HAZARDOUS WASTE MANAGEMENT

Course code: 21CE40A3 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course outcome	PO	BTL
1	Understanding about Solid Waste	1	2
2	Understanding about Conversion and recovery	1	2
3	Understanding about Hazardous Waste	2	2
4	Understanding about Physico-chemical processes	2	2

SYLLABUS

Solid wastes: Sources, Types, reasons for increase in generation, composition and properties of solid waste, Collection and on-site handling, Separation and processing. Solid waste disposal methods, Land filling, methods of land filling, Design of Landfills, gas production, Leachate and its control.

Conversion and recovery:Incineration, Pyrolysis, Composting methods, merits and demerits, Energy recovery, Bio methanation, use of refuse derived fuels (RDF).

Hazardous Waste, Definition, Sources, Classification, Hazardous wastes rules, and Nuclear waste, Biomedical wastes, Chemical wastes, disposal methods, Waste minimization. Treatment methods, Physico-chemical processes, Biological methods, Stabilization and Solidification, Thermal methods, Disposal methods Land disposal. Remedial technologies.

TEXT BOOKS:

1. Solid waste Engineering by P.AarneVesilind , William Worrell & Debra Reinhart, Cengage Learning India Pvt. Ltd, New Delhi
2. Environmental pollution control Engineering by C. S. Rao; New age International Publishers, New Delhi.

REFERENCE BOOKS:

1. Venkatappa Rao. G and Sasidhar. R.S.(2009), Solid waste management and Engineered Landfills, Sai Master Geoenvironmental Services Pvt.Ltd, Hyderabad
2. World Health Organization, *Global Water Supply and Sanitation Assessment 2000* (Geneva2000).
3. Environment and Pollution Laws: Universal, Universal Law Publishing Co. Pvt.Ltd, Ed 2011.
4. Solid and hazardous waste management by M.N.Rao and Razia Sultana, BS Publications, Hyderabad.

REMOTE SENSING AND GIS

Course code: 21CE40A4 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	To understand the basic concepts of remote sensing and image processing	PO2	2
2	To outline the significance of Geographical Information System	PO2	2
3	To generalize the knowledge of Integrating Remote sensing and GIS	PO2	2
4	To understand the remote sensing and GIS tool for solving various societal problems	PO2	2

SYLLABUS

INTRODUCTION - Definition, History of Remote Sensing. Basic components of Remote Sensing, Electromagnetic Remote sensing process, Passive and active remote sensing. Electromagnetic Spectrum, Energy source and its characteristics, Nature of EMR, Blackbody radiation principles, radiation quantities and terminology.

PHYSICS OF REMOTE SENSING: EMR Interaction with Earth Surface Materials -Spectral Signature concepts – Spectral reflectance & emittance – Typical spectral reflective characteristics of water – vegetation, soil, minerals/rock, man-made structures. Atmospheric properties, solar radiant energy characteristics with atmosphere. Atmospheric Scattering, Particulate scattering & absorption, Rayleigh's & Mie's theories. Sunlight and skylight & its spectral composition, Atmospheric Windows.

REMOTE SENSING PLATFORMS AND SENSORS - Introduction; Satellite system Parameters; instrumental and viewing parameters, sensor parameters: Spatial, Spectral and Radiometric resolutions, imaging sensor systems: Multi spectral imaging sensor systems, Thermal sensing systems, microwave image systems. Earth resources satellites: Landsat, SPOT, IRS, AEM and other recent satellites. Meteorological satellites: NOAA, GOES, NIMBUS, Meteosat series, Oceansat, IKONOS satellites.

Visual Image Interpretation - Introduction ; Types of pictorial data products ; Image interpretation Strategy, Levels of interpretation keys; Process of image interpretation; Basic elements of image Interpretation. Overview on visual image interpretation equipment. Key elements of visual image Interpretation, Topography, Drainage Pattern and Texture, Erosion, Image tone, Vegetation and land use; Concept of converging evidence. Temporal aspects of image interpretation.

Image Analysis - Visual image analysis for land use / land cover mapping, geological and Soil mapping, Agriculture applications for forestry applications, water resources applications, Urban and regional planning, Environmental assessment. Principles of landform identification and evaluation: Sedimentary, Igneous and Metamorphic rock terrain.

Textbooks:

1. Remote Sensing and Image Interpretation- 5th Edition by Lillesand, Kiefer and Chipman, Published by John Wiley and Sons, Inc, New York, 2007**.**

2. Text book of Remote sensing and GIS – 3rd Edition by M. Anji Reddy, BS Publications, Hyderabad, 2010.

Reference Books:

1.Geoinformatics for Environmental management" by M. Anji Reddy, B.S Publications, Hyderabad, 5th Edition, 2019

2. Remote Sensing and GIS- by B. Bhatia Published by Oxford University Press, 2nd edition, 2009

DISASTER MANAGEMENT

Course code: 21CE40A5 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understanding the Concept of Disaster Management	2	2
2	Understanding the Landslide Hazard Mitigation	3	2
3	Understanding the Tropical Cyclone	2	2
4	Understanding the Disaster Management Cycle	3	2

SYLLABUS

Introduction and Concept of disasters and hazards related to Earthquakes, Tsunami, Volcanic eruption, Cyclones, Floods, Drought, Landslides, Forest fires, Avalanches and Pest infestation. Prediction and perception of hazards and adjustments to hazardous activities; Rates of natural cycles and residence time. Landslide: causes, prevention and correction. Landslide hazard mitigation. Earthquakes: intensity and magnitude of earthquakes; geographic distribution of earthquake zones; precursors to the earthquakes, seismic waves, travel-time and location of epicentre; nature of destruction; ground subsidence; protection from earthquake hazards; do's and don'ts during earthquake; Tsunamis causes and consequences. Floods: Causes, nature and frequency of flooding: nature and extent of flood hazard; urban floods, environmental effects of flooding; flood mitigation methods. Tropical cyclone- formation and consequences. Coastal erosion; sea level changes and its impact on coastal areas. Drought: Nature and effect on plant and animal systems. Study of pattern and mitigation of forest fires. Geological and environmental investigations for the construction of dams, bridges, highways and tunnels. Impact of major geotechnical projects on the environment. Disaster Management: Capability- Vulnerability- risk- preparedness and mitigation- Disaster management cycle; Disaster Risk Reduction and Resilience; Disaster Management Act and Policy. Disaster Management case studies.

Text books:

1. Environmental Hazards by Smith, K., Routledge, London,1992.
2. Geological Hazards by Bell, F.G., Routledge, London,1999.

Reference books:

1. Principles of Engineering Geology by Krynine, D.S. and Judd, W.R., CBS, New Delhi, 1998.
2. Natural Hazards by Bryant, E., Cambridge University Press. London, 1985.
3. Landslide Disaster – Assessment and Monitoring Nagarajan, R., Anmol Publications, New Delhi, 2001.
4. Environmental risks and hazards by Cutter, Susan L., Prentice Hall of India, New Delhi.1999.
5. Bill Mc Juire, Ian Mason and C. Killburn (2002) Natural hazards and Environmental change, Oxford University Press, New York.

6. Gupta, Harsh K. (2003) Disaster Management, Universities Press (India) Pvt. Ltd
7. Coppola, Damon P. (2006) Introduction to International Disaster Management, Butterworth -Heinemann
8. Jha, Madan Kumar (2010) Natural and Anthropogenic Disasters: Vulnerability, Preparedness and Mitigation, Springer.
9. Glade, Thomas, Malcolm G. Anderson, Michael J. Crozier (2005) Landslide Hazard and Risk, edited Springer
10. Singh, Surendra, LeszekStarkel, Hiambok Jones Syiemlieh (2008) Environmental Changesand Geomorphic Hazards, Bookwell.

FUNDAMENTALS OF DBMS

Course code: 21CS40A6 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Database Fundamentals: DBMS Characteristics & Advantages, Database Environment, Database Users, Database Architecture, Data Independence, Languages, Tools and Interface in DBMS, DBMS types, **Data Modeling:** ER Model, Notation used in ER Diagram, Constraint, Types, Relationships in ER Model and other considerations in designing ER diagram. **SQL:** Data Definition and other languages in SQL, Creating tables and Data types, Constraints, DML statements, Functions and writing SQL statements using nested sub queries, complex queries, joining relations, Embedded SQL- Writing functions and procedures with PL/SQL, Relational Model, Relational Algebra, Operators in relational algebra. **Normalization:** Guidelines for good database design, Normalization- Normal Forms, First, Second, Third Normal Forms, BCNF, Multi value and join dependencies, 4^{th} and 5^{th} normal forms. File storage, Index structures, Indexing and hashing (Basics) Query Processing: Issues in query processing **Transaction Processing:** Transaction processing issues, Transaction states, problems during multiple transactions processing, ACID properties, system log, Concurrency control techniques: binary locks**,** exclusive locks, Lock based techniques, Timestamp based techniques,.

TEXT BOOK:

1.Elmasri and Navathe, 'Fundamentals of Database Systems', 2008, 4^{th} edition, Pearson Education. '

REFERENCE BOOKS:

1.Silberschatz, Henry F Korth, S. Sudarshan, "Database System Concepts:, 2003, Fifth Edition, Tata MCGraw-Hill.

2.Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 2004, second Edition, Tata MCGraw Hill.

FUNDAMENTALS OF SOFTWARE ENGINEERING

Course code: 21CS40A7 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Software and Software Engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, software engineering practice, software myths. Process Models: Generic process model, prescriptive process models, specialized process models, unified process, personal and team process models, product and process. Agile development: Agility, agile process, extreme programming. Design issues : Software architecture, architectural styles, architectural design.Use cases, Classes, Relationships, common Mechanisms and their diagrams. Interfaces, Modeling techniques for Class & Object Diagrams. Behavioral Modeling :Interaction diagrams. Activity Diagrams.Software testing: A strategic approach to software testing, strategic issues, test strategies for conventional software, Black-Box and White-Box testing, validation testing, system testing. Software Process Improvement, SPI, The SPI process, The CMMI.

Text Books:

1. Roger S.Pressman ,"Software Enginering – A Practitioner's Approach 7th Edition, Mc Graw Hill,(2010).
2. Ian Sommerville, 'Software Engineering', Sixth Edition,Pearson Education,(2001).
3. Jim Arlow, Ila Neustadt, "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design", 2nd Edition, Pearson, (2005).

Reference Books:

1. Craig Larman, "Applying UML and Patterns: An introduction to OOAD and design and interface deployment", Pearson, (2002).
2. Alan Dix, Janet Finlay, Gregory d Abowd, Russel Bealel,"Human Computer Interaction", 3rd edition, Pearson education, (2008).
3. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited,(2007).

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course code: 21CS40A8 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS:

Fundamentals of Computers: Introduction, Architecture, organization of a small computer, center Processing Unit, Execution cycle, Instruction categories, measures of CPU performance, Memory, Input/output devices, BUS-addressing modes. **System Software:** Assemblers, Loaders and linkers, compilers and interpreters. **Operating System:** introduction, memory management schemes, Process management, scheduling, threads. **Programming Fundamentals:** Problem solving with algorithms, Programming styles, coding Standards and Best practices, Introduction to C Programming, Testing and Debugging. Code reviews. **System Development Methodologies:** Software development Models. **User Interface Design:** introduction, the process, Elements of UI design & reports. **RDBMS:** Introduction, Data processing, the database technology, Data models **ER Modeling:** Concept, Notations, Extended ER features, Logical database design **Normalization:** Functional Dependency, Normal Forms. **SQL:** DDL statements, DML statements, DCL statements, writing Simple queries. **SQL tuning techniques:** Embedded SQL, OLTP. **Object oriented concepts:** Object oriented programming, relationship, Inheritance, Abstract classes, polymorphism, UML Diagrams, Object Oriented Design Methodology. **Rational Rose Tool:** Application of OOC using Rational Rose Tool.

TEXT BOOKS

1. Andrew S. Tanenbaum, Structured Computer Organization,PHI,3rd ed.,1991
2. **S**iberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley,1995
3. Dromey R.G., How to solve it by Computers PHI,1994
4. Kernighan, Ritchie, ANSI C language PHI,1992
5. Wilbert o.Galitz essential Guide to user interface design john,wiley,1997
6. Alex Berson, Client server Architecture, McGrew Hill International,1994
7. Rojer Pressman,Softer Engineering-A Practitioners approach, McGraw Hill 5th ed., 2001
8. Alfred V Aho,EHoproft, Jeffrey D Ullman, Design and Analysis or computer algorithms, Addison Wesley publishing Co..;1998
9. Henny F korth , Abraham Silbefrschatz, Database System concept, 2nd . McGraw- Hill international editions,1991
10. Elmasri and Navathe, Fundamentals of Database systems, 4th edition, admisonWesely, Person Eductaion

IMAGE PROCESSING

Course code: 21EC40A9 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS:

INTRODUCTION: Origin of Digital Image Processing, Fields that uses Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System**.**

DIGITAL IMAGE FUNDAMENTLS: Elements of Visual perception, Image sampling and Quantization, Basic relationships between Pixels, Linear and Non-linear operations.

DIGITAL IMAGE TRANSFORMS: Image Transforms – The Discrete Fourier Transform, The FFT, Walsh, Hadamard, Discrete Cosine Transform, The Haar Transform, And The Slant Transform,

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Some basic Grey level transformations, histogram processing, enhancement using Arithmetic/Logic operations, Smoothing Spatial Filters, Sharpening Spatial Filters.

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Introduction to Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters.

IMAGE RESTORATION: Noise models, Restoration in the presence of Noise, only Spatial Filtering, Periodic Noise reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Inverse Filtering, Wiener Filtering, Least mean square Filtering.

IMAGE COMPRESSION: Fundamentals – Image Compression models – Error Free Compression, Lossy Compression.

IMAGE SEGMENTATION: Detection of discontinuities, Thresholding, Edge based Segmentation and Region based Segmentation.

IMAGE REPRESENTATIONS AND DESCRIPTION : Representation schemes, Boundary Descriptors, Regional Descriptors

Text books:

1. Rafael C Gonzalez, Richard E Woods," Digital Image Processing", Second Edition, Pearson Education Asia, 2002. (Chapter 1, 3, 4, 5, 6, 7, 8, 9)
2. Jorg Arndt, " DSP Algorithms for Programmers"(Chapter 3)
3. Gonzalez. R & Woods B.E.," Digital Image Processing", Addison Wesley Longman Pearson Education, 2000.

REFERENCE BOOKS

1. MilanSonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, Thomson learning, SecondEdition, 2001.
2. William J Prati, "Digital Image Processing", John Wiley & sons
3. Tinku Acharya, Ajoy K Ray, "Image Processing Principles and Applications Principles and Applications", Wiley- Inter science.

LINUX PROGRAMMING

Course code: 21EM40B1 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Linux Utilities-File handling utilities, Security by file permissions, Process utilities ,Disk utilities Text processing utilities, and Backup utilities Sed- scripts, operation, addresses, commands, applications, Awk execution, field and records , scripts, operation, patterns, actions functions using system commands in awk.

Working with Bourne again Shell (bash) responsibilities, here documents , running shell script, Shell as a programming language, shell meta characters, Control structures, arithmetic in shell, examples Interrupt processing, functions, debugging shell scripts.

Files : file Concept , File System Structure, I nodes, File Attributes, File types Library functions ,standard and formatted I/O in C, stream errors Kernel support for files ,System calls, file descriptors, low level file access File structure related system calls (FILE APIS), file and record locking File and directory management-Directory file APIS, Symbolic links and hard links

Process concept, Kernel support for process, process attributes, process creation , waiting for a process, Process termination ,Zombie process, orphan process, Process APIs Introduction to signals, signal generation and handling ,Kernel support for signals, signal function, unreliable signals , reliable signals Kill ,raise, alarm, pause, abort, sleep functions

Introduction to IPC , pipes, FIFOs- Introduction to three types of IPC-message queues, semaphores and shared memory -Kernel support for messages, Unix system V APIs for messages- Client /Server example

Text Books:

1. Unix and Shell Programming , B. A. Forouzan and R.F Gilberg, Cengage learning
2. Unix Concept and Applications, 4thedn. SumitabhadasTMH
3. Beginning Linux programming 4thedn. N. Matthew , R stones Wrox Wiley India edn.

Reference Books:

1. Linux system Programming , Robot Love, O;Reilly, SPD
2. Unix Network Programming , W.R. Stevens , PHI
3. Unix Internals , U Vahalia , Pearson Educaiton
4. UnixandshellProgramming,S.G.KochanandP.Word3rdedn.PearsoEdn.

E-COMMERCE

Course code: 21EM40B2 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Electronic Commerce: Revolution. E-Commerce Business models and concepts: The Internet and World Wide Web: E-commerce infrastructure. Building an E-commerce web site, online Security and payment systems, E-Commerce Marketing concepts, , Ethical, Social and Political issues in E-Commerce, Retailing on the Web, Online Service industries, B2B E-Commerce: Supply chain management and collaborative commerce. E-Commerce Marketing communications, Internet Resources for Commerce: Technologies for Web Servers, Internet Applications for commerce, Internet Charges, Internet Access and Architecture, Searching the Internet

Text Books:

1. Kenneth C.Laudon, Carol G.Traver , E-Commerce, (Pearson Education)

Reference Books:

1. Daniel Minoli,EmmaMinoli,'Web Commerce Technology Handbook',(TMG)
2. Elias M.Awad'Electronic Commerce'(PHI)

RENEWABLE ENERGY RESOURCES

Course code: 21EE40B3 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Extraterrestrial solar radiation, terrestrial solar radiation, solar thermal conversion,flat plate and concentrated solar thermal collectors, solar ponds, solar heating/cooling technique, solar distillation, photovoltaic energy conversion, solar cells – 4 models.

Planetary and local winds, vertical axis and horizontal axis wind mills, principles of wind power, maximum power, actual power, wind turbine operation, yaw control, pitch control and stall control mechanisms, derivation of power coefficient.

Ocean temperature differences, principles of OTEC plant operations, wave energy, devices for energy extraction, tides, simple single pool tidal system.

Origin and types, Bio fuels, classification, direct combustion for heat and electricity generator, anaerobic digestion for biogas, biogas digester, power generation.

Biomass energy conversion technologies, Biogas generation – classification of Biogas plants. Micro hydro electric systems- different types of turbines.

Text books*:*

1. Godfrey Boyle "Renewable Energy", Oxford Publications, Second edition.

2. G. D. Rai, "Non-Conventional Energy Sources", Khanna Publishers, First edition.

Reference books*:*

1. Roger H.Charlier, Charles W. "Ocean Energy- Tide and Tidal Power"ISBN: Library of Congress Control Number: 2008929624_c Springer-Verlag Brerlin Heidelberg 2009.

2. John Twidell& Toney Weir: E&F.N. Spon, "Renewable Energy Sources", Taylor & Francis New York, 2nd edition.

3. John F.Walker&N.Jenkins, "Wind Energy Technology", John Willey and Sons Chichester, U.K – 1997

ROBOTICS

Course code: 21ME40B4 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Introduction to Robotics, Major components of a Robot, Robotic like devices, Classification of Robots – Classification by coordinate system and by control method, Specifications of Robots, Fixed versus flexible automation, economic analysis.

ROBOT END EFFECTORS: Introduction, End effectors, interfacing, types of End effectors, grippers and tools, considerations in the selection and design of remote centered devices.

ROBOTIC SENSORY DEVICES: Objective, Non-Optical position sensors – Potentiometers, Synchros, inductosyn, optical position sensors – opto interrupters, Optical encoders (absolute & incremental).

PROXIMITY SENSORS: Contact type, non-contact type – reflected light scanning laser sensors.

TOUCH & SLIP SENSORS: Touch sensors – proximity Rod & Photodetector sensors, Slip sensors – Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors.

TRANSFORMATIONS AND KINEMATICS: Objectives, homogeneous coordinates, basic transformation operations, forward solution – DenavitHartenberg procedure, Simple problems involving planar manipulators, inverse or backward solution – problems involved, techniques. Introduction to Trajectory Planning, the manipulator jacobian.

ROBOT APPLICATIONS: Industrial Applications – Material Transfer, material handling, Loading and unloading, processing, spot and continuous arc welding, spray painting, grinding, Assembly and Inspection and Non-Industrial Applications.

ROBOT LANGUAGES: Introduction, AL, AML, VAL, RAIL

TEXT BOOK

1. Robotic engineering by Richard D. Klafter, Prentice Hall India
2. Industrial robotics by MikellP.Groover, Mcgraw Hill Publications

REFERENCE BOOKS

1. Robotics – K.S. Fu, Gonzalez & Lee, Mcgraw Hill Publications
2. Robotics For Engineers by YoramKkoren, Mcgraw Hill Publications
3. Introduction to Robot Technology, - P.Coiffet and M.Chairenze / Kogam Page Ltd. 1983 London.

MECHATRONICS

Course code: 21ME40B5 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

INTRODUCTION TO MECHATRONICS: Introduction, Elements of Mechatronic system, Applications.

SENSORS AND TRASDUCERS: Introduction, Classification of Sensors, selection of sensors. Classification of transducers - strain gauges, displacement transducers, capacitive and inductive transducers, LVDT, oscillation transducer, piezoelectric, potentiometric, velocity transducers, temperature transducers, optical transducers.

SIGNAL CONDITIONING: Introduction, data acquisition –Quantizing theory, Analog to Digital conversion, Digital to Analog conversion.

DATA PRESENTATION SYSTEMS: Data presentation elements, Data acquisition systems, systems measurement, Testing and calibration.

ACTATION SYSTEMS: Pneumatic and hydraulic actuation systems, Stepper and Servo Motors

SYSTEM MODELS: Modeling of one and two degrees of freedom Mechanical, Electrical, fluid and thermal systems. Block diagram representations for these systems.

SYSTEM RESPONSE: Introduction, Transfer function, Time response and Frequency response analysis mechanical systems and electrical systems.

CLOSED LOOP CONTROLERS*: Continuous and discrete processes, control modes, Two-step, proportional, Derivative, integral, PID controllers.*

DIGITAL LOGIC: Logic gates, Boolean algebra, Karnaugh maps**.**

PLC: Introduction, basic structure, I/P ,O/P processing, programming, ladder diagrams, Timers, Internal relays and counters ,data handling, Analogue Input and Output, selection of a PLC**.**

DESIGN: Mechatronics system Design, possible design solutions.

CASE STUDY: pick and place Robot, CNC Machine.

TEXT BOOKS:

1. W.Bolton, ”Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering” , 3rd Edition, Pearson education,2007.
2. David G. Alciatore, Michael B. Histand ,” Introduction to mechatronics and measurement systems”, 2nd Edition, McGraw-Hill Professional, 2002.

REFERENCE BOOKS:

1. A.K.Sawhney, "A course in Electrical and Electronic Measurement and Instrumentation"- Dhanpat Rai & Sons - 1991.
2. NitaigourPremchandMahalik, “Mechatronics”, Tata McGraw-Hill, 2003.
3. HMT Limited, “Mechatronics”, McGraw-Hill Education (India) Pvt Ltd, 2000.
4. T.G. Beckwith &N.L.Buck, “Mechanical Measurements”, 3rd Edition, Addison-Wesley Pub. Co., 1969.

OPERATIONS RESEARCH

Course code: 21ME40B6 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Introduction to Operation Research: Introduction, Modeling in Operations Research, Phases of OR study, Scope and application of OR. Linear Programming and its Applications: Linear Programming Problem – Graphical solution of LP Problem. Simplex method, Big M method, two phase method, multiple solution, infeasible solution, unbounded solution, degeneracy, Dual Simplex method. Transportation: Introduction – Methods of basic feasible solution, Optimality test, Degeneracy in transportation problem, unbalanced transportation Problem, Assignment Problems: Hungarian method for assignment problem, Traveling salesman problem. Theory of Games: Introduction, to solve the rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, solution of a two person zero sum 2Xn game, Graphical method for 2Xn and nX2 games.

Inventory Control: Introduction – EOQ with uniform rate of demand, Economic lot size with finite rate of replenishment, Quantity discounts, Deterministic model with Shortages, ABC analysis of inventory. Dynamic Programming: Introduction, Bellman's principle of optimality, application to shortest route problem, linear programming, tabular method. Queuing Theory: Introduction, single channel, Poisson arrival, exponential service time with finite population and infinite population, Simulation: Introduction, Monte-Carlo Simulation, Application to Inventory Control. Project Management by PERT/CPM: Introduction, simple network techniques, construction rules of drawing, Fulkerson's rule, Critical path method (CPM)-floats, critical path, project duration, PERT: Introduction, different Time estimates, expected time, variance, expected project duration and probability of completion. Crashing: Introduction, crashing of network, problem

Text Books:

1. Operations Research - Hamdy Taha
2. Operations Research – Hiller &Liberman.

Reference Books:

1. Quantitative Techniques – A.P. Natarajan
2. Operations Research – S.D. Sarma

NANO MATERIALS AND TECHNOLOGY

Course code: 21PH40B7 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Introduction : Evolution of science and technology, Introduction to Nanotechnology, Nanotechnology-Definition, Difference between Nanoscience and Nanotechnology, Feynman predictions on Nanotechnology, Moore's law, Bottom up and top down approaches, challenges in Nanotechnology .

Nano materials : History of materials, Nanomaterials-Definition, Classification of Nanostructured materials, causes of interest in nanomaterials, some present and future applications of nanomaterials, Bio-Medical Applications-Drugs, Drug Delivery, Photodynamic therapy, Molecular motors, Neuro-Electronic Interfaces, Protein Engineering, Nanoluminescent tags.

Synthesis and processing of nanoparticles, thin films : Nanoparticles: Processes for producing ultrafine powders-mechanical milling, wet chemical synthesis, gas condensation process, chemical vapour condensation, laser ablation.

Thin Films: Synthesis techniques- Physical Vapor Deposition: Evaporation, Molecular beam epitaxy, Sputtering. Comparision of evaporation and sputtering.

Special nanomaterials, characterization and tools : Carbon nanotubes, nano composites, carbon fullerenes-An overview over preparation, properties, applications. Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy, Atomic Force Microscopy, Scanning Probe Microscopy– X ray Diffraction. MEMS: – Introduction, types of MEMS:- Mechanical, Thermal, Magnetic MEMS; Fabrication of MEMS.

TEXT BOOKS

1.Nano structures & Nano materials by Guozhongcao, Imperial college press.

2.Micro manufacturing and Nano Technology by N.P.Mahalik.

REFERENCE BOOKS

1. Nano Technology by Mark Ratner &Danier Ratner, Prentice Hall
2. Nano materials by A S Edelstein& R C Cammarata, Institute of physics publishing, Bristol and Philadelphia.

SUBSEA ENGINEERING

Course code: 21PE40B8 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Overview of subsea engineering, subsea field development, distribution systems, subsea surveying positioning and foundation, installation of subsea equipment, subsea control, power supply, subsea hydraulics, subsea corrosion and scale, subsea connections and jumpers, subsea well heads and X-trees, subsea drilling risers, subsea production risers, subsea pipelines, subsea risk and reliability.

REFERENCE BOOKS

1. Yong Bai, Qiang Bai, "Subsea engineering handbook", Gulf publishers, (2010)
2. Yong Bai, Qiang Bai, "Subsea pipeline and risers", Gulf publishers, (2005)
3. Boyun Guo, Shanhong Song, Jacob Chacko, Ali Ghalambor, "Offshore Pipeline", Gulf publishers, (2005)

OIL AND GAS MANAGEMENT

Course code: 21PE40B9 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of the course outcomes with student's outcomes.

CO No.	Course outcome's	Mapped SO	BTL
CO 1	Understand the global oil and gas market	a	1
CO 2	Understand the E&P activities, marketing and transportation of oil and gas	a	1
CO 3	Understand the refining activities, estimating the future of oil and gas industry	a	1

SYLLABUS

Global Oil and Gas: Value Chain and Geopolitics of Oil
The Upstream: Exploration, Development, and Production
The Midstream: Markets and Transportation
The Downstream: Refining and Marketing
The Future Oil and Gas Industry

REFERENCE BOOKS

1. Adedeji B. Badiru Samuel O. Osisanya, "Project Management for the Oil and Gas Industry", CRC Press, 2013.
2. Use Internet sources for present trends.

PHOTOGRAPHY

Course code: 21BM40C1 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

History of Photography –Cameras. Film Speed – Shutter Speed – Aperture – Figuring Focus – Depth Definitions – Camera: Types, Structure & Features. Specialized of Field – Exposure Types of Lenses – Normal lens, Wide angle, Telephoto, Fish eye & Close up lenses, Macro and Zoom Lens – Focal Length - Angle of View.

Photographic equipment and types of photography,Digital and film photography.,Digital images and their characteristics,Pixels and resolutions,Digital Camera and their types, Storage and memory issues of digital images, Scanners and their applications.

Basic Lightings – Outdoor Lightings- Indoor Portrait Lighting - Flashbulbs – Electronic Flash units – Flash Techniques - B/W & Color Filters – Filter Factor Composing Effective Photographs: Picture Purpose – Centre of Interest , Rule of Third, Backgrounds, Angles – Framing – Varying Format, Focus for Effect – Good Timing – Color Consideration – Imagination. Photography under Special Conditions.

Different types of photography, Introduction to Digital Photography & Its Fundamentals. – Digital Image Sensor – Resolution - Storage Medium – File Formats – Digital Printing Technology.

Reference:

3. Tom Grimm, *The Basic book of Photography*, New York, Plume, 1979
4. George Haines, *learning photography*, Hamlyn Publishing Group, London 1992
5. Michael Langford , *Basic photography* , focus press London 1986
6. JhonHedgeco, *New Book of photography* , Dorling Kindersley book Lonon1994
7. Leslie D Stroebel,and Richard D Zakia, *Basic photography materials and process*-
8. John Hedgecoe, *The Photography's Handbook*,-1992
9. Chris George, *Mastering Digital Flash Photography*-2008.

SELF DEVELOPMENT

Course code: 21GN40C1 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Orientation, Discussion on Values : Understanding Values, Behavior and Attitudes, Application of Values and Universal Values, **Philosophy of Yoga :** God, Self and Ultimate goal of yoga, Brief Introduction to various types of yoga and Integration of values in Yoga, **Study of major Religions :** Identify commonality, condition of its origin or intention vs. current state, **Art of Meditation :** Observation, Introspection, Contemplation, Meditation and Concentration, Schools of Meditation, **Systematic Practice of Meditation:** Theories of life, Need for Meditation, Natural Path, Integration **Personal Responsibility:** Stress Management, Tips for Self-Management, Choices we make, Excellence.

TEXT BOOK

1. Self development modules from Heartfulness Institute (www.heartfulness.org)

REFERENCE BOOKS

1. Complete works of Swami Vivekananda
2. Jonathan –Livingston - Seagull
3. The Monk Who Sold His Ferrari_Robin S. Sharma
4. You can win by shiv khera
5. Many lives Many Masters
6. The road less travelled – Scott Peck
7. As a man thinketh
8. Journey of the Soul
9. The Bhagavad-Gita
10. King James version of the Holy Bible
11. Holy-Quran

EMOTIONALINTELLIGENCE

Course code: 21GN40C2 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS

Course Objective: The main objective of the course is to enable the students understand meaning and importance of emotional intelligence.

Emotional Intelligence: The Concept, dimensions of emotions; Theories of Multiple intelligences; importance of emotions; emotions and the brain; The Role of Emotions in Organizations; Self-Awareness and Self-Control; Empathy; Social Expertness; Personal Influence.

Emotional Intelligence and Personality: relationship between EQ and IQ; human mind; consequences of low and high EQ; EQ development; Emotional Skills; emotional factors: Emotional Competency, Emotional Maturity, and Emotional Sensitivity**.**

Levels of EI: Models of Emotional Intelligence; emotional intelligence competencies; emotional intelligence and leadership behavior; emotional intelligence and stress management; art of influencing people.

The Role of Emotional Intelligence in Professional Success: Emotional Intelligence and the Complexity of Work; Emotional Intelligence and High IQ Professions; Emotional Intelligence and Leadership; manage emotional upsets; Emotional 'Winner'**.**

EQ in the Indian Perspective; EQ and Managerial Effectiveness; the soft art of being a tough leader.

Recommended Textbook(s):

1.Dalip Singh - Emotional Intelligence at Work: A Professional Guide – Response Books – 2006.

Reference Books:

1. Daniel Goleman, Emotional Intelligence, Bantam Books, 2006.
2. Moshe Zeidner, Gerald Matthews, and Richard D. Roberts, What We Know About Emotional Intelligence – How It Affects Learning, Work, Relationships, and Our Mental Health, The MIT Press, 2009.
3. James Bradford Terrell and Marcia Hughes , A Coach's Guide to Emotional Intelligence: Strategies for Developing Successful Leaders , Wiley, 2008.
4. Dr. Jeanne Segal , The Language of Emotional Intelligence, McGraw-Hill, 2008.

BEHAVIORALSCIENCES

Course code: 21GN40C3 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

Course Objective : The objective of the course is to increase the students' knowledge of behavioral aspects of individuals and interactions among the individuals and the groups.

SYLLABUS

Introduction to Behavioural Science;Foundations of Individual Behavior: Personality-Personality determinants; Personality traits: The Big Five Model, Major personality attributes influencing OB; Theories of personality; Values – Types of Values.

Learning- Theories of learning; Principles of learning; Attitudes – Source of attitudes; Types of Attitudes, Attitudes and consistency – Cognitive Dissonance theory.

Perception- Perceptual process; Factors influencing **Perception;** perceptual distortion; Linkage between perception and individual decision making; Motivation – Theories of Motivation – Hierarchy Needs Theory – Two-Factor Theory – Expectancy Theory; Applications of Motivation.

Foundations of Group Behavior: Groups – Nature of groups; Types of groups; Stages of Group Development; Group Cohesiveness; Teams vs Groups

Leadership – Nature; Leadership Styles; Theories of leadership: Trait Theories, Behavioral Theories and Contingency Theories.

Recommended Text Book(s):

1. Aswathappa, **Organizational Behaviour**, Himalaya Publishing House, 2010.

Reference books:

1. Robbins, Stephen, Timothy, A &Sanghi, S. **Organizational Behavior**, 13thEdn, Pearson Education. 2009.
2. Fred Luthans, **Organizational Behaviour**, Prentice Hall, 2007.
3. UdaiPareek, **Organizational Behavior**, Oxford Publishers, New Delhi, 2008.

MANAGEMENT ELECTIVES

PARADIGMS IN MANAGEMENT THOUGHT

Course code: 21MB4051 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS:

Management Introduction - Early management thought - Management Concept – Nature - Management as art, science, profession - Scope and functions of Management - Levels of Management - Importance of management.

Classical Approach to Management: (a) Scientific Management- The advent of Scientific Management – Frederick W Taylor's contributions, - Contribution by Henry L Gantt - Contribution by Frank, Lillian Gilberth.

General Administrative Approach: Henry Fayol's contributions towards general management – Max Weber's Bureaucracy Approach.

Quantitative Approach: Important contributions – TQM – implications in today's management – Six sigma.

Behavioral Approach: Organizational Behaviour – Contributions of Elton Mayo's – .Hawthorne studies – contributions of Mary Parker Follett – Chester Bernard.

Contemporary Approach: Systems Theory – Contingency Theory – Chao's Theory -Peter F Drucker Contributions – C K Prahlad's Contribution – Porter's theory – Worker Management – Employee Engagement – People Capability Maturity Model.

Recommended Text Book(s):

1. Management by Stephen P Robbins, Mary Coulter, Neeharika Vohra – Pearson – 10th edition

Reference Books:

1. Management by Stoner, Freeman, Gilbert – PHI – 7th edition.
2. Management A Global & Entrepreneurial Perspective – Weihrich, Cannice, Koontz – Mc Graw Hill – 13th Edition.
3. The evolution of management thought by Daniel A Wren, Arther G Bedeian : john wiley& sons

INDIAN ECONOMY

Course code: 21MB4052 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS:

Economy: Meaning, types, problems and functions – Features of Indian Economy: Circular flow of economic activity: two sector, three sector and four sector models. Sectoral distribution of the economy. Nature and features of Indian Economy; Sectoral contribution of National Income-Share of Public and Private Sectors in GDP.

Agricultural Sector of India: importance and general problems; Land Reforms, Agricultural marketing problems and remedies. Industrial Sector of India: Types, Importance and general problems: Small Scale Sector: Importance and general problems.

Tertiary Sector in India- Importance – Infrastructure Development – Transport – Roadways, Railways – Banking and Insurance –Communication – Science and Technology – Software. Personal Income distribution and causes of inequality - Unemployment causes and remedial measures; Poverty in India- Poverty Line – antipoverty programs. Human development: concept and measurement - Human Development Index.

Economic Planning in India: Role of Planning Commission - Over all Objectives and achievements of various Five Year Plans. 12th Five Year Plan; Economic Liberalisation: LPG strategy-General Agreement on Tariffs and Trade (GATT) - Objectives of GATT and Evolution of WTO – WTO and the Indian Economy, NABARD and World Bank.

Recommended Text Book(s):

1. G.Dutt and K.P.M.Sundaram: Indian Economy (2011), S.Chand&Co., New Delhi.
2. S.K.Mishra and V.K.Puri: Indian Economy, 30th ed., Himalaya Publishing House, New Delhi.
3. M.L.Jingan: Macro Economics, 6th ed., Konark Publishing House.

Reference Books:

1. P.K.Dhar, Indian Economy-Its growing dimension, Kalyani Publishers.
2. Alok Ghosh, Indian Economy, Its Nature and Problem, World Press.
3. A.N.Agarawal, Indian Economy- Problems of Development and Planning, New Age

MANAGING PERSONAL FINANCES

Course code: 21MB4053 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Financial planning process: Introduction-Importance of Financial Planning- Process of financial planning -The planning environment-Determinants of personal income- Financial statements and plans-Concept of Time value of money - Preparing a personal balance sheet - Preparing the income and expense statement-Using personal financial statements - Ratio Analysis.

Managing Taxes: Introduction-Importance of tax planning-Basic concepts of income tax - Personal taxation -Income tax benefits on certain long term investments -Tax planning-Ethical consideration in tax planning.

Making decisions regarding houses and automobiles:- Meeting housing needs-The rental option - The home buying process - Financing the housing transaction - Housing finance institutions in India - Housing schemes in India- Automobile purchase planning.

Planning for Investments:- Types of investment vehicles-Factors considered in the choice of investments- Developing the investment strategy-Investing in Equities- Investment Process-Investing in Fixed Income Securities- Bond Market-Bond Investing Strategies-Types of Bonds-Bond Returns- Risks from Investing in Bonds

Insurance & Mutual Funds:-Insurance planning - Buying a life insurance - Life insurance products in India- Health Insurance-Need-Types and Sources of health care plans-Providers of Health care-Long term care insurance-Disability income insurance-Health Insurance in India; Mutual funds – Types of mutual fund products – Objectives of investing in Mutual funds.

Recommended Text Book(s):

1. Jack R Kapoor, “Personal Finance” Mc Graw Hill Publications, New Delhi, 2008.
2. KC Mishra and Steward Doss, “Basics of Personal Financial Planning” Cengage Learning, First Edition 2009.

Reference books:

1. Joehnk, Billingsley and Gitman “Planning Your Personal Finances” Cengage Learning India Private Limited, Delhi, 2012.
2. Mark Hirschey and John Nofsinger “Investments Analysis” and Behavior” Mc Graw Hill Publications, New Delhi, 2008.

BASICS OF MARKETING FOR ENGINEERS

Course code: 21MB4054 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS:

Introduction and Nature of Marketing: Evolution of Marketing Concept - Core concepts of marketing - Scope and Importance of Marketing. -Difference between Selling and Marketing - Marketing Myopia - Consumer Marketing Vs. Industrial Marketing.

Understanding Consumer Behaviour: nature, scope and importance of consumer behavior – Factors influencing Consumer Behavior - Buying decision making process - Market Segmentation, Targeting and Positioning (STP).

Marketing mix - Product definition, levels of product, product classification, difference between goods and services, Product Life Cycle, New Product Development – Technology and Product Management - Concept of Pricing – Factors influencing the pricing policy – Pricing strategies - Pricing Considerations in High-Tech Markets.

Promotion mix - Marketing Communication Tools for High-Tech Markets - Channels of distribution - Supply Chain Management in High-Tech Markets - Technology Marketing, Green Marketing, Introduction to market study.

Text Books:

1. Philip Kotler and Gary Armstrong- Principles of Marketing- 17/e, Pearson Education.
2. Jakki J Mohr, Sanjit Sengupta and Stanley Slater, Marketing of High-Technology Products and Innovations, 3/e Pearson India

Reference Books:

1. V.S. Ramaswamy and S.Namakumari – Marketing Management, 4/e, Mc Millan Publications, New Delhi.
2. RajanSaxena, Marketing Management- 3/e, TMH, New Delhi.

ORGANIZATION MANAGEMENT

Course code: 21MB4055 L–T–P: 3-0-0
Pre-requisites: NIL Credits: 3

SYLLABUS:

Development of Management thought – Introduction, Various theories; Functional approach, scientific management approach, human relations approach, latest management thoughts, organisation theory-classical organisation, neo-classical organisation theory, modern organisation theory.

Organization Structure--Principles of organisation, organizational theories, departmentalism, authority, power, organizing, organizational effectiveness, structuring the organisation, organizational change, organisation charts; types of organisations—line , functional and line and staff relations, Organisational manuals.

Motivation, Morale and behavioral science—Motivation: Characteristics, importance, Kinds of motivation. Thoughts of motivational philosophy: Gouglass Mc Gregore—X and Y theory; Herzberg's theory. Human needs, Incentive as motivators, Managing dissatisfaction and frustration. Morale, Absenteeism, Behavioral science, Group dynamics, Group behavior. Leadership—Meaning, importance, styles, theories, leaders Vs managers.

Management concept—Management, Administration, Organisation, Difference and Relationship between Management, Administration and Organisation, Importance of Management, Characteristics of management, Managerial Skills, Managerial Objectives, Harmonization of Objectives, Hirechy of Objectives.

Industrial Relations, Trade Union And Collective Bargaining—Industrial relations, Industrial Psychology, Industrial disputes, Conflict management, Views about conflict, Labor Policy. Workers grievances, Suggestion system. Trade Unions. Collective Bargainning, Negotiations, Industrial Safety—working conditions, Accidents, Preventive measures, Safety training.

TEXT BOOKS

1. Stephen P. Robins, Organizational behavior, PHI / Pearson education, 11th edition , 2008.
2. Koontz &Wehrich., Essentials of Management, 12th edition, Tata Mc Grawhill, 2007.

REFERENCES

1. Banga&Sarma , Industrial Engineering Management including Productionmanagement, 11th edition, 2010.
2. O.P. Khanna , Industrial engineering management, Khanna publications, 2006.

RESOURCE, SAFETY AND QUALITY MANAGEMENT

Course code: 21MB4056 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No:	CO	PO/PSO	BTL
1	Understand the concepts of quality management and the factors influencing construction quality	1,3,4	2
2	Recognize quality planning and programs in construction industry	3,4	2
3	Acquire knowledge of quality management systems and ISO 9000 family of standards.	1,3,4	2
4	Examine and analyses quality circle (QC) concepts for possible implementation to solve construction productivity and quality problems	1,3,4	3

SYLLABUS

CO-1

Quality Management: Introduction – Definitions and objectives – Factors influencing construction quality –Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles.

Quality Systems: Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

CO-2

Quality Planning: Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures -Processes and products – Total QA / QC programmed and cost implication.

CO-3

Quality Assurance And Quality Improvement Techniques: Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, –Stability methods and tools, optimum design – Reliability testing, Reliability coefficient and reliability prediction - Life cycle costing – Value engineering and value analysis. Quality Improvement Tools and Techniques.

CO-4

Safety Management Systems: Fundamental of safety management, construction safety, safety in scaffolding and working platform, welding and handling, excavation work, concreting and cementing work. Building construction, TAC and NBC rules, High rise building. Evolution of modern safety concept- Safety policy - Safety Organization. Safety survey, safety inspection, safety sampling, Safety Audit. Concept of an accident, Reportable and non reportable accidents, unsafe act and condition principles of accident prevention, Overall accident investigation process. Risk management

TEXT BOOKS:

1. Construction Engineering and Management by S.Seetharaman; Umesh publications, Nai sarak, Delhi, 2000

2. Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee; Khanna Publishers, Nai Sarak; Delhi,1997

REFERENCES:

1. Hutchins.G, ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2. James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van Nostrand, 1997.
3. John L. Ashford, The Management of Quality in Construction, E &F.N.Spon, 1989.
4. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001.
5. Kwaku.A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., 1985.
6. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longm.

ECONOMICS FOR ENGINEERS

Course code: 21MB4057 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

SYLLABUS

Introduction to Engineering Economics: Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, Elementary economic Analysis

Unit II: Value Engineering: Make or buy decision, Value engineering – Function, aims, value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

Unit III: Cash Flow: Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the method

Unit IV: Replacement and Maintenance Analysis: Introduction-Types of maintenance – types of replacement Problem-Determination of economic life of an asset-Replacement of existing asset with a new asset.Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction.

Text Books:

1. Dr. K K Patra, DhirajBhattacharjee, Engineering Economics and Costing, S. Chand & Company Ltd, New Delhi, 2013.
2. PanneerSelvam, R., ***Engineering Economics***, Prentice Hall of India Ltd, New Delhi, 2001.

Reference Books:

1. Chan S.Park, ***Contemporary Engineering Economics***, Prentice Hall of India, 2002. Donald.G. Newman, Jerome.P.Lavelle, ***Engineering Economics and analysis***Engg. Press, Texas, 2002.
2. Degarmo, E.P., Sullivan, W.G and Canada, J.R, ***Engineering Economy***, Macmillan, New York, 1984.
3. William G. Sullivan, Elin M Wicks, and James Luxhoj, Engineering Economy, 13th edition (Prentice-Hall)

CONSTRUCTION PROJECT MANAGEMENT

Course code: 21MB4058 L–T–P: 2-0-0

Pre-requisites: NIL Credits: 2

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No	CO	PO	BTL
1	Construction and project planning	3	3
2	Techniques of planning, Resource scheduling	3	4
3	PERT, Planning and Organizing construction site and resources	3	4
4	Construction Cost, Monitoring and Control Supervision	3	4

SYLLABUS

Construction- unique features of construction, construction project types and features, phases of a project, agencies in involved and their methods of execution **Construction project planning-** stages of project planning: pre tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail, process of development of plans and schedules, work breakdown structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data. **Techniques of planning-** Bar charts, Networks: basic terminology, types of precedence relationships: finish to start, start to start, finish to finish, start to finish, Preparation of CPM networks: activity on link and activity on node representation and analysis of single relationship (finish to start) networks, computation of float values and semi critical path calendaring networks. **Resource scheduling-** Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation smoothening and leveling **PERT-** Assumptions underlying pert analysis data mining free time estimates analysis computation calculation of probability of completion **Planning and Organizing construction site and resources-** Site: site layout, developing site organization, record keeping at site, manpower planning, organising, staffing, motivation, Materials: concept of planning, procurement and inventory control, Equipment: Basic concepts of planning and organising, Funds: cash flow, sources of funds. **Construction Cost**: classification of costs, time cost trade off in construction project compression and decompression. **Monitoring And Control Supervision**: Record keeping, Periodic progress reports, Periodical progress meeting, updating of plans: purpose, frequency and methods of updating, Common cause of time and cost overruns and corrective measures, Quality control: concept of quality, quality of constructed structure, use of manuals and checklist for quality control, role of inspection, basics of statistical quality control, safety and health on project site: accidents causes and effects cost of accidents, occupational and health problems in construction organising for safety and health.

TEXT BOOKS:

1. Construction Engineering and Management by Dr.S.Seetharaman; Umesh publications, Nai sarak, Delhi.

2. Fundamentals of PERT/CPM and Project Management by S. k. Bhattacharjee; Khanna Publishers, Nai Sarak; Delhi.

REFERENCE Books:

1. Construction Management and Planning by B.Sengupta and H.Guha; Tata Mc Graw- Hill Publishing co. ltd, New Delhi.
2.Construction planning, Equipment and Methods by Peurifoy R.L; Mc Graw – Hill International Book Company

DISASTER MANAGEMENT

Course code: 21CE40A5 L–T–P: 3-0-0

Pre-requisites: NIL Credits: 3

Mapping of Course Outcomes to Program Outcomes: The students will be able to

CO No.	Course Outcomes	PO	BTL
1	Understanding the Concept of Disaster Management	2	2
2	Understanding the Landslide Hazard Mitigation	3	2
3	Understanding the Tropical Cyclone	2	2
4	Understanding the Disaster Management Cycle	3	2

Syllabus:

Introduction and Concept of disasters and hazards related to Earthquakes, Tsunami, Volcanic eruption, Cyclones, Floods, Drought, Landslides, Forest fires, Avalanches and Pest infestation. Prediction and perception of hazards and adjustments to hazardous activities; Rates of natural cycles and residence time. Landslide: causes, prevention and correction. Landslide hazard mitigation. Earthquakes: intensity and magnitude of earthquakes; geographic distribution of earthquake zones; precursors to the earthquakes, seismic waves, travel-time and location of epicenter; nature of destruction; ground subsidence; protection from earthquake hazards; do's and don'ts during earthquake; Tsunamis causes and consequences. Floods: Causes, nature and frequency of flooding: nature and extent of flood hazard; urban floods, environmental effects of flooding; flood mitigation methods. Tropical cyclone- formation and consequences. Coastal erosion; sea level changes and its impact on coastal areas. Drought: Nature and effect on plant and animal systems. Study of pattern and mitigation of forest fires. Geological and environmental investigations for the construction of dams, bridges, highways and tunnels. Impact of major geotechnical projects on the environment. Disaster Management: Capability-Vulnerability- risk- preparedness and mitigation- Disaster management cycle; Disaster Risk Reduction and Resilience; Disaster Management Act and Policy. Disaster Management case studies.

Text books:

1. Environmental Hazards by Smith, K., Routledge, London, 1992.
2. Geological Hazards by Bell, F.G., Routledge, London, 1999.

Reference books:

1. Principles of Engineering Geology by Krynine, D.S. and Judd, W.R., CBS, New Delhi, 1998.
2. Natural Hazards by Bryant, E., Cambridge University Press. London, 1985.
3. Landslide Disaster – Assessment and Monitoring Nagarajan, R., Anmol Publications, New Delhi, 2001.
4. Environmental risks and hazards by Cutter, Susan L., Prentice Hall of India, New Delhi.1999.
5. Bill Mc Juire, Ian Mason and C. Killburn (2002) Natural hazards and Environmental change, Oxford University Press, New York.

6. Gupta, Harsh K. (2003) Disaster Management, Universities Press (India) Pvt. Ltd
   Coppola, Damon P. (2006) Introduction to International Disaster Management,
   Butterworth –Heinemann Jha, Madan Kumar (2010) Natural and Anthropogenic Disasters:
   Vulnerability,
7. Preparedness and Mitigation, Springer
8. Glade, Thomas, Malcolm G. Anderson, Michael J. Crozier (2005) Landslide Hazard and
9. Risk, edited Springer