SRI VENKATESWARA COLLEGE OF ENGINEERING

(An Autonomous Institution, Affiliated to Anna University, Chennai – 600025)

B.E. Civil Engineering

CURRICULUM AND SYLLABUS
REGULATION – 2022
CHOICE BASED CREDIT SYSTEM

Curriculum Revision No:	01	Board of Studies recommendation date :	19.09.2023	Academic Council Approved date:	October 2023
Salient Points of the revision	01.	List of Verticals and courses finalized.			
	02.	List of Open Electives and Value Added Courses finalized.			

Chairman
Board of Studies
Faculty of Civil Engineering

Chairperson
Academic Council

SRI VENKATESWARA COLLEGE OF ENGINEERING

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REGULATIONS 2022

B. E. CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Civil Engineering graduates during the first few years of graduation will:

I. Practice civil engineering in construction industry, public sector undertaking or as an entrepreneur by applying ethical principles and following norms of civil engineering practice. (Technical Competence)

II. Pursue higher education for professional development. (Life-long Learning)

III. Exhibit leadership and team working skills in their profession and other activities with demonstrable attributes to contribute to the societal needs and to adapt to the changing global scenario. (Professionalism)

PROGRAM OUTCOMES (POs)

PO   GRADUATE ATTRIBUTES

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and concepts of Civil Engineering to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional

engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Students in the Civil Engineering program should, at the time of their graduation, be able to
1. Provide solutions for real life problems related to core areas of civil engineering by applying knowledge of mathematics, Basic and Engineering Sciences and by using appropriate engineering tools.
2. Plan, analyse, design, execute and manage infrastructure projects considering safety, societal and environmental factors.

PEOs – POs & PSOs MAPPING:

POs/PSOs	PEOs		
	I	II	III
PO 1	3	2	
PO 2	3	2	
PO 3	3	2	
PO 4	3		
PO 5	3		
PO 6	2		
PO 7	2		
PO 8	3		
PO 9	3		3
PO 10	2	2	
PO 11	3		3
PO 12	1	3	
PSO 1	3	2	2
PSO 2	3		3

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B. E. CIVIL ENGINEERING

CURRICULUM FOR SEMESTERS I TO IV AND SYLLABI FOR SEMESTERS I AND IV

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
1.	IP22151	Induction Programme (Common to all Branches)		-	-	-	-	-	-	-
Theory Subjects										
2.	HS22151	Tamil language and Heritage of Ancient Tamil Society (Common to all branches)	HS	1	0	0	1	15	NIL	F
3.	HS22152	Communicative English (Common to all Branches)	HS	3	0	0	3	45	NIL	F
4.	MA22151	Applied Mathematics I (Common to all Branches except MR)	BS	3	1	0	4	60	NIL	F
5.	PH22152	Engineering Physics (Common to AE, CE, ME, MN, MR)	BS	3	0	0	3	45	NIL	F
6.	CY22153	Technical Chemistry (Common to BT, CH, CE)	BS	3	0	0	3	45	NIL	F
7.	CE22101	Engineering Geology and Construction Materials	PC	3	0	0	3	45	NIL	F
8.	CE22102	Engineering Drawing for Civil Engineers	ES	1	0	4	3	75	NIL	F
Practical Subjects										
9.	PH22161	Physics Laboratory (Common to all Branches except BT)	BS	0	0	2	1	30	NIL	F
10.	CY22161	Chemistry Laboratory (Common to all	BS	0	0	2	1	30	NIL	F

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C	TOTAL Hours	Prerequisite	Position
		Branches except AD, CS, IT)								
11.	ME22161	Basic Civil and Mechanical Engineering Laboratory (Common to CE, EE, EC)	ES	0	0	2	1	30	NIL	F
			Total	**17**	**1**	**10**	**23**	**420**		

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to all Branches)	HS	2	0	0	2	30	NIL	F
2.	HS22252	Technical English (Common to all Branches)	HS	3	0	0	3	45	NIL	F
3.	MA22251	Applied Mathematics II (Common to all Branches except MR)	BS	3	1	0	4	60	NIL	F
4.	IT22251	Computer Programming and Practice (Common to AE, BT, CE, CH)	ES	2	0	2	3	60	NIL	F
5.	EE22151	Basic Electrical and Electronics Engineering (Common to all Branches except CH, EE, EC)	ES	3	0	0	3	45	NIL	F
6.	CE22201	Building Planning and Drawing	PC	2	0	2	3	60	NIL	F
7.	CE22202	Engineering Mechanics for Civil Engineers	ES	3	1	0	4	60	NIL	F
Practical Subjects										
8.	EE22111	Basic Electrical and Electronics Engineering Laboratory (Common to all Branches except EC)	ES	0	0	2	1	30	NIL	F
9.	CE22211	Construction Materials Laboratory	PC	0	0	2	1	30	NIL	F
			Total	**18**	**2**	**8**	**24**	**420**		

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	CE22301	Soil Mechanics	PC	3	0	0	3	45	NIL	F
2.	CE22302	Construction Techniques Equipment and Practices	PC	3	0	0	3	45	NIL	F
3.	CE22303	Strength of Materials	PC	3	1	0	4	60	NIL	F
4.	CE22308	Surveying: Theory and Practices	PC	3	0	2	4	75	NIL	F
5.	CE22309	Fluid Mechanics: Theory and Practices	PC	3	0	2	4	75	NIL	F
6.	CE22310	Highway Engineering: Theory and Practices	PC	2	0	2	3	60	NIL	F
Practical Subjects										
7.	CE22311	Strength of Materials Laboratory	PC	0	0	2	1	30	NIL	F
			Total	**17**	**1**	**8**	**22**	**375**		

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	GE22451	Environmental Sciences and Sustainability (Common to all Branches)	BS	3	0	0	3	45	NIL	F
2.	MA22453	Statistics and Numerical Methods	BS	3	1	0	4	60	NIL	F
3.	CE22401	Structural Analysis I	PC	3	0	0	3	45	NIL	F
4.	CE22402	Water Supply and Wastewater Engineering	PC	4	0	0	4	60	NIL	F
5.	CE22403	Foundation Engineering	PC	3	0	0	3	45	NIL	F

6.	CE22409	Applied Hydraulic Engineering: Theory and Practices	PC	3	0	2	4	75	NIL	F
Practical Subjects										
7.	CE22411	Survey Practical	PC	0	0	2	1	30	NIL	F
8.	CE22412	Soil Mechanics Laboratory	PC	0	0	2	1	30	NIL	F
			Total	**19**	**1**	**6**	**23**	**390**		

Note: Internship of 4 weeks must be completed before the sixth semester.
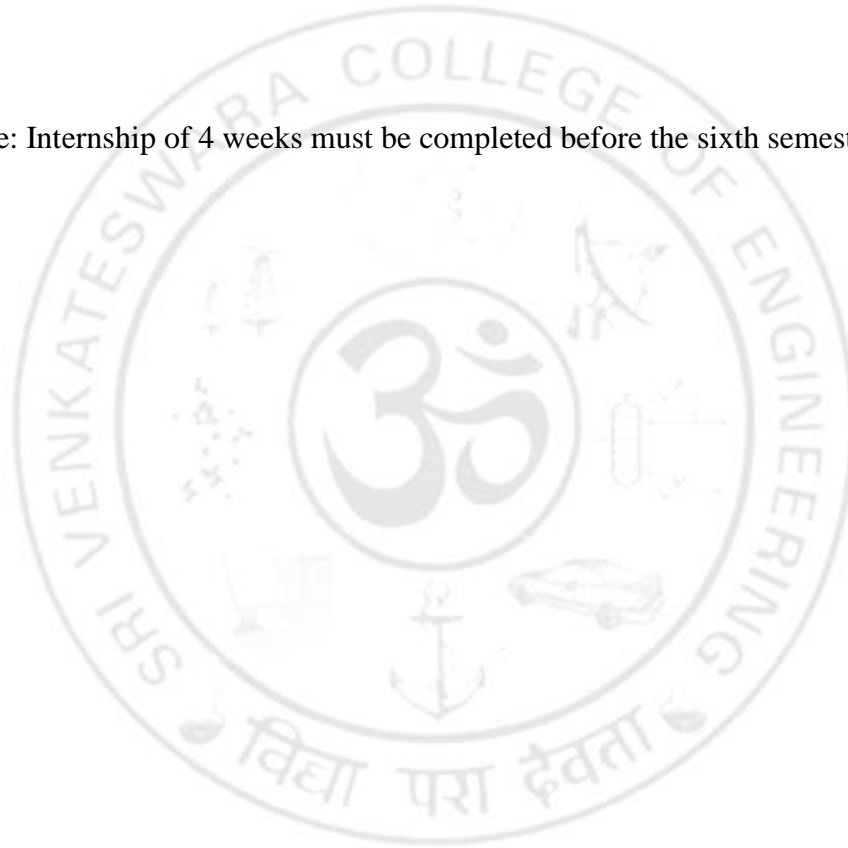
List of Verticals

S. No	Course Code	Course Title	L	T	P	C
Vertical I - Structural Engineering						
1	CE22011	Concrete Technology	3	0	0	3
2	CE22012	Prestressed Concrete Structures	3	0	0	3
3	CE22013	Prefabricated Structures	3	0	0	3
4	CE22014	Repair and Rehabilitation of Structures	3	0	0	3
5	CE22015	Advanced Strength of Materials	3	0	0	3
6	CE22016	Structural Dynamics	3	0	0	3
7	CE22017	Earthquake Resistant Design of Structures	3	0	0	3
8	CE22018	Smart Materials and Structures	3	0	0	3
9	CE22010	Mini Project	0	0	4	2
Vertical II- Environmental Engineering						
1	CE22021	Municipal Solid Waste Management	3	0	0	3
2	CE22022	Industrial Waste Management	3	0	0	3
3	CE22023	Air Pollution Management	3	0	0	3
4	CE22024	Environmental Policy and Legislations	3	0	0	3
5	CE22025	Environment Health and Safety	3	0	0	3
6	CE22026	Disaster Mitigation and Management	3	0	0	3
7	CE22027	Global Climate Change	3	0	0	3
8	CE22028	Sustainability and Social Development	3	0	0	3
9	CE22020	Mini Project	0	0	4	2
Vertical III - Construction Management						
1	CE22031	Construction Materials and Management	3	0	0	3
2	CE22032	Construction Equipment and Management	3	0	0	3
3	CE22033	Formwork Scaffolding and Shoring	3	0	0	3
4	CE22034	Construction Quality and Safety Management	3	0	0	3
5	CE22035	Risk Management in Construction Projects	3	0	0	3
6	CE22036	Contract Management and Dispute Resolution	3	0	0	3
7	CE22037	Sustainable Construction	3	0	0	3
8	CE22038	Building Services and Maintenance	3	0	0	3
9	CE22030	Mini Project	0	0	4	2
Vertical IV - Transportation Engineering						
1	CE22041	Pavement Engineering	3	0	0	3
2	CE22042	Design of Pedestrian and Bicycle Tracks	3	0	0	3
3	CE22043	Airport and Harbour Engineering	3	0	0	3
4	CE22044	Urban Planning and Development	3	0	0	3

S. No	Course Code	Course Title	L	T	P	C
5	CE22045	Traffic Engineering and Management	3	0	0	3
6	CE22046	Traffic Management Plan for Construction Site	3	0	0	3
7	CE22047	Intelligent Transportation Systems	3	0	0	3
8	CE22048	Smart Cities	3	0	0	3
9	CE22040	Mini Project	0	0	4	2
Vertical V - Geo-Informatics						
1	CE22051	Total Station and GPS Surveying	3	0	0	3
2	CE22052	Geo informatics and its Applications	3	0	0	3
3	CE22053	Geographic Information Systems	3	0	0	3
4	CE22054	Photogrammetry	3	0	0	3
5	CE22055	Cartography	3	0	0	3
6	CE22056	Airborne and Terrestrial laser mapping	3	0	0	3
7	CE22057	Satellite Image Processing	3	0	0	3
8	CE22058	Cadastral and Hydrographic Surveying	3	0	0	3
9	CE22050	Mini Project	0	0	4	2
Vertical VI - Geotechnical Engineering						
1	CE22061	Subsurface Investigation and Instrumentation	3	0	0	3
2	CE22062	Earth Pressure and Earth Retaining Structures	3	0	0	3
3	CE22063	Deep Foundation	3	0	0	3
4	CE22064	Soil Dynamics and Machine Foundations	3	0	0	3
5	CE22065	Tunneling	3	0	0	3
6	CE22066	Rock Mechanics	3	0	0	3
7	CE22067	Ground Improvement Techniques	3	0	0	3
8	CE22068	Geosynthetics Design and Applications	3	0	0	3
9	CE22060	Mini Project	0	0	4	2
Vertical VII - Water Resources Engineering						
1	CE22071	Groundwater Engineering	3	0	0	3
2	CE22072	Participatory Water Resources Management	3	0	0	3
3	CE22073	Urban Water Infrastructure	3	0	0	3
4	CE22074	Watershed Conservation and Management	3	0	0	3
5	CE22075	River Engineering	3	0	0	3
6	CE22076	Water Resources Systems Engineering	3	0	0	3
7	CE22077	Integrated Water Resources Management	3	0	0	3
8	CE22078	Environmental Hydraulics	3	0	0	3
9	CE22070	Mini Project	0	0	4	2

List of Value Added Courses

S.No.	Course Code	Course Title	Contact Periods	L	T	P	C
1.	VD22401	Application of Planning Tool in Construction Projects	2	2	0	0	2
2.	VD22402	GIS Tools in Civil Engineering	2	2	0	0	2
3.	VD22403	Finite Element Analysis using Computer Tools	2	2	0	0	2
4.	VD22404	Water Conservation Techniques	2	2	0	0	2
5.	VD22405	Vastu in Construction	2	2	0	0	2
6.	VD22406	Building Valuation	2	2	0	0	2
7.	VD22407	Design of Multistorey Building	2	2	0	0	2
8.	VD22408	Corrosion of Steel in Concrete and Preventive Measures	2	2	0	0	2
9.	VD22409	Wastewater Treatment Techniques	2	2	0	0	2
10.	VD22410	Automation in Construction	2	2	0	0	2
11.	VD22411	Biomimicry in Civil Engineering	2	2	0	0	2
12.	VD22412	Building Acoustics	2	2	0	0	2
13.	VD22413	Forensic Civil Engineering	2	2	0	0	2
14.	VD22414	Optimization Techniques	2	2	0	0	2
15.	VD22415	In-Situ Soil Testing and Instrumentation	2	2	0	0	2
16.	VD22416	Non Destructive Testing Techniques	2	2	0	0	2
17.	VD22417	Base Isolation and Damping Techniques in Aseismic Design	2	2	0	0	2
18.	VD22418	Interior Designing	2	2	0	0	2
19.	VD22419	Landscaping Architecture	2	2	0	0	2
20.	VD22420	Green Building Concepts	2	2	0	0	2
21.	VD22421	Basics of Steel Concrete Composite Construction	2	2	0	0	2
22.	VD22422	BIM for Civil Engineers	2	2	0	0	2

தமிழ் மொழியும் தமிழர் மரபும்

HS22151
TAMIL LANGUAGE AND HERITAGE OF ANCIENT TAMIL SOCIETY
(Common to all branches)

L	T	P	C
1	0	0	1

OBJECTIVES:
பாடத்தின் நோக்கங்கள்:

1. They will learn about the origin of the Tamil language and the ways of life through five types of lands.
2. They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

1. தமிழ் மொழியின் தோற்றம் பற்றியும், திணை கருத்துக்கள் வாயிலாக வாழ்வியல் முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.
2. இந்திய தேசிய சுதந்திர இயக்கத்தில் தமிழர்களின் பங்களிப்பு மற்றும் தமிழர்களின் மேலாண்மை முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.

UNIT I	LANGUAGE AND HERITAGE	
அலகு 1	தமிழுக்கும் தொழில்நுட்பக் கல்விக்கும் உள்ள தொடர்பு	**3**

Language families in India – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U. Ve. Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

மொழி மற்றும் பாரம்பரியம்: இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழில் செம்மொழி இலக்கியம் - உ.வே.. சாமிநாதய்யர். ஆறுமுகநாவலர் ஆகியோரின் பங்களிப்பு – தொழில் நுட்பக் கல்வியில் தமிழ் மொழியின் முக்கியத்துவம்.

UNIT II	THINAI CONCEPTS	
அலகு 2	திணை கருத்துக்கள்	**9**

Five types of lands, animals, Gods, occupation, life styles, music, dance , food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Cholas

திணை கருத்துக்கள்: -ஐந்து வகை நிலங்கள், விலங்குகள், கடவுள்கள், தொழில், வாழ்க்கை முறைகள், இசை, நடனம், உணவு முறை, தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள் – தொல்காப்பியம் மற்றும் சங்க இலக்கியங்களில் இருந்து அகம் மற்றும் புரம் கருத்து – தமிழ் பற்றிய அறம் கருத்து – கல்வி மற்றும் எழுத்தறிவு சங்க காலம் – சங்ககாலத்தின் பண்டைய நகரங்கள் மற்றும் துறைமுகங்கள் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – சோழர்களின் வெளிநாட்டு வெற்றி.

UNIT III HERITAGE OF TAMILS
அலகு 3 தமிழரின் மரபு

Contribution of Tamils to Indian National Freedom Movement and Indian Culture : Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar

இந்திய தேசிய சுதந்திர இயக்கம் மற்றும் இந்திய கலாச்சாரத்திற்கு தமிழர்களின் பங்களிப்பு:- சுப்ரமணிய பாரதி, வாஞ்சிநாதன், சுப்பிரமணிய சிவா, வீரபாண்டிய கட்ட பொம்மன், வா..ஊ சிதம்பரம் பிள்ளை, தீரன் சின்னமலை, மருது பாண்டிய சகோதரர்கள், பூலி தேவர், திருப்பூர் குமரன், வீரமங்கை வேலு நாச்சியார் - ,தமிழர் இலக்கியங்களில் மேலாண்மை கருத்துக்கள் (கி. மு. 500 முதல் கி. பி 200 வரை) – அகநானூறு, புறநானூறு, திருக்குறள் ஆகியவற்றில் மேலாண்மைக் கருத்துகள்.

TOTAL : 15 PERIODS

OUTCOMES :

பாடநெறி முடிவுகள் :

CO	**CO statements** Upon successful completion of the course, the students should be able to படிப்பை வெற்றிகரமாக முடித்தவுடன், மாணவர்கள் பின்வருவனவற்றைச் செய்ய முடியும்.	**RBT level**
CO1	Students will learn about the origin of the Tamil language மாணவர்கள் தமிழ் மொழித் தோற்றம் பற்றித் தெரிந்து கொள்வார்கள்.	1
CO2	They will know the ways of life of Tamils. தமிழர்களின் வாழ்வியல் முறைகளைத் தெரிந்து கொள்வார்கள்.	2
CO3	They will know about the freedom fighters of Tamils and the management of Tamils தமிழர்களின் சுதந்திர போராட்ட வீரர்களை பற்றியும், மேலாண்மைகளை பற்றியும் தெரிந்து கொள்வார்கள்.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
பாடநூல்கள்:

1. **பொன். முத்துகுமாரன்** (2002), "தமிழ் மரபு", காந்தளகம், 68, அண்ணா சாலை, சென்னை 600 002

2. **பி. டிஸ்ரீனிவாச ஐயங்கார்** (தமிழக்கமும் திறனாய்வும்) புலவர் கா. கோவிந்தன் (1988), "தமிழர் வரலாறு (முதல் பகுதி)", திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்பு கழகம் ,154, TTK சாலை, சென்னை 18.

3. **டாக்டர். கே. கே. பிள்ளை** (2009), "தமிழக வரலாறு மக்களும் பண்பாடும்", உலக தமிழாராய்ச்சி நிறுவனம், தரமணி , சென்னை 600113

4. **முனைவர். ச. இராஜேந்திரன்** (2004), "தமிழில் சொல்லாக்கம்", தஞ்சாவூர் தமிழ் பல்கலைக் கழகம் வெளியீடு

	L	T	P	C
HS22152 **COMMUNICATIVE ENGLISH**	L	T	P	C
(Common to all branches)	3	0	0	3

COURSE OBJECTIVES:
1. Enable learners to interact fluently on everyday social contexts.
2. Train learners to engage in conversations in an academic/scholarly setting.
3. Instil confidence in learners to overcome public speaking barriers.
4. Develop learners' ability to take notes and in the process, improve their listening Skills
5. Enhance learners' reading skill through reading text passages for comprehension and contemplation.
6. Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

UNIT I   **9**

Listening - short video clips - conversational scenes form movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

UNIT II   **9**

Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

UNIT III   **9**

Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking - language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

UNIT IV   **9**

Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product,

movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar – Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

UNIT V 9

Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

TOTAL: 45 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Acquire adequate vocabulary for effective communication	3
CO2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	3
CO3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	4
CO4	Comprehend conversations and short talks delivered in English.	6
CO5	Write short write-ups and personal letters and emails in English	6

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:
1. Department of English, Anna University, Mindscapes : English for Technologists and Engineers. Orient Black Swan, Chennai, 2017.
2. Downes and Colm, "Cambridge English for Job-hunting";, Cambridge University Press, New Delhi, 2008.
3. Murphy and Raymond, "Intermediate English Grammar with Answers Cambridge University Press, 2000.
4. Thomson, A.J., "Practical English Grammar 1 & 2";, Oxford, 1986.

WEBSITES:
1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

SOFTWARES:

1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University Press 2017.
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition.
5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low

3 means 'a strong correlation' as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in formal and informal environment.

	MA22151	**APPLIED MATHEMATICS I**	**L**	**T**	**P**	**C**
		(Common to all Branches except MR)	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:
The Student should be made to:
1. Compute eigen values and eigen vectors and use in diagonalization and in classifying real quadratic forms.
2. Study differential calculus and its applications to relevant Engineering problems.
3. Compute derivatives using the chain rule or total differentials.
4. Understand the rotation of two dimensional geometry using definite integrals.
5. Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I   MATRICES (9+3)

Eigen values and Eigen vectors of a real matrix – Characteristic equation –   Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem –Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II   APPLICATION OF DIFFERENTIAL CALCULUS (9+3)

Curvature and radius of Curvature– Centre curvature – Circle of curvature –Evolutes– Envelopes- Evolute as Envelope of Normals.

UNIT III   DIFFERENTIAL CALCULUS FOR SEVERAL (9+3)
                VARIABLES

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor's series for functions of two variables – Maxima and Minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIT IV   APPLICATION OF DEFINTE INTEGRALS (9+3)

Integration by Parts-Bernoulli's formula for integration- Definite integrals and its Properties-Solids of Revolution- Disk Method- Washer Method- Rotation about both x and y axis and Shell method.

UNIT V   MULTIPLE INTEGRALS (9+3)

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

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

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Solve the Eigen value problems in matrices.	3
CO2	Apply the basic notion of calculus in Engineering problems and to tackle for different geometries.	3
CO3	Perform calculus for more than one variable and its applications in Engineering problems.	3
CO4	Apply definite integrals for design of three dimensional components.	3
CO5	Evaluate multiple integral in Cartesian and polar coordinates.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics",10thEdition, John Wiley, (2015)
2. Grewal B.S, Grewal J.S, "Higher Engineering Mathematics",43rdEdition, Khanna Publications, Delhi, (2015).

REFERENCES:
1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Nineth Edition, Laxmi Publications Pvt. Ltd.,(2014).
2. Glyn James, "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education,(2016).
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).

WEB LINKS:
1. https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf
2. https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	3	-	-

3-High, 2-Medium, 1-Low

	PH22152	**ENGINEERING PHYSICS**	**L**	**T**	**P**	**C**

PH22152   **ENGINEERING PHYSICS**   **L T P C**
(Common to AE, CE, ME, MN, MR)   **3 0 0 3**

COURSE OBJECTIVES:

To enhance the fundamental knowledge in Physics and its applications relevant to various Streams of Engineering.

UNIT I   MECHANICS   9

Moment of inertia (M.I) - Radius of gyration - Theorems of M. I - M.I of circular disc, solid cylinder, hollow cylinder, solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic molecule – Rotational energy state of a rigid diatomic molecule - centre of mass – conservation of linear momentum – Relation between Torque and angular momentum - Torsional pendulum.

UNIT II   PROPERTIES OF MATTER AND THERMAL PHYSICS   9

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

Modes of heat transfer- thermal conductivity- Newton's law of cooling - Linear heat flow – Lee's disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel)

UNIT III   ACOUSTICS AND ULTRASONICS   9

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting Acoustics of buildings and their remedies. Production of Ultrasonics by Magnetostriction and Piezoelectric methods – Acoustic grating -Non-Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays, medical applications – Sonogram.

UNIT IV   PHOTONICS AND FIBER OPTICS   9

Photonics: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO_2 Laser – Applications. **Fiber optics:** principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication-fibre optic sensors: pressure and displacement- Endoscope.

UNIT V   CRYSTAL PHYSICS   9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances- coordination number and packing factor for SC, BCC, FCC, HCP and diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Gain knowledge in Mechanics	2
CO2	Evaluate the concepts of properties of matter and thermal physics	3
CO3	Learn to solve the issues related to defects in the buildings due to acoustic design and the significance of ultrasonic waves	3
CO4	Develop an understanding about photonics and Fiber Optic communication system	2
CO5	Classify and demonstrate the fundamentals of crystals and their defects.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Gaur R.K. and Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2. Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4. Arumugam M, "Materials Science", Anuradha Publications, 2015.

REFERENCES:
1. David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley, 2015.
2. Peter Atkins and Julio De Paula, "Physical Chemistry", 10th Edition, Oxford University Press, 2014.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S, "Concepts of Modern Physics", 7th Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	2	-	-	-	-	-	1	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	1	-	2	-	-
CO3	3	-	2	-	3	2	1	-	-	1	-	-	-	-
CO4	3	-	2	-	3	2	1	-	-	1	-	2	-	-
CO5	3	2	2	-	-	-	-	-	-	1	-	-	-	-

3-High, 2-Medium, 1-Low

CY22153 **TECHNICAL CHEMISTRY**

L	T	P	C
3	0	0	3

(Common to BT, CH, CE)

OBJECTIVES:

make the student conversant with the

- Electrodes, Corrosion and Protective coatings
- Photochemical process
- Synthesis and applications of nanoparticles
- Characteristics and analysis of water
- Materials like polymers, composites and binding materials

UNIT I ELECTROCHEMISTRY   **9**

Electrodes and electrochemical cells – electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation – determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (dry cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery) and next generation batteries.

UNIT II PHOTOCHEMISTRY   **9**

Laws of photochemistry – Grotthuss-Draper law, Stark–Einstein law and Lambert Beer Law – determination iron by spectrophotometer. Quantum efficiency – Photo physical processes - internal conversion, inter-system crossing, fluorescence, phosphorescence and photo-sensitization-Quenching of fluorescence and its kinetics, Stern-Volmer relationship. Applications of photochemistry.

UNIT III NANOCHEMISTRY   **9**

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications – Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

UNIT IV WATER TECHNOLOGY   **9**

Sources, impurities in water and their effects. WHO guideline and BIS guideline for drinking water. Water characteristics – Hardness – Types of hardness – Disadvantages of hard water. Boiler troubles: Scale, Sludge, Priming and Foaming, Caustic embrittlement and Boiler corrosion. Water softening methods - Internal treatment of water: Carbonate conditioning, Phosphate conditioning and Calgon conditioning - External treatment of water: Ion exchange process. Domestic water treatment. Water analysis: Hardness – determination by EDTA method, Alkalinity – determination by double indicator method, Determination of dissolved oxygen by Winkler's method and Determination of chloride by Mohr's method.

UNIT V   MATERIALS CHEMISTRY   9

Polymers: Introduction – Monomers, functionality and its significance, Free radical polymerization mechanism. Conducting polymers – mechanism of conduction in polyacetylene and applications.

Composites: Definition, need for composites. Constitution – Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of composites materials. Hybrid composites, Binding materials and its applications

TOTAL (L: 45): 45 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Identify electrochemical cells, corrosion and fundamental aspects of batteries	2
CO2	Interpret the photochemical reactions and make use of spectroscopic techniques	2
CO3	Realize the structures, properties and applications of nanoparticles.	2
CO4	Describe the hardness of water, the problems caused by the hard water and their removals methods.	3
CO5	Illustrate the significance of various materials like polymer, composites their composition, properties and applications.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpet Rai & Sons, New Delhi, 17th Edition, 2018.
2. Dara, "A Text Book of Engineering Chemistry", S.Chand & Co. Ltd., New Delhi, 12th Edition, 2016.
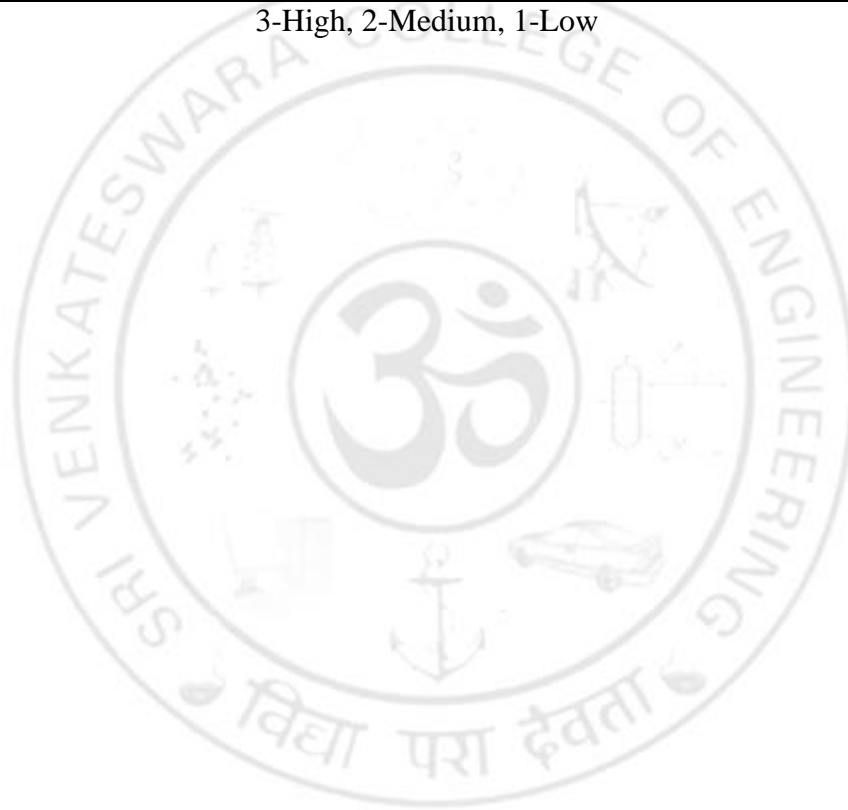
REFERENCES:
1. B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	-		-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-
CO3	3	3	3	-	-	3	3	3	-	-	-	3	-	-
CO4	3	3	-	2	-	3	3	3	-	-	-	3	-	-
CO5	3	3	3	-	-	3	3	3	-	-	-	3	-	-

3-High, 2-Medium, 1-Low

CE22101	ENGINEERING GEOLOGY AND CONSTRUCTION MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
- This course will give insights on the basics of geology and significance of rocks and minerals.
- This course will introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I   MINERALS AND ROCKS   9

Relevance and importance of Engineering Geology of Civil Engineers, Minerals, their physical properties, composition and their use in the manufacture of construction materials– rock forming minerals, physical and engineering properties of igneous, metaphoric and sedimentary rocks

UNIT II   LIME, STONE, BRICK AND MASONRY   9

Lime mortar, Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification, Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption, Efflorescence – Brick and Stone Masonry – Concrete hollow blocks –Paver Blocks.

UNIT III   CEMENT, MORTAR, AGGREGATES   9

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

UNIT IV   CONCRETE   9

Concrete – Ingredients, Manufacturing Process, Properties of fresh concrete – Slump, Flow and compaction Factor, Properties of hardened concrete –Compressive strength, tensile strength, flexural strength, modulus of elasticity, Mix specification and proportioning, Mix design using BIS.

UNIT V   MODERN MATERIALS   9

Timber – types and applications, Metals used in construction industry – steel, alumnium – Characteristics, forms available and applications, Bitumen, Fibre Reinforced Polymer, Glass, geotextiles, High Density Polyethylene, self healing materials.

TOTAL: 45 PERIODS

OUTCOMES:

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Explain about minerals and rock formation.	2
CO2	Summarise the significance of lime, stone, brick and masonry in construction.	2
CO3	Describe the properties of cement, mortar and aggregates.	2
CO4	Explain about concrete, its ingredients, properties and tests.	2
CO5	Ennumerate on the modern construction materials.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.

REFERENCES:
1. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009
2. Chenna Kesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009.
3. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
4. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
5. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
6. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008
7. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
8. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
9. Gambhir. M.L., &Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
10. IS 456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
11. IS 4926 - 2003: Indian Standard specification for ready–mixed concrete, 2012
12. IS 383 - 2016: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete.
13. IS 1542-1992: Indian standard specification for sand for plaster, 2009
14. IS 10262-2019: Indian Standard Concrete Mix Proportioning –Guidelines.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	2

3-High, 2-Medium, 1-Low
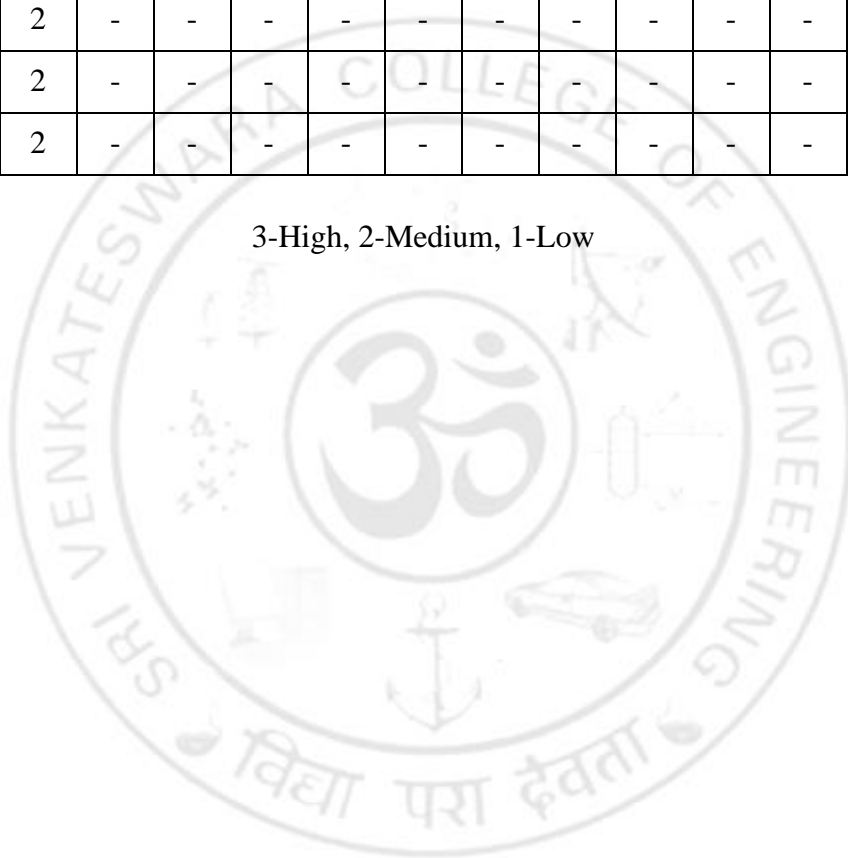
CE22102	ENGINEERING DRAWING FOR CIVIL ENGINEERS	L	T	P	C
		1	0	4	3

COURSE OBJECTIVES:
- This course will introduce students to Engineering Drawing and build their ability to read drawings and interpret the position and form of simple geometry, culminating into understanding of simple technical assemblies.

UNIT I   FUNDAMENTALS OF DRAWING AND CONIC SECTIONS   12

Drawing standards: BIS, Lettering, Dimensioning, Type of lines, BIS Conventions, size, layout and folding of drawing sheets, use of drafting tools, Basic geometrical constructions.
Projection: Principal Planes, Projection of Points using Four Angles of Projection, Projection of Straight Lines - Lines parallel or inclined to one plane.
Conic Sections - Ellipse, Parabola, Hyperbola using Eccentricity method

UNIT II   PROJECTION OF PLANES AND SOLIDS   15

Projection of Plane Figures - Inclined to any one Principal Plane
Projection of Solids - Simple Solids (Prisms, Pyramids, Cone and Cylinder) axis inclined to any one Principal Plane.

UNIT III   SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   15

Section of Solids - Sectional views of simple vertical solids cut by section plane inclined to any one Principal Plane.
Development of Surfaces - Development of lateral surfaces of truncated and frustum of simple solids.

UNIT IV   ORTHOGRAPHIC AND ISOMETRIC PROJECTION   15

Isometric Projection - Principle, Isometric Planes, Isometric Scales, Isometric Projection of simple solids and their combination.
Orthographic Projection - Orthographic views of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views.

UNIT V   COMPUTER AIDED DRAWING   18

Basics of Computer Tools – basic drawing and modifying commands, hatching, plotting drawings. Drawing simple solids, orthographic and simple 3D models.
Civil Drawing Conventions, Building Plan standards, layer creation, Drawing plan of a single room building using software.

.**TOTAL: 75 PERIODS**

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the basic engineering drawing principles to construct conic sections and sketch the orthographic views of lines as per drawing standards	3
CO2	Draw projections of plane surfaces and simple solids in various positions.	3
CO3	Draw projections of sectioned solids and develop the lateral surfaces of simple solids.	3
CO4	Draw orthographic and isometric projections of simple solids and their combinations	3
CO5	Apply the engineering drawing fundamentals to draw solids and building plan using software application	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Bhatt N.D, Panchal Pramod V.M and Ingle R, "Engineering Drawing", Charotar Publishing House, 2019.
2. Gupta B.V.R and Raja Roy.M, "Engineering Drawing with AutoCAD", Dream Tech Press and Wiley Publications, third edition, 2021

REFERENCES:

1. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International (P) Limited, 2014.
2. Shah M.B and Rana B.C, "Engineering Drawing", Pearson Education, 2009.
3. Gopalakrishna K.R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2010.
4. Natrajan K.V, "A   Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
5. Gowri S and Jeyapoovan T, "Engineering Graphics", Vikas Publishing House Pvt. Ltd., 2012.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	2	-	-	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

PH22161 **PHYSICS LABORATORY**
(Common to all Branches except BT)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS (Any eight Experiments)

1. a) Determination of Wavelength, and particle size using Laser.
    b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of Young's modulus by Non uniform bending method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7. Determination of Rigidity modulus of a given wire -Torsional Pendulum
8. Energy band gap of a Semiconductor
9. Determine the Hysteresis loss of a given Specimen
10. Calibration of Voltmeter & Ammeter using potentiometer.

TOTAL: 30 Periods

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	4
CO2	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering.	3
CO3	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering.	3
CO4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	3
CO5	Extend the scope of an investigation whether or not results come out as expected	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. "Physics Laboratory practical manual", 1st Revised Edition by Faculty members, 2018.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	2	-	-	-	3	1	-	2	-	-
CO2	3	3	-	3	-	2	-	-	3	1	-	2	-	-
CO3	3	3	2	3	2	2	-	-	3	1	-	2	-	-
CO4	3	3	-	3	-	-	-	-	3	1	-	2	-	-
CO5	3	3	-	3	2	-	-	-	3	1	-	2	-	-

3-High, 2-Medium, 1-Low
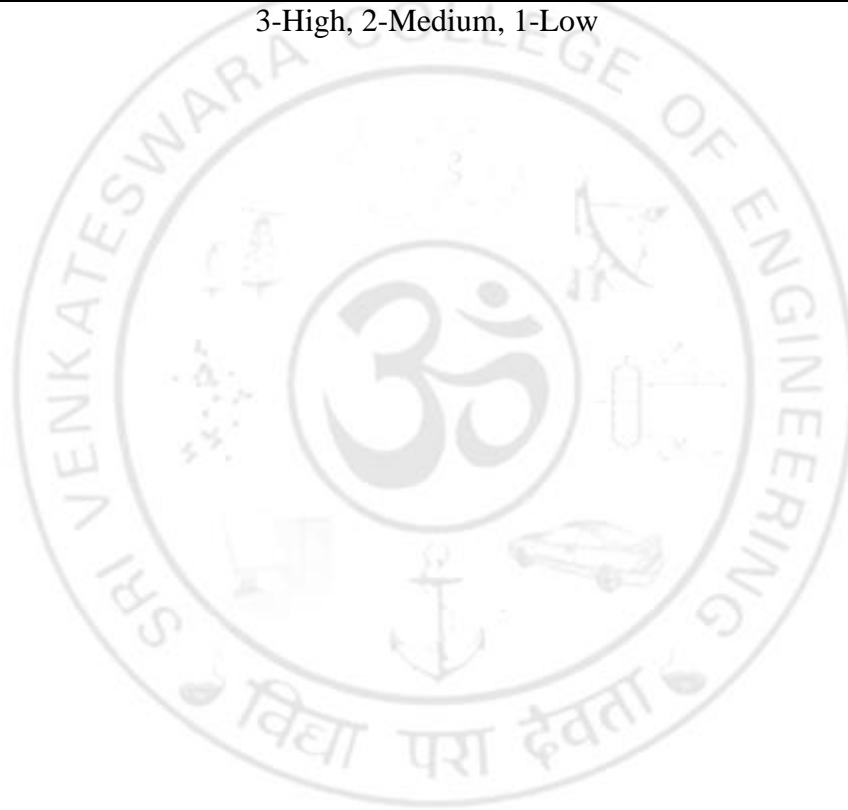
CY22161   **Chemistry Laboratory**

(Common to all Branches except AD, CS, IT)

L	T	P	C
0	0	2	1

OBJECTIVES

The objective of the ChemistryLaboratory is to acquaint the students with the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and Engineering field.

1. To appreciate the need and importance of water quality parameters for industrial and domestic use.
2. To gain the knowledge on electrochemical instrumention techniques like potentialand current measuring used in electrochemistry applications
3. To impart knowledge on separation of components using paper chromatography.
4. To enhance the thinking capabilityabout polymer and properties like molecular weight.

LIST OF EXPERIMENTS (Minimum 8 Experiments)

1. Determination of DO content of water sample by Winkler's method.
2. Determination of strength of given hydrochloric acid using pH meter
3. Determination of strength of acids in a mixture using conductivity meter
4. Estimation of iron content of the water sample using spectrophotometer (phenanthroline / thiocyanate method)
5. Determination of total, temporary & permanent hardness of water by EDTA Method.
6. Estimation of iron content of the given solution using potentiometer.
7. Determination of alkalinity in water sample.
8. Determination of Single electrode potential.
9. Separation of components from a mixture of red and blue inks using Paper chromatography.
10. Determination of molecular weight of polymer by using Ostwald's/Ubbelohde viscometer.

TOTAL: 15 Periods

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Distinguish hard and soft water, solve the related numerical problems on water, purification and its significance in industry and daily life.	3
CO2	Interpret the knowledge of instruments to measure potential and current related parameters.	2
CO3	Demonstrate the basic principle for separation of components using paper chromatography.	3
CO4	Evaluate the molecular weight of polymer using Ostwald's/Ubbelohde viscometer.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New York 2001.
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel"s Textbook of practical organic chemistry", LBS Singapore 1994.
3. Jeffery G.H., Bassett J., Mendham J.and Denny vogel"s R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	-	3	3	3	1	-	1	2	-	-
CO2	3	2	1	-	-	3	3	3	-	-	-	-	-	-
CO3	3	-	-	-	-	3	3	-	-	-	-	2	-	-
CO4	3	-	-	1	-	3	3	3	-	-	-	-	-	-

3-High, 2-Medium, 1-Low

ME22161	**BASIC CIVIL AND MECHANICAL ENGINEERING LABORATORY** **(Common to CE, EE, EC)**	L	T	P	C
		0	0	2	1

OBJECTIVES:

To provide an exposure and hands on experience to the students on various civil and mechanical engineering processes.

LIST OF EXPERIMENTS

1- Carpentry – Preparation of Cross half lap joint and Tee joint using power tools.
2- Plumbing – Basic pipe line connection used in houses with PVC pipes, valves, taps, couplings, unions, reducers, elbows.
3- Welding - Butt joint and lap joint using Electric Arc welding.
4- Machining – Turning and facing using Centre Lathe.
5- Sheet metal work – Making of a cylinder using GI sheet and finishing using rivets.
6- Fitting – Preparation of metal pieces by grinding and filing to maintain flat sides at right angles
7- Drilling and Tapping – Drilling of holes precisely and making internal threads by Tapping for various sizes.
8- Casting – Mould preparation using simple solid pattern and casting.
9- Automation – Basic pneumatic circuit using single and double acting cylinder.
10- 3D printing –Demonstration of printing of simple solids using Additive Manufacturing/3D printing.

TOTAL: 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Prepare various joints used for assembling wooden parts.	3
CO2	Make required pipeline connection by selecting the suitable components	3
CO3	Fabricate components by various manufacturing processes.	3
CO4	Understand the principles of low-cost automation using pneumatic circuits.	2
CO5	Understand the principle of additive manufacturing/3D printing	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab

Manual", Vikas Publishing House Pvt.Ltd, 2006.

3. Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.

4. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.

5. Anthony Esposito, Fluid Power with Applications, Pearson Education, 7th edition, 2009.

6. Civil & Mechanical engineering practices lab manual, SVCE, 2022.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	2	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	2	-	-	-	-	-	-	-	-	-

3-High, 2-Medium, 1-Low

		L	T	P	C

HS22251 அறிவியல் மற்றும் தொழில்நுட்பத்தில் தமிழ்
SCIENCE AND TECHNOLOGY IN ANCIENT TAMIL SOCIETY

(Common to all Branches)

L	T	P	C
2	0	0	2

OBJECTIVES:
பாடத்தின் நோக்கங்கள்:

1. They will know about the use of Tamil in science.
2. Learn about the impact of Tamil heritage on technology.
1. அறிவியலில் தமிழின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.
2. தொழில்நுட்பத்தில் தமிழ் பாரம்பரியத்தின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்

UNIT I   SCIENTIFIC TAMIL
அலகு 1   அறிவியல் தமிழ்

6

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation

கருவி உருவாக்கம் – ஆராய்ச்சி மேம்பாடு – கல்வி வளர்ச்சி – அறிவியல் தமிழ் சொற்கள் உருவாக்கம்

UNIT II   TAMIL IN TECHNOLOGY
அலகு 2   தொழில்நுட்பத்தில் தமிழ்

24

Design and Construction Technology : Building materials in Sangam age – Great temples of Cholas and other workship places – Sculptures and Temples of Pallavas (Mamallapuram) – Temples of Nayakas period (Madurai Meenakshi amman temple), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

Manufacturing Technology : Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

Agriculture and Irrigation Technology: Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

Tamil Computing : Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project. Future of Tamil and Information Technology- Globalization and Information Technology-Teaching Tamil for Computer-Resources in Tamil Language Technology.

வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் : சங்க காலத்தில் கட்டுமானப் பொருட்கள் – சோழர்களின் பெரியகோவில்கள் மற்றும் பிற வழிபாட்டுதலங்கள் – பல்லவர்களின் சிற்பங்கள் மற்றும் கோவில்கள் (மாமல்லபுரம்) - நாயக்கன் கால

கோவில்கள் (மதுரை மீனாட்சி அம்மன் கோவில்), திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள்.

உற்பத்தி தொழில் நுட்பம் : கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள், தங்கம், தாமிரம், இரும்பு பற்றிய அறிவு – தொல்பொருள் சான்றுகள் – சுட்டக் களிமண் மணிகள், சங்கு மணிகள், எலும்பு மணிகள்.

விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் : அணைகள், ஏரிகள், குளங்கள், மதகுகள், சோழர் கால குமுழி தூம்பு ஆகியவற்றின் முக்கியத்துவம் – கால்நடை பராமரிப்பு, கால்நடைகளின் பயன்பாட்டிற்காக வடிவமைக்கப்பட்ட கிணறுகள். விவசாயம் மற்றும் வேளாண் செயலாக்கம் – கடல் பற்றிய அறிவு – மீன் பிடித்தல், முத்து குளித்தல், சங்கு சேகரித்தல்.

தமிழ் கணினி: அறிவியல் தமிழ் வளர்ச்சி – தமிழ் கணினி, தமிழ் புத்தகங்களின் டிஜிட்டல்மயமாக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மென்பொருள் உருவாக்கம் – தமிழ் மெய் நிகர் அகாடமி – சொற்குவை திட்டம்.

தமிழின் எதிர்காலமும் தகவல் தொழில்நுட்பமும்- உலகமயமாக்கலும் தகவல் தொழில்நுட்பமும் – கணினிக்கு தமிழ் கற்று கொடுத்தல் – தமிழ்மொழித் தொழில்நுட்பத்தில் வளங்கள்.

TOTAL : 30 PERIODS

OUTCOMES :
பாடநெறி முடிவுகள் :

CO	CO statements Upon successful completion of the course, the students should be able to படிப்பை வெற்றிகரமாக முடித்தவுடன், மாணவர்கள் பின்வருவனவற்றைச் செய்ய முடியும்.	RBT level
CO1	They will know about the use of Tamil language in science அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.	2
CO2	They will learn about the influence of Tamil language in various technologies. பல்வேறு தொழில்நுட்பத்தில் தமிழ்மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
பாடநூல்கள்:
1. டாக்டர், வா.செ .குழந்தைசாமி (1985), "அறிவியல் தமிழ்" , பாரதி பதிப்பகம், 126/108, உஸ்மான் சாலை, தியாகராய நகர் , சென்னை 600017

2. சுப. திண்ணப்பன், (1995), "கணினியும் தமிழ் கற்பித்தலும்", புலமை வெளியீடு, 38-B

மண்ணத்நதோட்டத் தெரு, ஆழ்வார்பேட், சென்னை 600018

3. மு. பொன்னவைக்கோ, (2003), "வளர்தமிழில் அறிவியல் – இணையத் தமிழ்", அனைத்திந்திய அறிவியல் தமிழ்க் கழகம், தஞ்சாவூர் 615 005.

4. துரை. மணிகண்டன், (2008), "இணையமும் தமிழும்", நல்நிலம் பதிப்பகம்,   7-3, சிமேட்லி சாலை,   தியாகராய நகர், சென்னை 600 017.

HS22252   **TECHNICAL ENGLISH**
                     (Common to all Branches)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. Enable learners to define and understand technical communication and scientific writing
2. Expose learners to the technicalities of seminar presentation, group discussion, and public speaking
3. Develop learners' writing skills for scientific and documenting purposes
4. Improve learners' ability to draft correspondences for business purposes
5. Cultivate learners' ability to holistically understand the nuances of job interviews and recruiting process.

UNIT I   **9**

Listening - AV files pertaining to manufacturing processes of products, scientific documentaries; Speaking - syllable division and word stress, intonation, sharing opinions; Reading - news articles related to science and technology; Writing - definitions, instruction, recommendation, data interpretation, resume; Grammar -tenses and their aspects, sentence connectors – discourse markers, sequential words, active and passive voice, subject-verb agreement.

UNIT II   **9**

Listening - AV pertaining to marketing strategies, peer reading and pronunciation; Speaking- turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; Reading - analytical documents, descriptive documents; Writing - fliers, brochures, resume - letter of application, checklists; Grammar - modal verbs, clauses - types and uses, conditional clauses, articles.

UNIT III   **9**

Listening - AV related to how to use components, scientific description, Speaking - speaking for motivation and initiation, speaking at a seminar presentation; Reading - scientific journals, papers; Writing - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; Grammar - phrasal verbs, prepositions, technical and scientific affixes.

UNIT IV   **9**

Listening - scientific debates, crisis management; Speaking - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, Reading- documented evidences of uses and functions of a product, review of a product, Writing - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. Grammar - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

UNIT V 9

Listening - AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; Speaking- speaking at group discussions, interviewing a personality, answering at the interviews; Reading - WebPages of top notch engineering companies, Writing - blogging, e-mails, letter of complaint, minutes of the meeting; Grammar - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

TOTAL: 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand the nuances of technical communication and scientific writing	3
CO2	Present papers and give seminars	6
CO3	Discuss in groups and brainstorm	6
CO4	Draft business correspondences and write for documenting purposes	6
CO5	Face job interviews with confidence	6

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:
1. Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012.
2. Downes, Colm, Cambridge English for Job-hunting, Cambridge University Press, New Delhi. 2008
3. Murphy, Raymond, Intermediate English Grammar with Answers, Cambridge University Press 2000.
4. Thomson, A.J., Practical English Grammar 1 & 2, Oxford, 1986.
5. Herbert A J, The Structure of Technical English, Longman, 1965.

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1. http://www.usingenglish.com
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3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

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1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance
   Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University
   Press 2017.

4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition.
5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-

3-High, 2-Medium, 1-Low

3 denotes 'a strong correlation' as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in technical and professional situations.

MA22251   **APPLIED MATHEMATICS II**   **L   T   P   C**

(Common to all Branches except MR)
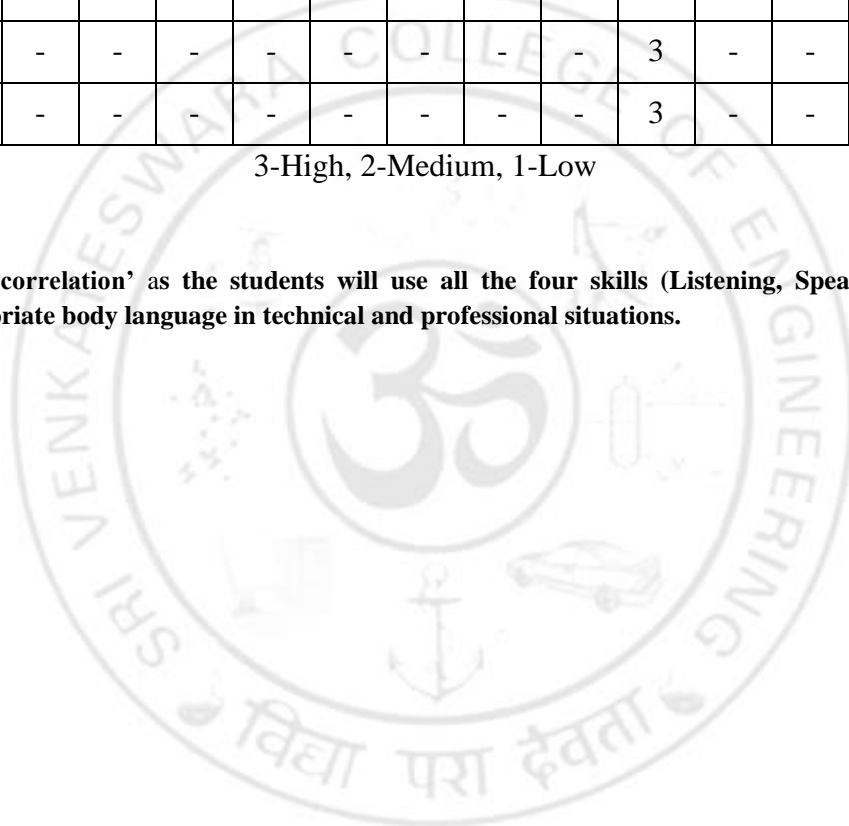
OBJECTIVES:

The students should be made to

- Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
- Skilled at the techniques of solving ordinary differential equations that model engineering problems.
- Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- Explain geometry of a complex plane and state properties of analytic functions.
- Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

UNIT I   VECTOR CALCULUS   (9+3)

Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes'
theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

UNIT II   ORDINARYDIFFERENTIAL EQUATIONS AND ITS APPLICATIONS   (9+3)

Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

UNIT III   LAPLACE TRANSFORM   (9+3)

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV   ANALYTIC FUNCTIONS   (9+3)

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) -

Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping – Mapping by functions $W = Z + C$, CZ, $1/Z$, Z^2 – Joukowski's transformation- Bilinear transformation.

UNIT V   COMPLEX INTEGRATION   (9+3)

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

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

OUTCOMES:

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	3
CO2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations.	3
CO3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.	3
CO4	Explain Analytic functions and Categorize transformations.	3
CO5	Perform Complex integration to evaluate real definite integralsusing Cauchy integral theorem and Cauchy's residue theorem.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERENCES:
1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications(p) Ltd., 2014.

WEB LINK:
1. https://nptel.ac.in/courses/111/105/111105134/
2. https://nptel.ac.in/courses/111/105/111105121/

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	3	-	-

3-High, 2-Medium, 1-Low
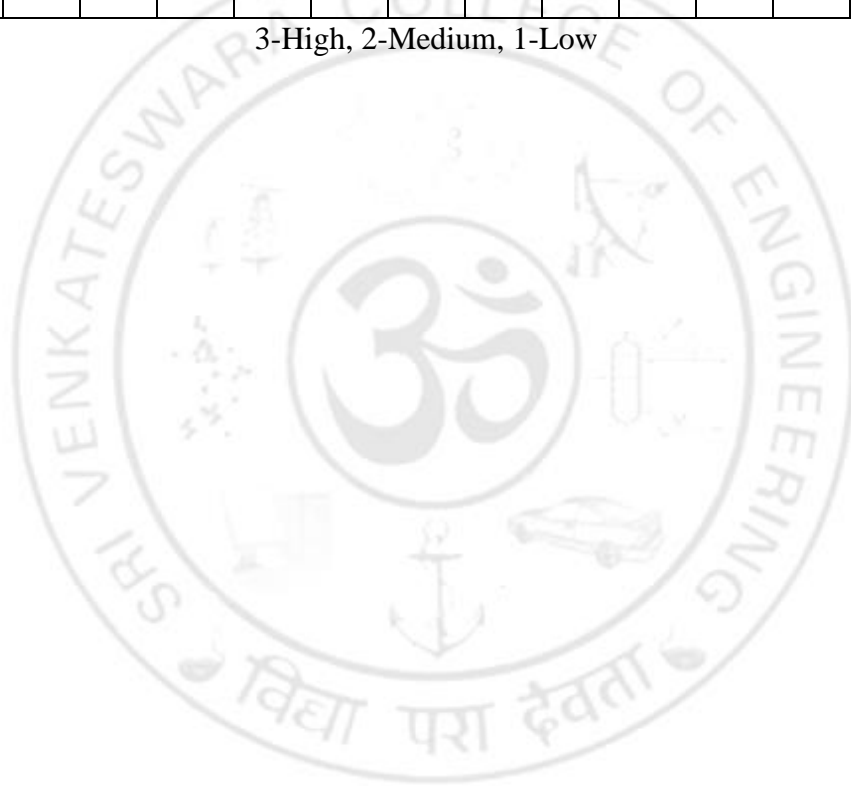
IT22251	Computer Programming and Practice	L	T	P	C
	(Common to AE, BT, CE, CH)	2	0	2	3

OBJECTIVES:

To know the basics of algorithmic problem solving
To learn programming using a structured programming language.
To implement programs with basic features of C.

Unit 1   Fundamentals of Computing   6+3

Computing Devices – Identification of Computational Problems – Algorithms – Building Blocks of Algorithms - Pseudocodes and Flowcharts- Notion of memory, addresses, variables, instructions, execution of instructions- Operating system commands, file editing, compiling, linking, executing a program. Introduction to different programming languages.
Suggested Activities:
Practical - Use of operating system commands and file editing operations

Unit 2   Basics of C   6+9

Data types - constants, variables - operators - expressions - basic input/output. Statements and blocks - Selection - if-else construct - iteration - while - for constructs.
Suggested Activities
Practical
Demonstration of programs using data types, operators and basic input/output.
Demonstration of programs using if else, else-if, switch.
Demonstration of programs using, while, for do-while, break, continue

Unit 3   Arrays and Strings   6+6

Array, declaration, initialization. Multi dimensional arrays. Strings and character arrays, string operations on arrays
Suggested Activities
Practical
Demonstration of programs using arrays and operations on arrays
Demonstration of programs implementing string operations on arrays

Unit 4   Functions and Structures   6+6

Functions, definition, call, arguments, call by value. Call by reference. Recursion, Introduction to structures and unions.
Suggested Activities
Practical
Demonstration of programs using functions.
Demonstration of programs using recursion
Demonstration of programs using Structures and Unions

Unit 5   Pointers and File handling in c   6+6

Introduction to Pointers- pointers to basic variables, pointers and arrays. Pointers to strings
Dynamic Memory Allocation, Files - binary, text - open, read, write, random access, close.
Preprocessor directives
Suggested Activities
Practical
Demonstration of programs using pointers
Demonstration of programs using files

Total (L:30+P:30)

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Understand the model of a computer, software design methodologies, and represent solutions to computational problems as algorithms	3
CO2	Analyze the problem scenarios and develop C programs using sequential, conditional, and iterative constructs	3
CO3	Appraise problem scenarios and develop C programs using complex storage structures.	3
CO4	Design modularized solutions for larger problems	3
CO5	Inspect the storage structure in a computer and design C programs to access permanent storage	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Pradip Dey, Manas Ghosh, " Programming in C ", First Edition, Oxford University Press, 2018.
2. R G Dromey, "How to Solve it using Computer", Pearson,2006.

REFERENCES:
1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson
Education, 2015.
2. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGrawHill, 2010
4. Reema Thareja, "Programming in C", 2nd ed., Oxford University Press, 2016

Evaluation Method

60% theory+40% practical

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	3	3	2	2	1	-	1	3	2	-	2	1	-
CO2	2	3	2	2	2	1	-	1	3	2	-	2	1	-
CO3	2	3	2	2	2	1	-	1	3	2	-	2	1	-
CO4	3	3	2	2	2	1	-	1	3	2	-	2	1	-
CO5	1	1	1	1	2	1	-	1	3	2	-	2	1	-

3-High, 2-Medium, 1-Low
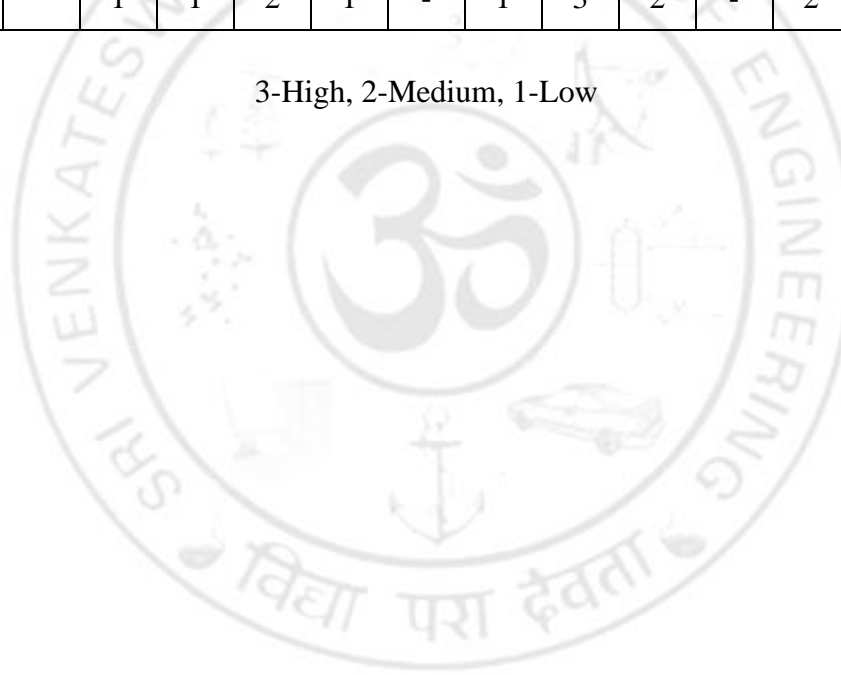
		L	**T**	**P**	**C**
EE22151	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING** **(Common to all Branches except CH, EE, EC)**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
1. To understand the basic theorems used in Electrical circuits.
2. To educate on the different concepts and functions of electrical machines.
3. To introduce electron devices and its applications.
4. To explain the principles of digital electronics.
5. To impart knowledge on the principles of measuring instruments.

UNITI   ELECTRICALCIRCUITS   9

Ohm's Law – Kirchhoff's Laws - Steady State Solution of DC Circuits using Mesh and Nodal Analysis -Introduction to AC Circuits - Waveforms and RMS Value - Power and Power factor - Single Phase and Three Phase AC Balanced Circuits.

UNIT II   ELECTRICAL MACHINES   9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.

UNIT III   SEMICONDUCTOR DEVICES AND APPLICATIONS   9

Characteristics of PN Junction Diode - Zener Effect - Zener Diode - LED, Photo diode and its Characteristics-Half Wave and Full Wave Rectifiers-Voltage Regulation. Bipolar Junction Transistor-Common Emitter Configuration, Characteristics and CE as an Amplifier - Photo transistors.

UNIT IV   DIGITAL ELECTRONICS   9

Number System Conversion Methods–Simplification of Boolean Expression using K-Map – Half and Full Adders – Flip-Flops – Shift Registers - SISO, SIPO, PISO, PIPO and 4-bit Synchronous and Asynchronous UP Counters.

UNIT V   MEASURING INSTRUMENTS   9   9

Types of Signals: Analog and Digital Signals- Construction and working Principle of Moving Coil Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and End meters. Instrumentation Amplifier, – R-2R ladder Type D/A Converter - Flash Type and Succes Approximation Type A/D Converter.

TOTAL: 45 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Compute the electric circuit parameters for simple problems	4
CO2	Understand the construction and characteristics of different electrical machines.	4
CO3	Describe the fundamental behavior of different semiconductor devices and circuits.	4
CO4	Design basic digital circuits using Logic Gates and Flip-Flops.	4
CO5	Analyze the operating principle and working of measuring instruments.	4

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. Sedha. R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. Mehta VK, "Principles of Electronics", S. Chand &Company Ltd, 2010.
3. M. Morris Mano, "Digital Logic & Computer Engineering", Prentice Hall of India, 2004.
4. Mahmood Nahvi and Joseph A.Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition, 2007.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	-	2	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	2	-	-	-	-	2	-	-
CO3	3	3	3	3	-	-	2	-	-	-	-	2	-	-
CO4	3	3	3	3	-	-	2	-	-	-	-	2	-	-
CO5	3	3	3	3	-	-	2	-	-	-	-	2	-	-

3-High, 2-Medium, 1-Low

CE22201	BUILDING PLANNING AND DRAWING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- The objective of this course is to inculcate in the student the ability to plan any building with appropriate dimensions.

UNIT I	**FUNDAMENTALS OF BUILDINGS AND ITS ELEMENTS**	**6**

Buildings – Classifications based on nature of occupancy, based on their fire resistance, built in environment, load transfer- components of a building (Dimensions of building) –Foundation and super-structure– Doors – Windows – Lintels and arches – Stairs – Roof – Flooring – Plastering.

UNIT II	**PRINCIPLES OF PLANNING OF BUILDINGS & ORIENTATION OF BUILDINGS**	**6**

Aspect – Prospect – Privacy –furniture requirement – roominess – grouping – circulation – lighting –ventilation– economy – Practical considerations – Orientation of building – Factors affecting orientation – Vaastu considerations.

UNIT III	**PLANNING OF RESIDENTIAL BUILDINGS**	**6**

Single storey Residential buildings – Rooms meant for various activities – Drawing or living room, dining room, kitchen, bedroom, bath and water-closets, veranda, store room, Prayer room, study room, guest room, office room, stairs, garage – minimum dimensions – doors, windows and ventilators

UNIT IV	**PLANNING OF PUBLIC BUILDINGS**	**6**

Public buildings - Schools, Library, Hospital, Theatre, Auditorium,– site selection, components, Principles of planning

UNIT V	**ANTHROPOMETRIC STUDIES AND BUILDING BYE-LAWS**	**6**

Engineering anthropometry – application of anthropometric data in design of residential building components. Building bye-laws as per National Building Code – Minimum plot sizes and building frontage – Floor Area Ratio- Open spaces – Minimum standard dimensions of building elements – provisions for lighting and ventilation, safety from fire and explosions, means of access, drainage and sanitation, safety against hazards or accidents, off street parking

PRACTICAL SESSIONS:

Expt. No.	Title of the Experiment	Unit Mapped	CO	Contact Hours
1	Drawing of Cross-section of a load bearing wall with foundation details and specifications	I	1	2
2	Drawing of Cross-section of a RCC column along with foundation details and specifications	I	1	2
3	Joinery details - door	I	1	2
4	Plan and elevation of a 1 BHK residential building considering the principles of orientation.	II	2	2
5	Cross sectional elevation of 1 BHK residential building	II	2	2
6	Furnishing details of a residential building using computer application	II	2	2
7	Plan of an individual house with all amenities, furniture and specifications.	III	3	2
8	Elevation of an individual house.	III	3	2
9	Sectional elevation of an individual house.	III	3	2
10	Plan of a school/any educational institution building	IV	4	2
11	Plan of a library building	IV	4	2
12	Plan of a hospital/healthcare building	IV	4	2
13	Specifications for a layout of a 200 units residential complex	V	5	2
14	Layout of a 200 units residential complex	V	5	4
			Total	30

TOTAL: 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Explain the fundamentals of buildings and components of a building.	2
CO2	Apply the basic principles of building planning and orientation.	3
CO3	Plan residential buildings	3
CO4	Summarise the important aspects of planning public buildings.	3
CO5	Implement anthropometric studies and bye laws while planning a building.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Dr. N. Kumara Swamy, A. KameswaraRao, "Building planning and drawing", Charotar Publishing house Pvt. Ltd , 9th edition, 2023.
2. National Building Code of India, Part V, "Building Materials", 2016.

REFERENCES:
1. SS Bhavikatti& M V Chitawadagi , "Building planning and drawing", I.K. International Publishing house Pvt. Ltd. , 2014.
2. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2004.
3. Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 2010. 4. National Building Code of India, BIS.

EVALUATION SCHEME:

FA 1 – Theory
FA 2 – Theory
FA 3 – Practical
Summative Assessment – Theory – 50% and Practical – 50%
Observation and Records will be maintained for Practical Sessions

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO2	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO3	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO4	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO5	2	-	-	-	-	3	-	3	-	-	-	1	3	3

3-High, 2-Medium, 1-Low

CE22202	ENGINEERING MECHANICS FOR CIVIL ENGINEERS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the various systems of forces and resolution of forces
- To illustrate the concepts of equilibrium of particles and rigid bodies in two and three dimensions
- To make the students to determine the centroid and moment of inertia of composite plane areas and to analyse trusses
- To impart knowledge on determination of shear force and bending moment in determinate beams

UNIT I   STATICS OF PARTICLES   12

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

UNIT II   EQUILIBRIUM OF RIGID BODIES   12

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

UNIT III   CENTROID AND MOMENT OF INERTIA   12

Centroids – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – Parallel axis theorem and perpendicular axis theorem- Centroids of T section, I section, - Angle section, Hollow section by using standard formula – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Product of Inertia – Principal axes and Principal moments of inertia of plane area.

UNIT IV   ANALYSIS OF TRUSSES   12

Analysis of pin jointed plane determinate trusses by method of joints, method of sections and method of tension coefficient

UNIT V   **ANALYSIS OF DETERMINATE BEAMS**   **12**

Types of beams and their supports –- Determinate and Indeterminate Beams - Types of loadings – Shear force and bending moment – Shear force Diagram and Bending Moment Diagram for Simply supported, Cantilever and over-hanging beams - Theory of simple bending – Bending stress distribution – shear stress distribution.

TOTAL: 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the concepts of mechanics to solve problems on statics of particles in two and three dimensions	3
CO2	Solve problems on equilibrium of rigid bodies in two and three dimensions	3
CO3	Evaluate centroid and moment of inertias of simple plane figures and composite plane areas	3
CO4	Determine member forces in truss using different methods of analysis	3
CO5	Draw the Shear force and Bending moment diagrams for determinate beams	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. David Mazurek, E. Russell Johnston, Ferdinand Beer, "Vector Mechanics for Engineers: Statics", McGraw-Hill Education (India) Pvt. Ltd. 12th Edition, 2019.
2. Rajput.R.K. "Essentials of Strength of Material"s, S.Chand & Company Ltd., New Delhi Reprint 2017.

REFERENCES:
1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers,1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education2010.
3. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015
4. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010
5. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van NosReinbhold, New Delhi 1999.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO3	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO4	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO5	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low
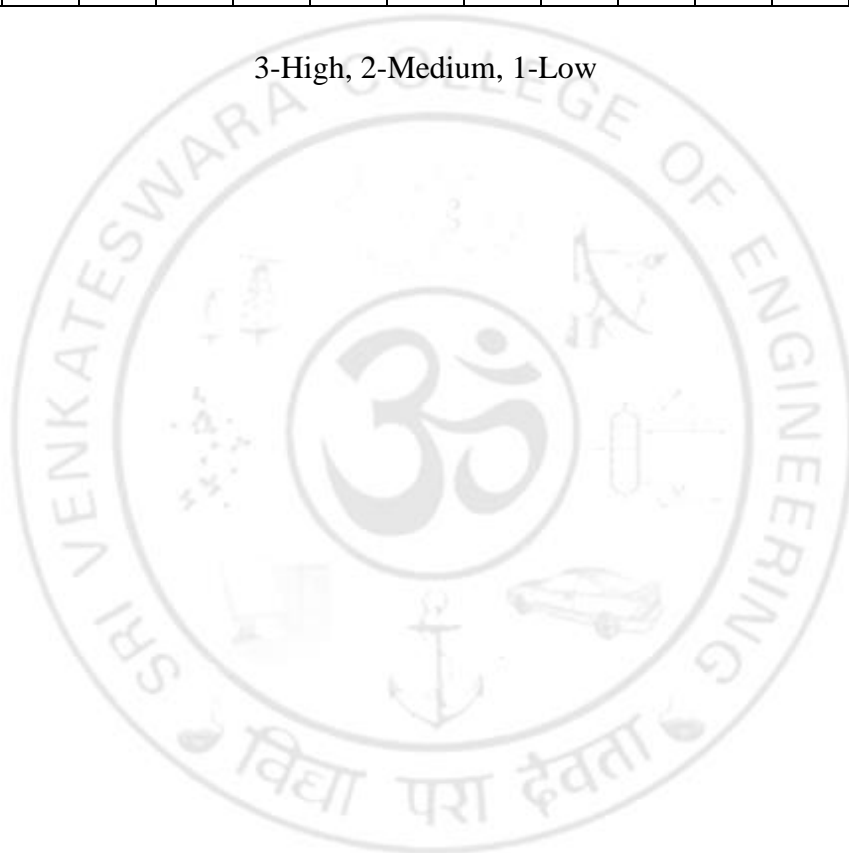
EE22111	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY (Common to all Branches except EC)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and basic laws of Electrical Circuits.

LIST OF EXPERIMENTS

1. Wiring – Residential house wiring and Stair case wiring.
2. (a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC.
   (b) Study of three phase system.
3. Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4. (a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice.
   (b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5. (a) VI Characteristics of Solar photovoltaic panel.
   (b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6. Design a 5V/12V Regulated Power Supply using FWR and IC7805/IC7812.
7. DC Analysis- Verification of Ohm's Law and Kirchhoff's Laws.
8. Study of Transformer and motor characteristics.

TOTAL: 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Verify the basic laws of Electric circuits and select various Electrical Machines.	4
CO2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	4
CO3	Construct electronic circuits and design solar photovoltaic system.	4
CO4	Apply the concept of three-phase system.	4
CO5	Construct a fixed voltage regulated power supply.	4

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata Mc Graw Hill (India), Second Edition, 2013.
2. Sedha R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	-	-	-	-	2	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	2	-	-	2	-	-
CO3	3	3	3	3	-	-	-	-	2	-	-	2	-	-
CO4	3	3	3	3	-	-	-	-	2	-	-	2	-	-
CO5	3	3	3	3	-	-	-	-	2	-	-	2	-	-

3-High, 2-Medium, 1-Low

CE22211	CONSTRUCTION MATERIALS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

 To develop skills to test various construction materials

LIST OF EXPERIMENTS

1. Tests on Cement
   a. Determination of fineness of cement
   b. Determination of consistency of cement
   c. Determination of specific gravity of cement
   d. Determination of initial and final setting time of cement
   e. Soundness test
2. Tests on Fine Aggregates
   a. Determination of specific gravity of fine aggregates
   b. Determination of Grading of fine aggregates
   c. Determination of water absorption of fine aggregates
3. Tests on Coarse Aggregates
   a. Determination of compacted and loose bulk density of coarse aggregate
   b. Determination of specific gravity and water absorption of coarse aggregate
4. Tests on Bricks
   a. Determination of compressive strength of bricks
   b. Determination of water absorption of bricks
   c. Determination of efflorescence of bricks
5. Tests on Concrete
   a. Determination of workability
      i. Slump cone test
      ii. Compaction factor test
      iii. Flow table test
      iv. Vee bee test
   b. Determination of compressive strength - Cubes
   c. Determination of split tensile strength - Cylinders
   d. Determination of Flexural strength - prisms
6. Exercise for demonstration only – Determination of compressive strength of concrete by using Rebound Hammer.

TOTAL: 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Determinate the physical and mechanical properties of cement and aggregates.	3
CO2	Determine the characteristics of bricks	3
CO3	Investigate the properties of fresh and hardened concrete.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. M. S. Shetty & A K Jain, Concrete Technology: Theory and Practice, S. Chand Publishing, 2019.

REFERENCES:

1. S.D Hasan, Civil Engineering Materials and Their Testing, Narosa Publication, reprinted in 2020.
2. IS 383– 2016 Indian Standard specification for coarse and fine aggregates from natural sources for concrete .
3. IS 516 -1959 – Indian Standard methods of tests for strength of concrete.
4. IS10262 -2019 – Indian standard Concrete Mix Proportioning — Guidelines.
5. IS 2386 – 1978, Methods of test for aggregates, Bureau of Indian Standards.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	1	1	-	-	-	-	3	1	-	-	3	3
CO2	3	1	1	1	-	-	-	-	3	1	-	-	3	3
CO3	3	1	1	1	-	-	-	-	3	1	-	-	3	3

3-High, 2-Medium, 1-Low

CE22301	SOIL MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The objective of this course is to impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I   SOIL CLASSIFICATION AND COMPACTION   9

Formation of soil - Soil description – Particle – Size shape and colour – Composition of gravel, sand, silt, clay particles – Particle behaviour – Soil structure – Phase relationship – Index properties –Significance – BIS classification system – Unified classification system – Compaction of soils –Theory, Laboratory and field tests – Field Compaction methods – Factors influencing compaction of soils.

UNIT II   EFFECTIVE STRESS AND PERMEABILITY   9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability interaction – Hydraulic conductivity – Darcy's law – Determination of Hydraulic Conductivity – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems. (Sheet pile and weir).

UNIT III   STRESS DISTRIBUTION AND SETTLEMENT   9

Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point land, Line land and udl) Use of New marks influence chart –Components of settlement — Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. - $\sqrt{t}$ and log t methods – e-log p relationship.

UNIT IV   SHEAR STRENGTH   9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V   SLOPE STABILITY   9

Stability Analysis - Infinite slopes and finite slopes – Total stress analysis for saturated clay – Friction circle method – Use of stability number – Method of slices – Fellenious and Bishop's method – Slope protection measures.

TOTAL :45 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems	3
CO2	Describe the basic understanding of flow through soil medium and its impact of engineering Solution	3
CO3	Describe the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation	3
CO4	Estimate the shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory.	3
CO5	Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.

REFERENCES:
1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2010.
3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning, Singapore, 8th Edition, 2013.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	2	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	3
CO3	3	2	2	2	-	-	-	-	-	-	-	-	3	3
CO4	3	2	2	2	-	-	-	-	-	-	-	-	3	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

		L	T	P	C
CE22302	**CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES**	3	0	0	3

COURSE OBJECTIVES:

The primary objective of this course is to make students aware of the various construction techniques, practices, and equipment required for various types of construction activities.

UNIT I   CONSTRUCTION TECHNIQUES   9

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism – Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact - Eco Building (Green Building) - Construction methods and Material used - Natural Buildings - Passive buildings – Intelligent (Smart) buildings - Building automation - Energy efficient buildings for various zones.

UNIT II   CONSTRUCTION PRACTICES   9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – Building   foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms –acoustic and fire protection.

UNIT III   SUB STRUCTURE CONSTRUCTION   9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement- Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and standby Plant equipment for underground open excavation.

UNIT IV   SUPER STRUCTURE CONSTRUCTION   9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks– in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braceddomes and space decks.

UNIT V   CONSTRUCTION EQUIPMENT   9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling

TOTAL PERIODS :45

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the different construction techniques and structural systems	2
CO2	Identify suitable site and techniques involved in good construction practices	2
CO3	Apply appropriate technique for sub structure in a construction project.	2
CO4	Apply appropriate technique for super structure in a construction project.	2
CO5	Identify the different construction equipment for various applications	2

TEXT BOOKS:
1. Shetty.M.S., Concrete Technology(Theory and Practice), S.Chand& Company Ltd., 2018.
2. Varghese.P.C., Building Constructions, PHI Learning Private Limited, 2016
3. Santhakumar.A.R., Concrete Technology, Oxford University Press ,India, 2018.
4. Deodhar, S.V.Construction Equipment and Job Planning, Khanna Publishers, New Delhi,2016

REFERENCES:
1. Peurifoy, R.L, Schexnayder,C.J., Shapira,A., Schmitt. R., Construction Planning, Equipment and Methods, Tata McGraw-Hill, 2018.
2. Punmia, B.C., Building Construction, Laxmi Publications (P) Ltd., 2016
3. Peurifoy, R.L., Form work for Concrete Structures, McGraw Hill Book Co., 2010.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO2	2	-	-	-	-	3	-	-	-	-	-	1	3	3
CO3	2	-	-	-	2	3	-	-	-	-	-	1	3	3
CO4	2	-	-	-	2	3	-	-	-	-	-	1	3	3
CO5	2	-	-	-	2	3	-	-	-	-	-	1	3	3

3-High, 2-Medium, 1-Low

	L	T	P	C
CE22303 **STRENGTH OF MATERIALS**	3	1	0	4

COURSE OBJECTIVES:

- To learn fundamental concepts of Stress, Strain and deformation of solids and to analyse a complex two dimensional state of stress.
- To know the slopes and deformations in beams.
- To know the concept of analyzing indeterminate beams
- To understand the effect of torsion on shafts and springs.
- To know the method of finding slope and deflection of beams and trusses using energy theorems

UNIT I   STRESS, STRAIN AND DEFORMATION OF SOLIDS   12

Simple Stresses and strains – Stress Strain Diagram – Deformation of axially loaded member - Composite Bars - Thermal Stresses – Elastic constants - State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Mohr's circle method

UNIT II   DEFLECTION OF BEAMS   12

Elastic curve – Differential equation of deflected beam - Double integration method - Macaulay's methods - Area moment method - conjugate beam method for computation of slopes and deflections of determinate beams.

UNIT III   INDETERMINATE BEAMS   12

Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT IV   TORSION AND SPRINGS   12

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts - strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Closed and Open Coiled helical springs

UNIT V   ENERGY PRINCIPLES   12

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact load),shear, flexure and torsion–Castigliano's theorems–Maxwell's reciprocal theorems - Principle of virtual work – unit load method- application of energy theorems for computing deflections in determinate beams, plane frames and plane trusses – lack of fit- temperature effects- Williot Mohr's Diagram.

TOTAL: 60 PERIODS

OUTCOMES:

CO	Statements After successful completion of this course, the students will be able to	RBT* Level
CO1	Solve problems applying the fundamental concepts of stress, strain, principal stresses and principal planes in mechanics of solids and structures.	3
CO2	Analyse and determine slope and deflection of determinate beams using appropriate method	4
CO3	Analyse indeterminate beams and draw shear force diagram and bending moment diagram.	4
CO4	Design shafts to transmit required power and also design helical springs for its maximum energy storage capacities.	3
CO5	Estimate strain energy and deflections of beams, trusses and frames using strain energy principles.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2015.
2. Rattan. S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi, 2012

REFERENCES:
1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi 2006.
2. Irwing H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
3. Beer. F.P. & Johnston.E.R."Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi 2010.
4. James M.Gere., Mechanics of Materials, Thomas Canada Ltd., Canada, 2006.
5. Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015.

COURSE ARTICULATION MATRIX:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2									3	3
CO2	3	3	2	2									3	3
CO3	3	3	2	2									3	3
CO4	3	3	2	2									3	3
CO5	3	3	2	2									3	3

3 - High, 2 -Medium, 1-Low

CE22308   **SURVEYING: THEORY AND PRACTICES** | L | T | P | C |

| 3 | 0 | 2 | 4 |

COURSE OBJECTIVES:

- To introduce the fundamentals of conventional surveying principles to Civil Engineers and to learn the various methods of plane and geodetic surveying to solve the real world problems.
- To introduce the concepts of Control Surveying.
- To introduce the basics of Modern Surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING   9

Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing – Plane table and its accessories – Merits and demerits – Radiation – Intersection – Resection – Plane table traversing

UNIT II LEVELLING   9

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling - Contouring.

UNIT III THEODOLITE SURVEYING   9

Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.

UNIT IV CONTROL SURVEYING AND ADJUSTMENT   9

Horizontal and vertical control – Methods – Triangulation – Traversing – Gale's table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

UNIT V MODERN SURVEYING   9

Total Station: Digital Theodolite, EDM, Electronic field book – Advantages – Parts and accessories – Working principle – Observables – Errors - COGO functions – Field procedure and applications. GPS: Advantages – System components – Signal structure – Selective availability and antispoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications.

PRACTICAL SESSIONS:

Chain Survey

   a. Determination Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset.
   b. Setting out works – Foundation marking using tapes single Room and Double Room

Compass Survey

   c. Compass Traversing – Measuring Bearings & arriving included angles

Levelling - Study of levels and levelling staff

   d. Fly levelling using Dumpy level
   e. Check leveling
   f. L.S & C.S - Road

Exp No.	Title of the Experiment	Unit mapped	CO	Contact hours
1.	Determination Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset.	1	1	6
2.	Setting out works – Foundation marking using tapes single Room and Double Room	1	1	6
3.	Compass Traversing – Measuring Bearings & arriving included angles	1	1	4
4.	Fly levelling using Dumpy level	2	2	4
5.	Check leveling	2	2	4
6.	L.S & C.S - Road	2	2	6
Total				**30**

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Introduce the fundamentals of various surveying and its principles.	3
CO2	Imparts knowledge in computation of levels of terrain and ground features	3
CO3	Imparts concepts of Theodolite Surveying for complex surveying operations	3
CO4	Understand the procedure for establishing horizontal and vertical control	3
CO5	Imparts the knowledge on modern surveying instruments	3

1-Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
2. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.

REFERENCES:
1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
3. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.

EVALUATION SCHEME:

FA 1 – Theory
FA 2 – Theory
FA 3 – Practical
Summative Assessment – Theory – 60% and Practical – 40%
Observation and Records will be maintained for Practical Sessions

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

CE22309	FLUID MECHANICS: THEORY AND PRACICES	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To introduce the students about properties of the fluids, behaviour of fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary layer theory and its applications.

UNIT I   FLUIDS PROPERTIES AND FLUID STATICS   9

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units viscosity , density , perfect gas, vapour pressure and surface tension - Basic equation of fluid statics- Pressure measurements - Manometers. - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies.

UNIT II   BASIC CONCEPTS OF FLUID FLOW   9

Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak- line and path-lines - Stream function and velocity potentials – Flow nets;
Dynamics Dimensional Concepts of System and Control volume - Application of control volume to continuity , energy and momentum – Euler's equation of motion along a stream line – Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation and their applications. Moment of momentum equation and its application.

**UNIT III   DIMENSIONAL ANALYSIS AND MODEL   9
                    STUDIES**

Fundamental dimensions - dimensional homogeneity – Rayleigh's method and Buckingham Pi Theorem - Dimensionless parameters - Similitude and model studies - Distorted and Undistorted Models.

UNIT IV   INCOMPRESSIBLE VISCOUS FLOW   9

Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V   BOUNDARY LAYER   9

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers -Momentum integral equation –Boundary layer separation and control- drag in flat plate – drag and lift co efficients.

PRACTICAL SESSIONS:

Expt. No.	Title of the Experiment	Unit Mapped	CO	Contact Hours
1.	Determination of Metacentric height of floating bodies	I	1	2
2.	Calibration of Rotameter	II	2	2
3.	Calibration of Orifice apparatus	II	2	4
4.	Calibration of Orificemeter	II	2	2
5.	Calibration of Venturimeter	II	2	2
6.	Bernouli's Experiment	II	2	2
7.	Calibration of Pitot tube	II	2	2
8.	Determination of discharge through rectangular notch	III	3	2
9.	Determination of discharge through V notch	III	3	2
10.	Determination of friction coefficient in aluminum pipe	IV	4	2
11.	Determination of friction coefficient in stainless steel pipe	IV	4	2
12.	Determination of friction coefficient in copper pipe	IV	4	2
13.	Determination of Minor Losses in pipes	IV	4	4
			Total	30

TOTAL: 75 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the differences between the solid and fluid and apply the fluid properties and its behaviour in static conditions to solve problems.	3
CO2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	3
CO3	Analyze the model for flow studies and to predict the performance of prototype.	3
CO4	Analyze the losses in pipe lines for both laminar and turbulent conditions.	3
CO5	Apply the boundary layer concepts to find the drag force exerted by fluid on the flat solid surface.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Modi P. N and Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi. 2017.
2. Dr.R.K.Bansal, A textbook of Fluid Mechanics and Hydraulic Machines,10th edition 2018.

REFERENCES:

1. Streeter, V .L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9thed) Tata McGraw Hill,New Delhi, 2010.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 1995.
3. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi,2014.
4. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University , 2004.
5. https://www.vlab.co.in/broad-area-civil-engineering

EVALUATION SCHEME:

FA 1 – Theory
FA 2 – Theory
FA 3 – Practical
Summative Assessment – Theory – 60% and Practical – 40%
Observation and Records will be maintained for Practical Sessions

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	3	-	3	2	1	2	-	-	1	3	3
CO2	3	3	-	3	-	3	2	1	2	-	-	1	3	3
CO3	3	2	-	-	-	3	-	1	-	-	-	1	3	3
CO4	3	3	-	3	-	3	2	1	2	-	-	1	3	3
CO5	3	2	-	-	-	3	-	1	-	-	-	1	3	3

3-High, 2-Medium, 1-Low

	L	**T**	**P**	**C**
CE22310 **HIGHWAY ENGINEERING: THEORY AND PRACTICES**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

- To give an overview on the basics of highway engineering and to impart the various process and methods involved in planning, development, design, construction and maintenance of highways with possible practical exposure.

UNIT I   **HIGHWAY PLANNING**   **6**

Classification of highways – Institutions for highway planning, design and construction in India – factors influencing highway alignment – Engineering surveys for alignment – application of statistics in transportation engineering: Regression analysis

UNIT II   **GEOMETRIC DESIGN OF HIGHWAYS**   **6**

Stopping Sight Distance – Overtaking Sight Distance – Super elevation design, extra widening of curves – Summit curve design – IRC standards

UNIT III   **PAVEMENT DESIGN**   **6**

Design of Flexible Pavement as per IRC – Design of Rigid Pavement as per IRC

UNIT IV   **PAVEMENT MATERIALS**   **6**

Desirable properties of subgrade soil (CBR Test), tests on road aggregates: Impact Test, Los Angeles Abrasion Test, Shape test, Crushing Strength Test and Test on Bitumen-Penetration test, Ductility test, softening point test, viscosity test

UNIT V   **PAVEMENT MAINTENANCE**   **6**

Types and causes of failures in flexible and rigid pavements – Maintenance of highway pavements – Strengthening existing pavements - evaluation, overlay design

TOTAL : 30 PERIODS

PRACTICAL SESSIONS:

S. No.	Title of the Experiment	Unit mapped	CO mapped	Practical hours
		Site Visit		
1	Local site visit (half a day)	II	2	3
		Test on Soil		
2	CBR Test 1	IV	4	3
		Tests on Road Aggregate		
3	Impact test	IV	4	3
4	Shape test	IV	4	3
5	Los Angeles Abrasion test	IV	4	3
6	Crushing Strength test	IV	4	3
		Tests on Bitumen		
7	Penetration test	IV	4	3
8	Ductility test	IV	4	3
9	Softening point test	IV	4	3
10	Viscosity test	IV	4	3
		Total		**30**

TOTAL: 60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Describe various factors considered in fixing alignment for a highway	2
CO2	Explain different components involved in highway geometric design	3
CO3	Design a flexible and rigid pavement as per IRC procedure.	3
CO4	Demonstrate different tests for highway materials and the relevant tests	2
CO5	Describe the procedure for pavement evaluation and maintenance methods	2

1-Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Veeraragavan.A, Khanna.K and Justo C.E.G. Highway Engineering, Nem Chand and Brothers Publishers, 2016 (10thedition).
2. Kadiyali L.R. Principles and Practices of Highway Engineering, Khanna Technical Publisher, Delhi, 2019.

REFERENCES:
1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, Scitech Publications (India), Chennai, 2010.
2. Subhash C Saxena, Textbook of Highway and Traffic Engineering., CBS Publishers, 2014.

3. R.Srinivasa Kumar., Textbook of Highway Engineering Universities Press (India) Private Limited, Hyderabad, 2011.

EVALUATION SCHEME:

FA 1 – Theory
FA 2 – Theory
FA 3 – Practical
Summative Assessment – Theory – 50% and Practical – 50%
Observation and Records will be maintained for Practical Sessions

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	1	-	-	3	-	-	-	-	-	3
CO3	3	-	-	-	1	-	-	-	-	-	-	-	-	3
CO4	3	3	3	-	-	-	-	3	-	-	-	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	3

3-High, 2-Medium, 1-Low

CE22311   STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:
- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS
1. Determination of Rockwell's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper by conducting hardness test.
2. Determination of Brinell's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper by conducting hardness test.
3. Determination of impact resistance of mild steel specimen by conducting Izod Impact test.
4. Determination of impact resistance of mild steel specimen by conducting Charpy Impact test.
5. Study the stress -strain characteristics of (a) Mild Steel and (b) Tor steel by conducting tension test using Universal Testing Machine.
6. Determination of shear strength of mild steel rod by conducting double shear test using Universal Testing Machine.
7. Determination of Modulus of rigidity of the material by conducting Torsion test on solid shaft
8. Determination of Modulus of rigidity of the material of a helical spring by conducting Compression test
9. Determination of Young's modulus of the material by conducting deflection test on a simply supported beam.
10. Determination of Modulus of elasticity of the material by conducting deflection test on a cantilever beam
11. Verification of Maxwell's reciprocal theorem by conducting deflection test on simply supported beam

TOTAL PERIODS : 30

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Determine the hardness and impact strength of metals using appropriate test apparatus	3
CO2	Evaluate the tensile and shear strength of materials using the relevant test procedures	3
CO3	Evaluate the elastic properties of material under compression, torsion and deflection tests	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. R.C. Hibbler, " Mechanics of Materials", 9th edition, Pearson Prentice Hall, 2014
2. U.C. Jindal, "Strength of materials", Pearson Education in South Asia, 2012
3. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011

REFERENCES:
1. Strength of Materials Laboratory Manual, 2013, Anna University, Chennai - 600 025.
2. IS1608-2005, Metallic materials – tensile testing at ambient temperature

COURSE ARTICULATION MATRIX:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	1	3	-	2	2	1	3	1	-	2	2	2
CO2	2	2	1	3	2	2	2	1	3	1	-	2	2	2
CO3	2	2	1	3	-	2	2	1	3	1	-	2	2	2

3-High, 2-Medium, 1-Low
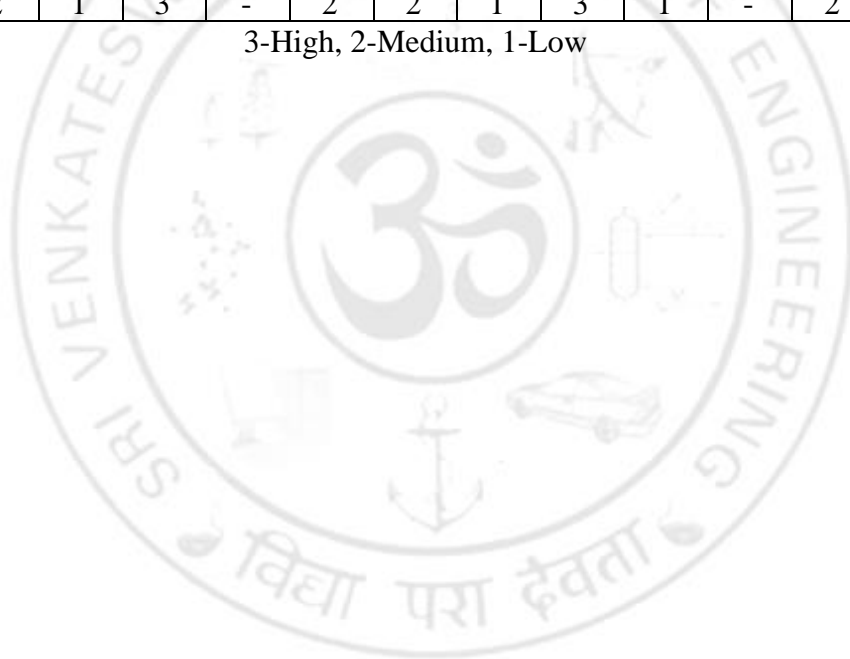
GE22451	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
	(Common to All Branches)	3	0	0	3

COURSE OBJECTIVES :

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.
- To study and understand the various types of renewable sources of energy and their applications.
- To familiarize the concept of sustainable development goals, economic and social aspects of sustainability, recognize and analyze climate changes, and environmental management challenges.
- To inculcate and embrace sustainability practices, develop a broader understanding of green materials and energy cycles, and analyze the role of sustainable urbanization.

UNIT I   ENVIRONMENT AND BIODIVERSITY   9

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– food chains, food webs and ecological pyramids, ecological succession. Biodiversity- types- genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: fragmentation and habitat loss, poaching of wildlife, human-wildlife conflicts – endangered and endemic species of India –conservation of biodiversity: In-situ and ex-situ.

UNIT II   ENVIRONMENTAL POLLUTION   9

Definition, causes, effects and preventive measures of air, water and soil pollution. Marine and thermal pollution - causes, effects and control measures. Light and noise pollution - effect on flora and fauna. Nuclear pollution- Sources, effects and control measures. Disposal of radioactive wastes (Nuclear hazards). Pollution case studies. Role of an individual in the prevention of pollution. Solid, hazardous and E-waste management. Occupational health and safety management system (OHASMS). Environmental protection, Environmental protection acts, categorization of spices according to IUCN.

UNIT III   RENEWABLE SOURCES OF ENERGY   9

Energy resources: Growing energy needs, Nonrenewable resources – types, uses. Energy management and conservation - New energy sources, Need of new sources - geo suitability of establishing renewable energy sources, different types new energy sources. Applications of hydrogen energy, ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Role of an individual in conservation of energy.

UNIT IV   SUSTAINABILITY AND MANAGEMENT   9

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development

goals, and protocols, Sustainable Development Goals-targets, indicators and intervention areas - Principles of green chemistry, Climate change- Global, Regional and local environmental issues and possible solutions-case studies - Role of non-governmental organization, Concept of carbon credit, carbon footprint - Environmental management in industry - A case study

UNIT V   SUSTAINABILITY PRACTICES   9

Zero waste and R concept, circular economy, ISO 18000 series, material life cycle assessment, environmental impact assessment. Wasteland reclamation, Sustainable habitat: green buildings, green materials, energy efficiency and energy audit, sustainable transports. Energy cycles, carbon cycle, emission and sequestration, Green engineering: sustainable urbanization- socio-economical and technological change. Rainwater harvesting, watershed management, environmental ethics: Issues and possible solutions.

TOTAL : 45 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Recognize the fundamental role of ecosystems and suggest an appropriate method for the conservation of biodiversity.	3
CO2	Describe the different types of pollution, their effects and strategies to control pollution.	3
CO3	Identify the various renewable energy resources and use the appropriate one thereby conserving non-renewable resources for future generation.	3
CO4	Explain the various goals of sustainable development applicable to suitable technological advancement and societal development.	3
CO5	Summarize the various sustainability practices, green materials, energy cycles, and the role of green engineering in sustainable urbanization.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 7th Edition, New Age International Publishers, 2022.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Pearson. 2011.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, CL Engineering, 2015.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 3rdedition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 3rd edition, 2021.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	-	3	3	2	-	2	-	-	-	-
CO2	3	-	-	-	-	3	3	2	-	2	-	-	-	-
CO3	3	-	1	-	-	3	3	1	-	2	-	-	-	-
CO4	3	-	-	-	-	3	3	3	-	2	-	-	-	-
CO5	3	-	-	-	-	3	3	3	-	2	-	-	-	-

3-High, 2-Medium, 1-Low

MA22453	STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods solving ordinary differential equations.

UNIT I   TESTING OF HYPOTHESIS   9+3

Introduction for random variable – Special distributions – Binomial, Geometric and Normal-Sampling distributions–Large sample test – Test for mean, proportion –Small sample test – Tests based on t and F – distribution for mean and variance– Chi square test for goodness of fit – Independence of attributes.

UNIT II   DESIGN OF EXPERIMENTS   9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT III   SOLUTION OF EQUATIONS AND EIGEN VALUE   9+3
**   PROBLEMS**

Solution of algebraic and transcendental equations–Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method–Iterative methods-Gauss Seidel- Eigenvalues of a matrix by Power method.

UNIT IV   INTERPOLATION, NUMERICAL DIFFERENTIATION   9+3
**   AND NUMERICAL INTEGRATION**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V   NUMERICAL SOLUTION OF ORDINARY   9+3
**   DIFFERENTIAL EQUATIONS**

Single step methods: Taylor's series method - Euler's method - Fourth order Runge – Kutta method for solving first order differential equations-Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL : 60 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the concept of testing of hypothesis for small and large samples to real life problems.	3
CO2	Apply the basic concepts of classifications of design of experiments to real life problems.	3
CO3	Appreciate the numerical techniques of interpolation in various intervals	3
CO4	Apply the numerical techniques of differentiation and integration for engineering problems.	3
CO5	Understand the knowledge of various techniques and methods for solving first order ordinary differential equations.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Grewal,B.S. and Grewal,J.S.,"Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, and Freund J.,"Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:
1. Burden, R.L and Faires, J.D, "Numerical Analysis",9th Edition, Cengage Learning,2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. GuptaS.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics",Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan R.A., "Schaum's Outline on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

WEBLINKS:
1. https://archive.nptel.ac.in/courses/111/107/111107105/
2. https://online.stat.psu.edu/stat503/lesson/1
3. https://online.stat.psu.edu/statprogram/reviews/statistical-concepts/hypothesis-testing

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-

3-High, 2-Medium, 1-Low

CE22401	STRUCTURAL ANALYSIS I	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the students to the basic theory and concepts of classical methods of structural analysis of beams, frames, arches and cable structures.

UNIT I   INDETERMINATE FRAMES   9

Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointed frames and rigid frames (Degree of static indeterminacy up to two) - Consistent deformation method.

UNIT II   SLOPE DEFLECTION METHOD   9

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry– Support displacements

UNIT III   MOMENT DISTRIBUTION METHOD   9

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway

UNIT IV   ARCHES   9

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects.

UNIT V   CABLE STRUCTURES   9

Beams curved in plan, Suspension cables – suspension bridges with two and three hinged stiffening girders

TOTAL : 45 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Analyse the pin-jointed and rigid jointed frames using consistent deformation method	3
CO2	Analyse the continuous beams and rigid frames by slope deflection method.	3
CO3	Apply the concept of moment distribution and analyse continuous beams and rigid frames with and without sway.	3
CO4	Analyse arches for given loading	3
CO5	Analyse the cable structures.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Bhavikatti, S.S,Structural Analysis,Vol.1,& 2, Vikas Publishing House Pvt. Ltd., NewDelhi-4, 2021.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2017.

REFERENCES:

6. Negi.L.S and Jangid R.S ., Structural Analysis , Tata McGraw-Hill Publishers, 2004.
7. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co. Ltd., Third Edition, 2010.
8. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.
9. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO3	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO4	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO5	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

CE22402   WATER SUPPLY AND WASTEWATER ENGINEERING

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To introduce students to various components and design of water supply scheme, sewerage system, sewage treatment and disposal.

UNIT I   WATER SUPPLY   12

Water demand - Surface and subsurface water resources - Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases - Standards for potable water. Intake of water: Pumping and gravity schemes.

UNIT II   WATER TREATMENT   12

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units - Coagulation and flocculation - Clariflocculator - Plate and tube settlers - Pulsator clarifier - Sand filters - Disinfection – Water softening - Removal of iron and manganese - Defluoridation - Desalination process – Residue Management - Construction, Operation and Maintenance aspects.

UNIT III   WATER STORAGE AND DISTRIBUTION   12

Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

UNIT IV   PLANNING AND DESIGN OF SEWERAGE SYSTEM   12

Characteristics and composition of sewage - Sanitary sewage flow and Storm runoff estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design - Sewer appurtenances – Sewage pumping - Drainage in buildings-plumbing systems for drainage.

UNIT V   SEWAGE TREATMENT AND DISPOSAL   12

Objectives - Selection of Treatment Methods - Principles, Functions - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - UASB - Waste Stabilization Ponds - Other treatment methods - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. - Discharge standards - Sludge treatment - Disposal of sludge

TOTAL : 60 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Describe the various sources and characteristics of water and determine the sizes of intake structure and conveyance system for water transmission	3
CO2	Describe the various unit operation and process of water treatment and compute the sizes of the water treatment units.	3
CO3	Determine the capacity of service reservoir, analyse the water distribution networks and describe the maintenance of distribution systems, pumping stations and house service connections.	3
CO4	Estimate sewage flow and storm runoff, describe the characteristics and composition of sewage and compute the sizes of sewerage system components.	3
CO5	Compute the sizes of the treatment units and explain the unit operations and processes that are involved in the treatment of sewage and sludge.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 35th Edition, 2022.
2. Garg, S.K. Environmental Engineering, Vol.II Khanna Publishers, New Delhi, 42nd Edition, 2022.

REFERENCES:
1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
3. Metcalf and Eddy – Waste water Engineering – Treatment and Reuse, Tata McGraw – Hill Company, New Delhi, 2017.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	1	-	2	3	-	-	-	-	-	3	2
CO2	3	2	2	1	-	2	3	-	-	-	-	-	3	2
CO3	3	2	2	1	-	2	3	-	-	-	-	-	3	2
CO4	3	2	2	1	-	2	3	-	-	-	-	-	3	2
CO5	3	2	2	1	-	2	3	-	-	-	-	-	3	2

3-High, 2-Medium, 1-Low

CE22403	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The objective of this course is to impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Objectives – Various steps of investigation – Types of boring–auguring and boring – Wash boring and rotary drilling – Depth of boring – Spacing of bore hole – Sampling techniques – Representative and undisturbed sampling – methods - Split spoon sampler, Thin wall sampler, Stationery piston sampler – Penetration tests (SPT and SCPT) - Bore log report – Data interpretation – Geophysical methods-seismic and electrical - Selection of foundation based on soil condition – Strength Parameters and Evaluation of Liquefaction potential

UNIT II SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum depth for rigid behaviour – Applications – Floating foundation – Special foundations – Seismic force consideration

UNIT IV PILE FOUNDATION 9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT, SCPT) – Negative skin friction – Uplift capacity- Group capacity by different methods (Feld's rule, Converse –

Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Lateral Load capacity of the pile.

UNIT V RETAINING WALLS 9

Retaining Wall - Types and application - Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls

TOTAL : 45 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Plan and execute a detailed site investigation to select geotechnical design parameters and type of foundation	3
CO2	Design shallow foundations, its component or process as per the needs and specifications.	3
CO3	Design combined footings and raft foundations, its component or process as per the needs and specifications.	3
CO4	Design deep foundations, its component or process as per the needs and specifications.	3
CO5	Design retaining walls, its component or process as per the needs and specifications.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics- (2016), New Age International (P) Ltd., New Delhi.
2. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2009

REFERENCES:

1. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering- (2009), 4th Edition, UBS Publishers and Distributors, New Delhi.
2. Braja, M. Das, Geotechnical Engineering; (2002), 5th Edition, Thomson Business Information India (P) Ltd., India
3. Donold P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New

Delhi,2017

4. Shashi K. Gulathi & ManojDatta, Geotechnical Engineering-. (2017), "Tata McGraw Hill

5. Muni Budhu ,Soil Mechanics and Foundation Engg.- (2011), 3rd Edition, John Wiely& Sons

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	-	2	-	3	-	-	-	-	3	3
CO2	3	3	3	2	-	2	-	3	-	-	-	-	3	3
CO3	3	3	3	2	-	2	-	3	-	-	-	-	3	3
CO4	3	3	3	2	-	2	-	3	-	-	-	-	3	3
CO5	3	3	3	2	-	2	-	3	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

CE22409	APPLIED HYDRAULIC ENGINEERING: THEORY AND PRACICES	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To impart basic knowledge about the open channel flows with analysis of uniform flow, gradually varied flows and rapidly varied flows
- To expose to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

UNIT I   UNIFORM FLOW   9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Computation in Steady uniform flow- Chezy equation, Manning equation - Best hydraulic sections for uniform flow- Specific energy and specific force.

UNIT II   GRADUALLY VARIED FLOW   9

Dynamic equations of gradually varied and spatially varied flows - Water surface flow Profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by: Direct step method and Standard step method -Applications.

UNIT III   RAPIDLY VARIED FLOW   9

Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Surges - positive and negative surges.

UNIT IV   TURBINES   9

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

UNIT V   PUMPS   9

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Air vessels, indicator diagrams and its variations-Savings in work done - Rotary pumps- Gear pump.

TOTAL: 45 PERIODS

PRACTICAL SESSIONS:

Expt. No.	Title of the Experiment	Unit Mapped	CO	Contact Hours
1.	Determination of conjugate depth of hydraulic jump	I	1	4
2.	Characteristics of Pelton wheel turbine	II	2	4
3.	Characteristics of Francis turbine	II	2	4
4.	Characteristics of Kaplan turbine	III	3	4
5.	Characteristics of Centrifugal pump /submersible pump	IV	4	6
6.	Characteristics of Gear pump	IV	4	4
7.	Characteristics of Reciprocating pump	V	5	4
			Total	30

TOTAL: 75 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Compute the discharge in a steady uniform flow in a channel using the concepts of energy equation	3
CO2	Analyse the various water surface profiles in the steady gradually varied flow.	3
CO3	Calculate the depth of flow before and after hydraulic jump using the concepts of momentum equation in the rapidly varied flows.	3
CO4	Analyse the performance of the various types of turbines.	3
CO5	Analyse the performance of rotodynamic pumps and reciprocating pumps	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Modi P. N and Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi. 2017.
2. Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2014.

REFERENCES:
1. VenTe Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi,2014.
3. Rajesh Srivastava, " Flow through open channels", Oxford University Press, New Delhi, 2008

4. Dr.R.K.Bansal, A textbook of Fluid Mechanics and Hydraulic Machines,10th edition 2018.
5. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2004.
6. https://www.vlab.co.in/broad-area-civil-engineering

EVALUATION SCHEME:

FA 1 – Theory
FA 2 – Theory
FA 3 – Practical
Summative Assessment – Theory – 60% and Practical – 40%
Observation and Records will be maintained for Practical Sessions

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	-	3	-	1	2	-	-	1	3	3
CO2	3	2	-	-	-	3	-	1	2	-	-	1	3	3
CO3	3	3	-	3	-	3	2	1	-	-	-	1	3	3
CO4	3	3	-	3	-	3	2	1	2	-	-	1	3	3
CO5	3	3	-	3	-	3	2	1	-	-	-	1	3	3

3-High, 2-Medium, 1-Low

CE22411   **SURVEY PRACTICAL**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:
- To impart knowledge about survey field techniques.

LIST OF EXPERIMENTS

Theodolite - Study of Theodolite
1. Measurements of horizontal angles by reiteration and repetition and vertical angles
2. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.
3. Curve setting by deflection angle

Tacheometry – Tangential system – Stadia system
4. Determination of Tacheometric Constants
5. Heights and distances by stadia Tacheometry
6. Heights and distances by Tangential Tacheometry

Contouring
7. Radial tachometric contouring
8. Grid Contouring
9. Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles
10. Traverse using Total station and Area of Traverse
11. Determination of distance and difference in elevation between two inaccessible points using Total station

TOTAL PERIODS : 30

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the principles of Theodolite to carry out various measurements in the field	3
CO2	Apply basic surveying knowledge to survey plain terrain	3
CO3	Use advanced instruments like Total station & EDM for efficient surveying	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.

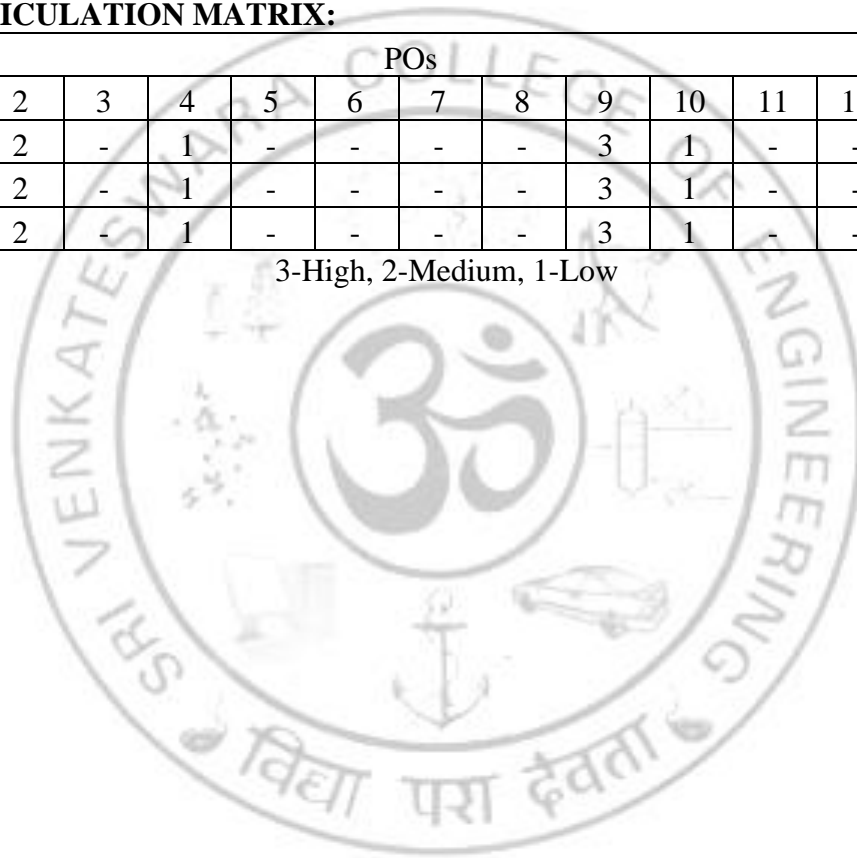2. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.

REFERENCES:

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
3. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.

COURSE ARTICULATION MATRIX:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	1	-	-	-	-	3	1	-	-	3	3
CO2	3	2	-	1	-	-	-	-	3	1	-	-	3	3
CO3	3	2	-	1	-	-	-	-	3	1	-	-	3	3

3-High, 2-Medium, 1-Low

	L	**T**	**P**	**C**
CE22412 **SOIL MECHANICS LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS

1. Determination of Index Properties
    a. Specific gravity test
    b. Grain size distribution curve using sieve analysis
    c. Liquid limit and Plastic limit test
    d. Shrinkage limit and differential free swell test

2. Determination of In-situ Density and Compaction Characteristics
    a. Core cutter test
    b. Sand replacement test
    c. Standard Proctor Compaction Test

3. Determination of Engineering Properties
    a. Constant and Variable head permeability test
    b. Bearing capacity of the soil from load settlement curve of the footing using the loading frame setup
    c. Direct shear test
    d. Unconfined compression test
    e. Vane shear test

4. Exercise for Demonstration only
    a. Triaxial Compression Test (Demo Only)
    b. One Dimensional Consolidation Test (Demo Only)

TOTAL PERIODS : 30

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Conduct tests to determine the index properties of soils.	3
CO2	Determine the characteristics of bricks	3
CO3	Conduct tests to determine the engineering properties of soils	3

1-Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Co-operative Society, Anna University, Chennai, 2010
2. Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) limited publishers, New Delhi, 2008.
3. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.
4. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.
5. G.Venkatappa Rao and Goutham .K. Potable, "Geosynthetics Testing – A laboratory Manual", Sai Master Geoenvironmental Services Pvt. Ltd., 1st Edition 2008
6. Braja M.Das., "Soil Mechanics: Laboratory Manual", Oxford University Press, eighth edition, 2012.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	-	-	-	-	3	1	-	-	3	2
CO2	3	2	-	-	-	-	-	-	3	1	-	-	3	2
CO3	3	2	-	-	-	-	-	-	3	1	-	-	3	2

3-High, 2-Medium, 1-Low

VD22401	**APPLICATION OF PLANNING TOOL IN CONSTRUCTION PROJECTS**	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To understand the significance of project planning in construction projects and give hands on experience to prepare project schedules using computer software which enables the project manager to execute the projects effectively.

COURSE CONTENT :

Introduction – Phases of construction project – Project Stakeholders – Types of Construction projects - Project Planning and Management - Purpose and Objective, Applications of Computer in Project Management - Role of Construction Management - Planning of Manpower, construction Materials, equipment - Planning engineer skills & responsibilities – Cost Control - Schedule Control - Project Planning using a computer tool - Creating new project with Planned Start Date, Defining Calendars, Organizing Work Breakdown Structure - Define WBS structure, Adding Activities, Estimate the activity duration, Assigning Relationship to the Activities, Assigning Predecessors and Successors, Scheduling the Project, Assigning Resources and Costs to Activities, Cost Forecast, Roles assignment, Budgeted Cost - Updating the project, Budgeted and Actual Cost Comparison based on S-Curve.

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the concepts of planning and scheduling of a construction project using the computer tools.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Jongpil Nam, "Construction Scheduling with Primavera P6" Author House UK Ltd. 2016
2. Vinayagam.P, Vimala.A., "Planning and Managing Projects with Primavera P6 Project Planner" I.K. International Publishing House Pvt. Ltd. 2017.
3. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGraw-Hill Publishing Company, New Delhi, 1998.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	3	-	3	3

VD22402	**GIS TOOLS IN CIVIL ENGINEERING**	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To give practical exposure to the students to data input, data storage, data analyses and data output capabilities of a standard GIS software (proprietary and open software's)
- It also adds skills in mapping techniques and map outputs.

COURSE CONTENT :

Fundamentals of GIS - Georeferencing of toposheet and creating vector layers, attribute tables and layout Preparation – Rectification and Spatial Referencing of Digital Map - Onscreen Digitization and Database Creation - Data Conversion - Vector to Raster, Raster to Vector - Analysis of data and creation of maps using Google earth maps - Open-source GIS (Preferably QGIS) Demo – Mini Project: Development of Digital Map of a City using QGIS software.

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Adopt the software skills to collect, process and analyse data using in digital image processing, Global positioning system in real time.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Ian Heywood, Sarah Cornelius, Steve Carver, An Introduction to Geographical Information
   Systems, Pearson Education, 4th Edition, 2012.
2. Michael N. DeMers, Fundamentals of geographic information systems, Wiley, 2009.
3. QGIS Training Manual (https://docs.qgis.org/3.28/en/docs/training_manual/index.html)

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22403	**FINITE ELEMENT ANALYSIS USING COMPUTER TOOLS**	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

* To impart knowledge on the basics of Finite element analysis using software

COURSE CONTENT :

Overview of Finite Element Analysis – Basics of Statics and Strength of Materials, Introduction to Finite Element software – Applications - computer tools - Programming mode and GUI software, Preprocessing - Basic geometry creation methods in Workbench- Meshing methods – refinement, Solving the problem – Post processing of results, types of analysis – static structural analysis, buckling analysis and non linear analysis, thermal analysis and dynamic analysis

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Apply the basics of Finite Element Analysis and its application using Computer Tools.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Ansys Workbench 14.0 for Engineers and Designers (MISL-DT) – 2013
2. Introduction to ANSYS 16.0 (English, Paperback, Choudary R. B.) - 2016

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22404	WATER CONSERVATION TECHNIQUES	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To emphasis the importance of ground water conservation

COURSE CONTENT :

Hydrology cycle - Rainfall- Run off relation – Importance of water conservation - Need of planned utilization of water resources – Traditional water harvesting techniques - Indoor water conservation – Outdoor water conservation - Check dams ,Farm Pond and other water storage works – Percolation pond- Evaporation suppression - Seepage reduction- Groundwater recharge - Water reuse – Rainwater harvesting- Water conservation practices in irrigated lands – Public education about water conservation techniques.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Enumerate the different water conservation techniques.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Santhosh Kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, Delhi.
2. G.L.Asawa, Irrigation and Water Resources Engineering ,New age international(p) ltd. publishers, New Delhi.

REFERENCES:
1. A Manual on "Rainwater Harvesting and Conservation": Government of India, Consultancy Service Organization Central Public Works Department, New Delhi.
2. Pietro Laureano, Water Conservation Techniques in Traditional Human Settlements COPAL publishing
3. Madireddi V. Subba Rao Water Conservation, Management and Analysis Read worthy Publications Pvt Ltd.
4. Traditional Water Harvesting Systems of India" C.P.R. Environmental Education Centre, Chennai, India (2004).
5. "A Water Harvesting Manual for Urban Areas" issued by Centre for Science and Environment.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22405   **VASTU IN CONSTRUCTION**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:
- To impart knowledge on the Vastu concepts in Civil Engineering

COURSE CONTENT :

Introduction to Vastu concepts, importance of Vastu, advantages of Vastu, disadvantages of Vastu, Basic Principles of Vastu Shastra: The Ten Directions– site selection and sub soil exploration - Open Space planning and Building design - Floor level Height factors – Verandas- Balconies -Porch Basements- Water flow - Mezzanine floors - Plants and Greenery - Vastu rules for rooms.

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Describe the applications of Vastu concepts in Civil Engineering practices.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Vaibhav Chawadre, Indian Vastu Shastra, Create space Independent Publishers, December 2015.
2. B. B. Puri, Applied Vastu Shastra Vaibhavam in modern architecture, Vastu Gyan Publication, 1997.

REFERENCES:

1. Ranjeet. P , D.V.S. Narshima Rao and Md. Akram Ullah Khan, Vastu in construction in civil Engineering point of view, International Journal of Research in Engineering and Technology (IJRET), Volume: 05 (04), 102-106, 2016.
2. Subodha Jalote, R. K. Pandey, C. B. Gupta, C. S. Mishra, Vikas Shrivastav, Application of Vastu in Construction, International Journal of Engineering and Advanced Technology (IJEAT), Volume-4 (6), 30-32, 2015.
3. Prabhu, Balagopal,T.S and Achyuthan,A, A text Book of Vastuvidya, Vastuvidya pratisthanam, 2011.
4. D. N. Shukla and Vastu-Sastra: Hindu Science of Architecture, Munshiram Manoharial Publishers, 1993.
1. V. Chakra borty, Indian Architectural Theory: Contemporary Uses of Vastu Vidya at Google Books.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

		L	T	P	C
VD22406	**BUILDING VALUATION**	**2**	**0**	**0**	**2**

COURSE OBJECTIVES:

- To understand the terminologies and concepts behind the valuation of buildings

COURSE CONTENT :

Principles of valuation, definition of value, price and cost. Attributes of value, Different types of values - Essential characteristics of market value. Valuer and his duties, purpose of valuation and its function. Factors affecting the valuation of properties-tangible and intangible properties, Landed properties- free hold and leasehold properties, different types of lease, Rental method of valuation – Rent control act - Value of land, belting method of valuation, Valuation based on land and building- item wise, cubic content basis. Valuation from yield Depreciation, different methods of calculating depreciation – Depreciated cost, Valuation of residential building, commercial industrial buildings.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Assess the value of buildings considering various influencing factors.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Jagannathan .G, "Getting More at Less Cost", - The Value Engineering Way, Tata McGraw Hill, New Delhi, 1992.
2. Rangwala .S.C, "Valuation of Real Properties", Charotar Publishing House,Anand, 2015.

REFERENCES:
1. V N Vazirani, S P Chandola, Civil Engineering Estimating, Costing and Valuation, Kanna Publishers.
2. B N Dutta, Estimation and Costing in Civil Engineering, 28th revision, 2016.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	3	-	3	3

3-High, 2-Medium, 1-Low

		L	**T**	**P**	**C**
VD22407	**DESIGN OF MULTISTOREY BUILDING**	**2**	**0**	**0**	**2**

COURSE OBJECTIVES:

- To impart principles of analysis and design of multi storey buildings subjected to gravity loads and lateral loads

COURSE CONTENT :

Multi storied buildings - Determination of dead load, live load, wind load and earthquake load on various components of the buildings - Analysis and design for gravity and lateral forces like wind load, earthquake loads. Detailing of reinforcement and bar bending schedule - Requirement of ductility in Multistoried Building- Ductile detailing of beams, columns and foundation – Design of transverse reinforcement in columns and shear stirrups in beams- confining reinforcement

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Analyse and design multi storey buildings subjected to gravity loads and lateral loads	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Unnikrishna Pillai, S., DevdasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi 2003.
2. Dr.S.R.Karve and Dr.V.L.Shah, "Illustrated Design of Reinforced Concrete Buildings", Nineth Edition, Structures Publications.

REFERENCES:
1. U.H. Varyani, "Structural Design of Multi Storeyed Building", Second Edition, Standard Publishers Distributors.
2. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2003.
3. W. Schueller, High Rise Building Structures: John Wiley & Sons, 1977.
4. B S Smith & A Coull, Tall Building Structures: - John Wiley & Sons, 1991.
5. http://ethesis.nitrkl.ac.in/4250/1/Computer_Aided_Analysis_and_Design_of_Multi-Storeyed_Buildings.pdf
6. http://www.iitk.ac.in/nicee/IITK-GSDMA/EQ26.pdf

COURSE ARTICULATION MATRIX :

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	3	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22408	**CORROSION OF STEEL IN CONCRETE AND PREVENTIVE MEASURES**	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To introduce the principles of corrosion and corrosion control techniques

COURSE CONTENT :

Corrosion of steel in concrete - Causes and mechanisms of corrosion – Carbonation - Chloride attack - Corrosion damage - Vertical cracks and horizontal cracks - Condition evaluation - Quantification of corrosion damage - Half cell potential measurements - Carbonated depth measurement - Chloride determination - Resistivity measurement - Corrosion rate measurement - Corrosion protection techniques - Cathodic protection - Sacrificial anode – Corrosion inhibitors - Concrete coatings - Corrosion resistant steels - Coatings to reinforcement - Indian standard codal requirements for enhancing durability of R.C.C. structures.

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Describe the various corrosion testing methods and the types of corrosion control techniques in field.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Broomfield John P, Corrosion of Steel in Concrete , Taylor & Francis, 2023.
2. Amir Poursaee, Corrosion of Steel in Concrete Structures, Woodhead Publishing, 2023
3. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution 2009.

REFERENCES:
1. Luca Bertolini PhD, Dr. sc. tech. Bernhard Elsener PhD, Pietro Pedeferri Rob B. Polder PhD, Wiley, Corrosion of Steel in Concrete: Prevention, Diagnosis, Repair, Wiley-VCH, 2004
2. Dodge Woodson, Concrete Structures, Protection, Repair and Rehabilitation, Butterworth Heinemann, Elsevier, New Delhi 2012.
3. Mars G. Fontana, Corrosion Engineering Mc-Graw Hill Publishers, New Delhi, 2001.
4. Ravishankar.K., Krishnamoorthy. T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Allied Publishers, 2004.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22409   **WASTEWATER TREATMENT TECHNIQUES**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To give sound knowledge with understanding of wastewater treatment technologies to the students

COURSE CONTENT :

Domestic wastewater treatment - Wastewater characteristics - Primary, secondary and tertiary treatment - Unit operations and processes - Physical unit operations - Biological unit processes: Aerobic and anaerobic processes, suspended and attached growth systems, batch and continuous systems - Aerobic treatment; Suspended growth aerobic treatment processes; Activated sludge process and its modifications; Attached growth aerobic processes; Tricking filters, Bio-towers and Rotating biological contactors - Anaerobic treatment; Suspended growth, Attached growth, Fluidized bed and Sludge blanket systems; DEWATS systems - Industrial wastewater treatment- Nitrification, Denitrification; Phosphorus removal, – Heavy metal removal – Membrane separation process – Air stripping and Absorption processes - Sludge treatment - Aerobic sludge stabilization - Anaerobic sludge stabilization and Sludge composting - Operations and maintenance of treatment plants, Troubleshooting – Eco toilets - Tertiary treatment techniques, Plant layout - Filtration, Softening process, Defluoridation, Removal of Odors -Treated municipal wastewater discharge systems, Post treatment techniques - Visit to a municipal wastewater treatment plant.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Design wastewater treatment plant units based on the characteristics of wastewater.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi, 2013.
2. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi, 2012.
3. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
4. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993.
5. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
6. Metcalf and Eddy, M.C., "Wastewater Engineering – Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	3	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22410	AUTOMATION IN CONSTRUCTION	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:
- To introduce the students the concepts of automation in construction

COURSE CONTENT :

Introduction- Present Scenario of automation in construction – Areas of automation in construction –Advantages of automation - Photogrammetric mapping for construction - LiDAR mapping and 3D point clouds - Unmanned Aerial Vehicle (UAV) / Unmanned Aircraft System (UAS) applications in construction - Simultaneous localization and mapping (SLAM) - Machine automation for civil engineering applications - Sensing technology for construction and maintenance - Field robotics - Augmented and virtual reality - Advanced computing in construction - Building information modelling (BIM)- Computer-aided construction and management

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Describe the scope of automation principles in construction.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Robotics and Automation in Construction, Edited by Carlos Balaguer and Mohamed Abderrahim, ISBN 978-953-7619-13-8, 404 pages, Publisher: InTech,2008.
2. Javad Majrouhi Sadroud, Automation in Construction Management – Automated Management of Construction Materials using RFID Technology, Scholar's Press, 2014.

REFERENCES:
1. Thomas Book, Thomas Linner, Robot – Oriented Design – Design and Management Tools for the Deployment of Automation and Robotics in Construction, Cambridge Handbook on Construction Robotics.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22411   **BIOMIMICRY IN CIVIL ENGINEERING**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- Understand the principles of biomimetics and how to adopt biomimicry in civil engineering.

COURSE CONTENT :

Introduction to biomimetics, evolution and approach towards biomimicry, biomimicry – a sustainable design, applications in construction materials, paint (lotus concept), architectural design of buildings and bridges, water harvesting, passive cooling systems, self-healing buildings, examples of buildings inspired by nature. Applications of Biomimicry in Construction and Architecture

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the concepts and applications of biomimicry in civil engineering.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Pacheo Torgal,F., Labrincha, J.A., Diamanti, M.V., Yu, C.P., Lee, H.K., "Biotechnologies and biomimetics for Civil Engineering", Springer, 2015.
2. Akhlesh Lakhtakia ,Raúl José Martín-Palma , "Engineered Biomimicry", Elsevier , 1st Edition, 2013.

REFERENCES:
1. Peter Forbes, "The Gecko's Foot: Bio-inspiration: Engineering New Materials from Nature", W. W. Norton & Company , May 17, 2006.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

		L	T	P	C
VD22412	**BUILDING ACOUSTICS**	2	0	0	2

COURSE OBJECTIVES:

- To understand basic concepts of acoustics and human hearing, behavior of sound in enclosed spaces, the theories on architectural acoustics, and the basic principles of noise control and acoustic comfort in buildings.

COURSE CONTENT :

Introduction to acoustics, effects of noise, basic principles of sound – Acoustical dry wall systems and panels – Room acoustics – absorption, reflection, refraction and diffusion – Building acoustics – noise control applications – hearing and perception – non-acoustic spaces – auditorium acoustics – acoustical measurement, analyses and modeling – Regulations and guidelines, Green materials with acoustic applications

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Describe the principles of acoustical design of buildings	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Marshall Long, "Architectural Acoustics", Academic Press, 2nd Edition, March 2014.
2. Tor Erik Vigran, "Building Acoustics", CRC Press, 1st Edition, July 2008.

REFERENCES:

1. M.D. Egan, "Architectural Acoustics,', Mc Grawhill Inc., 1988.
2. John Edwin Moore, "Design for Good Acoustics and Noise Control", Macmillan Education, 1988.
3. M. D. Egan, "Concepts in Architectural Acoustics", Tulane University, School of Architecture, 1972.
4. J. Flynn, J. A. Kremers, A. W. Segil, G. Steffy, Van Nostrand Reinhold, "Architectural Interior Systems, Lighting, Acoustics, Air Conditioning",Van Nostrand Reinhold , 1992.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22413	FORENSIC CIVIL ENGINEERING	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

To introduce the various aspects of investigation involved in Failure of structures

COURSE CONTENT :

Testing of failures - Various methods of testing of failed structures - Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology. Structural Failures - Failure of construction materials steel, concrete - Joints by Bolt and weld. Failure of compression members and tension members by reversal of loads – Failure aspects of post tensioned concrete systems, space frame, plane frame, precast buildings, failure of bridges. Geo Technical Failures - Soil liquefaction, failure of foundation systems – Causes and prevention. Designing Against Failure - Quality control – Material selection, workmanship, design and detailing. Case Studies And Professional Practice - Case Studies on famous failures – Reasons and lessons learnt – Aspects of professional practice.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarize the different failures encountered in civil engineering practice and explain how to investigate them.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Robert Ratay, "Forensic Structural Engineering Handbook", McGraw-Hill Education, 2nd Edition, 2010.
2. Stephen E. Petty, "Forensic Engineering – Damage Assessments for Residential and Commercial Structures", CRC Press, 1st Edition, 2013.

REFERENCES:
1. "Forensic Engineering – 2012", proceedings of sixth ASCE Conference of Forensic Engineering held in San Francisco, California, Oct 31- Nov 03, 2013.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22414	OPTIMIZATION TECHNIQUES	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

    . To introduce the various optimization techniques.

COURSE CONTENT :

Introduction – Phases of construction project – Project Stakeholders – Types of Construction Introduction to Optimization -Design Variables -Objective function – Constraints -Problem Formulation– Linear Programming Problem - Simplex method – Big-M Method- Two - phase method – Duality Problem – Unconstrained Single and Multi - Variable Optimization - Optimality Criterion -Constrained Optimization Technique -Lagrange multipliers and Kuhn-Tucker conditions -Solution of Optimization Problems using Excel and MATLAB - Applications of Genetic Algoritmh, Particle Swam Optimization, Firefly algorithm in Civil Engineering

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Apply the basic concepts of mathematics to formulate an Optimization problem.	3
CO2	Solve Optimization problems using MATLAB and MS Excel Platform.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Singiresu S Rao, "Engineering Optimization – Theory and Practice", New Age International Publishers, 2013.
2. A.K. Malik, S.K. Yadav and S.R. Yadav, "Optimization Techniques", IK Publishers, 2013.

REFERENCES:

1. J.C. Pant, Introduction to Optimization, Jain Brothers, 2008.
2. S.S. Rao, Optimization Theory and Applications, Wiley Eastern, 2004.
3. K.V. Mittal, Optimization Methods, Wiley Eastern, 2003.
4. H.A. Taha, Operations Research, Pearson, 2007.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22415   IN-SITU SOIL TESTING AND INSTRUMENTATION

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:
- To understand the various parameters to be arrived from field test
- To interpret the required properties of soil for designing structural elements

COURSE CONTENT :

Procedure, limitations, correction and data interpretation of following methods - Field index property tests - Penetration tests - Field vane shear test (In-situ shear and borehole shear test) – Pressure meter test – Dilatometer test – Plate load test (Monotonic and cyclic) – Field permeability tests – Block vibration test

Instrumentation in soil engineering –Data acquisition system – Strain gauges – Load cells – Earth pressure cells – Settlement and heave gauges – Pore pressure measurements - Slope indicators

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Describe the different in situ soil testing and instrumentation methods.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Alam Singh and Chowdhary, G.R., Soil Engineering in Theory and Practice, Volume-2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New Delhi,2006.
2. Nair, R.J. and Wood, P.M., Pressuremeter Testing Methods and Interpretation, Butterworths, 1987.

REFERENCES:
1. Dunnicliff, J., and Green, G.E., Geotechnical Instrumentation for Monitoring Field Performance, John Wiley, 1993.
2. Hunt, R.E., Geotechnical Engineering Investigation Manual, McGraw Hill,1984.
3. Hanna, T.H., Field Instrumentation in Geotechnical Engineering, Trans Tech., 1985.
4. Day, R.N., Geotechnical and Foundation Engineering, Design and Construction, McGraw-Hill, 1999.
5. Bowles, J.E., Foundation Analysis and Design, Fifth Edition, The McGraw-Hill companies, Inc., New York, 1995.
6. Clayton C. R. I., Matthews M. C. and Simons N. E., Site Investigation, Second Edition Halsted Press, 1982.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

	L	T	P	C
VD22416 **NON DESTRUCTIVE TESTING TECHNIQUES**	2	0	0	2

COURSE OBJECTIVES:

To introduce the various non-destructive testing (NDT) techniques currently employed for evaluation and condition monitoring of civil structures and construction materials.

COURSE CONTENT :

Introduction to Non-Destructive evaluation – Methods of Non-Destructive evaluation – Visual Inspection -Principles – Manual, Automated or Machine Vision Inspection - Liquid Penetrant Testing - Penetrant Materials , Considerations and Procedure - Ultrasonic Testing - Basic Principles of sound generation - Pulse echo and through transmission testing - RADAR and microwaves - Principle of the measurement - Magnetic Particle - Magnetism and Ferromagnetic Materials -Basic Procedure and Important Considerations - Radiology - Electromagnetic Radiation - General Principles of Radiography - Sources of Radiation - Thermography - Theory and applications - Acoustic Emission Testing - Applications of NDT in Civil Engineering -**Case studies** :NDT for detection of cracks voids in concrete bridges, NDT for steel bridges, NDT on masonry bridges

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Describe the basic principles and the method of application of the common Non - destructive Evaluation techniques	2
CO2	Discuss the applications and limitations of each of the techniques.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Malhotra, V.M. and Carino, N.J., Handbook on Non-Destructive Testing of Concrete, 2nd Ed., Taylor and Francis, London.
2. Bungey, S., Lillard, G. and Grantham, M.G. Testing of Concrete in Structures, 4th Ed. Taylor and Francis, London

REFERENCES:

1. Peter J. Shull and Marcel Dekker. "Nondestructive Evaluation – Theory, Techniques, and applications", ed., 2002.
2. Paul E. Mix, "Introduction to Nondestructive Testing: a Training Guide", 2nd ed., John Wiley & Sons, 2005.
3. Handbook on Nondestructive Testing of Concrete: Second Edition, V.M. Malhotra and N.J. Carino http://www.ndt-ed.org

4. Charles J. Hellier, "Handbook of Nondestructive Evaluation", McGraw-Hill, 2001.
5. Krautkramer, H., "Ultrasonic Testing of Materials", Springer-Verlag, 1969.
6. Novgoresky, M.A., "Testing of Building Materials and Structures", Mir Publishers, 1973.
7. American Society of Metals: Handbook, Vol. II, Destructive Inspection and Quality Control, 1976

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	3	-	-	-	-	-	-	-	3	3
CO2	3	3	2	2	3	-	-	-	-	-	-	-	3	3
CO3	3	3	2	2	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low
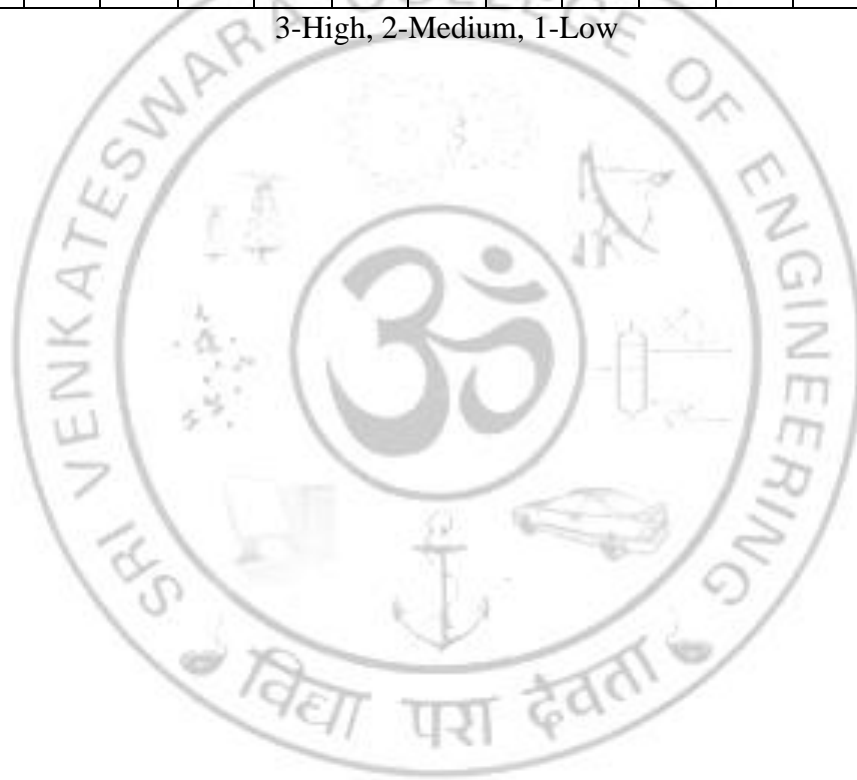
		L	T	P	C
VD22417	**BASE ISOLATION AND DAMPING TECHNIQUES IN ASEISMIC DESIGN**	2	0	0	2

COURSE OBJECTIVES:

- This course is designed to give an insight into the conventional techniques and latest developments regarding base isolation and damping techniques in aseismic design of civil engineering structures.

COURSE CONTENT :

Base isolation Techniques – Need – Mechanism – Types – Laminated Rubber bearing – Lead core rubber bearing – Roller Pendulum system (RPS) – Seismic dampers – Types – Metallic dampers- friction dampers – viscous fluid dampers – Semi-active dampers - Magneto-rheological Fluid dampers for vibration control - RPS augmented with Magneto-rheological fluid dampers for seismic isolation – Magneto-rheological elastomers and gels for seismic isolation – Shape memory alloys for vibration control – Design guidelines for base isolation – Isolation system – Building example – Bridge example

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Analyze the convensional and smart techniques for seismic isolation and damping of structures	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Anil K. Chopra, "Dynamics of Structures – Theory and applications to Earthquake Engineering", Pearson Education, 2019
2. Kelly T.E., "Bas Isolation of Structures – Design guidelines", Holmes consulting Group ltd., 2001.
3. Kelly T.E., "In-Structure Damping and energy dissipation", Holmes consulting group ltd., 2001.
4. S.R. Damodarasamy & S. Kavitha, " Basics of structural Dynamics and Aseismic design", PHI Learing private Limited, New Delhi, 2012.
5. A.V. Srinivasan & D. Michael McFarland, " Smart Structures –Analysis and Design",
6.   Cambridge University Press, 2001
7. Farzad Naiem and James M. Kelly, "Design of Seismic Isolated structures", John Wiley and Sons, 1999
8. Gian Paolo Cimellaro, "Seismic Isolation, Energy Dissipation and Active Vibration Control of Structures", 17th World Conference on Seismic Isolation, conference Proceedings, Springer, 2023

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22418	INTERIOR DESIGNING	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:
- To understand the basics of interior designing

COURSE CONTENT :

Theory of interior design - Fundamentals of design - Fundamentals of structure - Introduction to computers - Analytical drawing - Anthropometry and Ergonomics - History of crafts and interior design, Research strategy and design process - Building services, Residential space design, Applications of AutoCAD and SketchUp software for interior designing.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the concepts of interior designing.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Chris Grimley, Mimi Love, "The Interior Design Reference & Specification Book updated & revised: Everything Interior Designers Need to Know Every Day", January 2018
2. Frida Ramstedt, "The Interior Design Handbook: Furnish, Decorate, and Style Your Space" – 27 October 2020.

REFERENCES:
1. Lawrence Bauer, Michael, Mösle, Peter, Schwarz, Michael Green building, Springer-Verlag Ahmed Kasu, Interior Design, TWAIN Pub. Bombay
2. Sudhir Diwan, Sanskruti a manual of Interior DesignVol-1, Interior Affairs, Mumbai
3. Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.
4. Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.
5. Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.
6. Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979. Karlen
7. Barner, R.M., (1980), Motion and Time Study, Design and Measurement of work, John Wiley, New York

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	2	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22419   **LANDSCAPING ARCHITECTURE**

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To understand the necessity of planning landscaping.

COURSE CONTENT :

Site analysis, synthesis, suitability, landscape zoning and planning with landscape land uses for medium to large scale projects - visualising landforms - Understanding contours and their characteristics, graphical representation, - Surface Drainage: Site planning for efficient drainage; understanding drainage pattern and watershed area - Landscape Construction - Circulation: Roads and Parking, paths and plazas - Level Change: Wall, steps and ramps - Planting: Planters, beds, edges and terraces - Water elements: Pools and water bodies - Landscape simulation and site utilities: Basic planning and understanding of principles for: - External lighting; types of fixtures and their use in varying situations - Irrigation: broad systems and their utility as per plantation typology - Street furniture / site furnishings

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the methodology for planning exterior landscaping.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Simonds. J. O. (1961). Landscape Architecture, The Shaping of Man's Natural Environment.London: F.W. Dodge Cooperation.
2. Harris.C.W and Dine.N.T ; (1997) Time Saver Standards For Landscape Architecture, Mcgraw – Hill International Edition, Arch. Series
3. Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. 5 editions. McGraw-Hill Professional
4. Baker.B.H (1987) A Dictionary of Landscape Architecture.Albu : University of New MexicoPress
5. Reid G. W: (1987) Landscape Graphics: Watson-Guptill
6. Shaheer .M, Dua G.W and Pal.A .(2012) Landscape Architecture in India: a reader .India: La, Journal of Landscape Architecture
7. Reid G. W: (1993)From Concept to Form: In Landscape Design. John Wiley & Sons

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	2	3	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

		L	**T**	**P**	**C**
VD22420	**GREEN BUILDING CONCEPTS**	**2**	**0**	**0**	**2**

COURSE OBJECTIVES:
- To understand the necessity of adopting the basic green building concepts

COURSE CONTENT :

Introduction to Global Warming - Sources of global warming, Carbon footprint - Green buildings: Concepts, sun path, orientation of rooms and buildings - Rating – Rating by various agencies - Materials used and their Efficiency - Comparison of conventional & green buildings - Environment friendly and cost effective building technologies - Buildings with cost and energy efficient roofing systems - Building in different climatic regions, Energy audit

TOTAL : 30 PERIODS

OUTCOMES :

CO	**CO statements** Upon successful completion of the course, the students should be able to	**RBT level**
CO1	Summarise the green building concepts in buildings and explain how to rate a green building.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:
1. Jerry Yudelson,"The green building revolution", Island press, 2010.
2. Abe Kruger and Carl Seville, "Green building: principles and practices in residential construction", Cengage learning, 2012.

REFERENCES:
1. Lawrence Bauer, Michael, Mösle, Peter, Schwarz, Michael Green building, Springer-Verlag Berlin Heidelberg 2010
2. Hisham galal Elshimy, Green Building as Concept of Sustainability Sustainable Strategy to Design Office Building, pharos university 2015.
3. Sam kubba Handbook of Green Building Design and Construction, 2nd Edition, Butterworth-Heinemann 2016

COURSE ARTICULATION MATRIX :

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	3	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

	BASICS OF STEEL CONCRETE COMPOSITE CONSTRUCTION	L	T	P	C
VD22421		2	0	0	2

COURSE OBJECTIVES:

.   To introduce the principles and concepts of steel concrete composite construction.

COURSE CONTENT :

Introduction to steel - concrete composite construction – Cambering -Theory of composite structures Types of Composite construction – Concepts of Composite slabs and Beams, Composite Columns, Composite Trusses and Composite Box Girder Bridges -Shear connectors and their types – Partial and full shear connection - Design of composite beams as per IS 11384 and Eurocode - Case studies on Steel - Concrete Composite construction in buildings.

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Explain the theory and principles of Steel – Concrete Composite construction	2
CO2	Design composite beams and shear connectors	3
CO3	Elaborate case studies on steel - concrete composite construction in buildings.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS:

1. Johnson R.P. and Yong C. Wang "Composite Structures of Steel and Concrete", Blackwell Scientific Publications, UK, 2018.
2. Oehlers D.J. and Bradford M.A., "Composite Steel and Concrete Structural Members, Fundamental behaviour", Pergamon press, Oxford, 1995.

REFERENCES:

1. BS 5950-1: 2000 Structural use of steel work in building. Code of practice for design – Rolled and welded sections.
2.   EN 1994-1-1 (2004) (English): Eurocode 4: Design of composite steel and concrete structures – Part 1-1: General rules and rules for buildings
3. EN 1994-1-2 (2005) (English): Eurocode 4: Design of composite steel and concrete structures – Part 1-2: General rules - Structural fire design
4. IS 11384 – 2022 :Code of practice for composite construction in structural steel and concrete.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	-	-	-	3	-	-	-	-	3	3
CO2	3	3	3	2	-	-	-	3	-	-	-	-	3	3
CO3	3	3	3	2	-	-	-	3	-	-	-	-	3	3

3-High, 2-Medium, 1-Low

VD22422	BIM FOR CIVIL ENGINEERS	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To understand the necessity of adopting the Building Information Modelling as an engineer.

COURSE CONTENT :

Fundamentals of BIM Knowledge and BIM Models - Definition of BIM - From CAD to BIM - Necessity of BIM - BIM Benefits - LOD (Level of Development) in BIM, View & Retrieve Information from BIM Models – Computer tools and basic commands - Section a 3D view - Retrieve information from schedules - Measure distance in BIM models , Modeling of a Building - Introduction to Model Integration and Clash Detection -   Introduction to quantity take-off for construction - create quantity schedules - customize settings for schedules - create material take-off schedules - export and compile schedules

TOTAL : 30 PERIODS

OUTCOMES :

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Summarise the necessity of BIM, the different stages involved and adopt the concept of BIM using computer tools to perform the model integration and scheduling of construction project.	2

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

REFERENCES:

1. Peter Barnes, Nigel Davies, BIM in Principle and in Practice, ICE Publishing, 2015.
2. Rafael Sacks, BIM Handbook – A Guide to Building Information Modelling for Owners Designers, Engineers, Contractors and Facility Managers, 3rd edition, John Wiley Publishers, 2018.
3. Brad Hardin, Dave Mccool, BIM and Construction Management, 2nd edition, Wiley Publications, 2015.
4. Ph.D. Raja R. A. Issa, Ph.D., J.D., P.E. and Svetlana Olbina, Building Information Modelling : Applications and Practices, ASCE, 2015.

COURSE ARTICULATION MATRIX :

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	3	-	-	-	-	-	-	-	3	3

3-High, 2-Medium, 1-Low