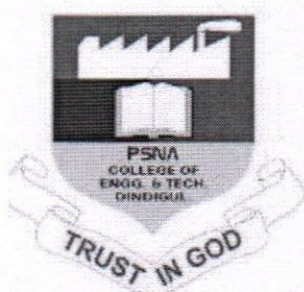# PSNA College of Engineering and Technology

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Dindigul – 624 622.

Estd : 1984

B. E. CIVIL ENGINEERING

Curriculum for Regulations 2022
(Choice Based Credit System)

For the Students admitted in the Academic year 2022-23 onwards

November 2022

FIRST MEETING OF THE ACADEMIC COUNCIL

18th November 2022

Regulations R 2022

BE CIVL ENGINEERING

Approved copy of Curriculum (1-8) semesters and syllabus (1 and 2 semesters)

Sl. No	Name and Affiliation	Signature
Chairman		
1.	**Dr. D. Vasudevan,** Principal and Chairman Academic Council, PSNACET.	
Registrar		
2.	**Dr. C. Jayaguru,** Registrar – Academic, PSNACET.	
Chairman BoS		
3.	**Dr. N. Mahendran,** Professor and Dean, Department of Civil Engineering, PSNACET.	

PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY, DINDIGUL

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Estd : 1984

REGULATIONS 2022

B. E. CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. **Fundamental Knowledge:** Graduates of the program will be skilled in the fundamental principles of mathematics, science, and sub-disciplines in Civil Engineering that are necessary for success in industry or in graduation.

2. **Specialization and Design Skills:** Graduates of the program will be proficient in each of the sub-fields of Civil Engineering and will be skilled in problem solving, design and interpretation of experiments, and operating within a team environment for the solution of design problems in their chosen field.

3. **Professional Skills:** Graduates of the program will be capable of operating effectively in a professional environment by virtue of their technical communication skills, ability to procure research and development projects by effective interaction with Civil Engineering professionals.

4. **Lifelong Learning:** Graduates of the program will be prepared to continue their professional development based on their awareness of professional society activities, and opportunities for further education.

PROGRAM OUTCOMES (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis:** Identify, formulate, review research literature, and analyze 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

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)

1. **Program Specific Outcome – 1 (PSO1):** Understand the need of soil investigation and structural design in a construction project and be able to undertake soil studies and prepare test reports and also be able to design structures and estimate the quantities using software applications

2. **Program Specific Outcome – 2 (PSO2):** Apply environmental principles to assess air and water quality, demand and for effective waste disposal and be able to apply the principles of highway engineering for design and construction of highway projects and an effective traffic management.
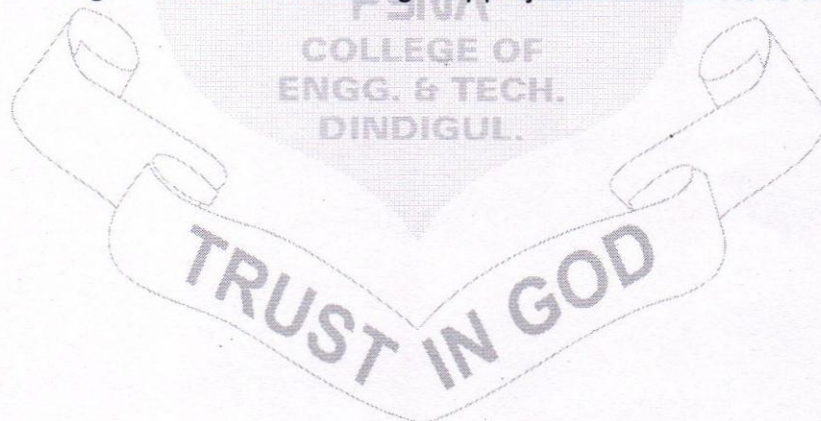
REGULATIONS 2022

B. E. CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS I AND II

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Induction Programme	-	-	-	-	-	0
THEORY								
2.	HS2121	Professional English and Functional skills	HSMC	3	0	2	5	4
3.	MA2122	Calculus for Engineers	BSC	3	1	0	4	4
4.	PH2123	Engineering Physics	BSC	3	0	0	3	3
5.	CY2124	Engineering Chemistry	BSC	3	0	0	3	3
6.	GE2125	Problem Solving and Python Programming	ESC	3	0	0	3	3
PRACTICALS								
8.	GE2181	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
9.	BS2182	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
		TOTAL		15	1	10	26	21

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS2221	Communicative English	HSMC	2	0	0	2	2
2.	MA2221	Integrals and Complex Functions	BSC	3	1	0	4	4
3.	PH2215	Mechanics of Materials	BSC	3	0	0	3	3
4.	GE2221	Engineering Graphics	ESC	2	0	4	6	4
5.	EC2213	Basic Electrical, Electronics and Instrumentation Engineering	ESC	3	0	0	3	3
6.	CE2211	Engineering geology	ESC	3	0	0	3	3
7.		NCC Credit Course Level 1[#]	-	2	0	0	2	2[#]
PRACTICALS								
8.	GE2281	Engineering Practices Laboratory	ESC	0	0	4	4	2
9.	CE2281	Computer Aided Building Drawing Laboratory	PCC	0	0	3	3	1.5
10.	HS2281	Communication and Soft skills Laboratory[$]	EEC	0	0	3	3	1.5
		TOTAL		16	1	14	31	24

[#] NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

[$] **Skill Based Course**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA2324	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2.	CE2311	Engineering Mechanics	ESC	3	0	0	3	3
3.	CE2312	Fluid Mechanics	PCC	3	0	0	3	3
4.	CE2313	Construction Materials and Technology	PCC	3	0	0	3	3
5.	CE2314	Water Supply and Wastewater Engineering	PCC	4	0	0	4	4
6.	CE2315	Surveying and Levelling	PCC	3	0	0	3	3
PRACTICALS								
7.	CE2381	Surveying and Levelling Laboratory	PCC	0	0	3	3	1.5
8.	CE2382	Water and Wastewater Analysis Laboratory	PCC	0	0	3	3	1.5
9.	GE2381	Professional Development $	EEC	0	0	2	2	1
		TOTAL		19	1	8	28	24

$ Skill Based Course

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CE2411	Applied Hydraulics Engineering	PCC	3	1	0	4	4
2.	CE2412	Strength of Materials	PCC	3	0	0	3	3
3.	CE2413	Concrete Technology	PCC	3	0	0	3	3
4.	CE2414	Soil Mechanics	PCC	3	0	0	3	3
5.	CE2415	Highway and Railway Engineering	PCC	3	0	0	3	3
6.	GE2421	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2 #		3	0	0	3	3 #
PRACTICALS								
8.	CE2481	Hydraulic Engineering Laboratory	PCC	0	0	3	3	1.5
9.	CE2482	Soil Mechanics Laboratory	PCC	0	0	3	3	1.5
10.	CE2483	Survey Camp (2 weeks)	EEC	0	0	0	0	1
		TOTAL		17	1	6	24	22

 # NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CE2511	Design of ReinforcedConcrete Structural Elements	PCC	3	0	0	3	3
2.	CE2512	Structural Analysis I	PCC	3	0	0	3	3
3.	CE2513	Foundation Engineering	PCC	3	0	0	3	3
4.		Professional Elective I	PEC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
6.		Professional Elective III	PEC	3	0	0	3	3
7.		Mandatory Course-I&	MC	3	0	0	3	0
PRACTICALS								
8.	CE2581	Highway Engineering Laboratory	PCC	0	0	4	4	2
9.	CE2582	Materials Testing Laboratory	PCC	0	0	4	4	2
		TOTAL		21	0	8	29	22

& Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CE2611	Design of Steel Structural Elements	PCC	3	0	0	3	3
2.	CE2612	Structural Analysis II	PCC	3	0	0	3	3
3.	CE2613	Hydrology and Water Resources Engineering	PCC	3	0	0	3	3
4.		Professional Elective IV	PEC	3	0	0	3	3
5.		Professional Elective V	PEC	3	0	0	3	3
6.		Professional Elective VI	PEC	3	0	0	3	3
7.		Open Elective – I*	OEC	3	0	0	3	3
8.		Mandatory Course-II&	MC	3	0	0	3	0
9.		NCC Credit Course Level 3 #		3	0	0	3	3 #
PRACTICALS								
10.	CE2681	Structural Design, Drafting and Detailing Laboratory	PCC	0	0	4	4	2
		TOTAL		24	0	4	28	23

*Open Elective – I - Student shall select one course from the list given under the table Open Elective I and II.

& Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC-II)

NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recordedin the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER VII/VIII*

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CE2711	Estimation, Costing and Valuation Engineering	PCC	3	0	0	3	3
2.	CE2712	Irrigation Engineeringand Drawing	PCC	2	0	2	4	3
3.	CE2713	Construction Management	PCC	3	0	0	3	3
4.	GE2721	Human Values and Ethics	HSMC	2	0	0	2	2
5.		Open Elective – II**	OEC	3	0	0	3	3
6.		Open Elective – III***	OEC	3	0	0	3	3
7.		Open Elective – IV***	OEC	3	0	0	3	3
		TOTAL		19	0	2	21	20

*If students undergo internship in Semester VII, then the courses offered during semester VII will be offeredduring semester VIII

**Open Elective – II - Student shall select one course from the list given under the table Open Elective I and II.

***Open Elective III and IV - - Student shall select one course from the list given under the table Open Elective III and IV respectively.

SEMESTER VIII/VII*

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	CE2891	Project Work/Internship	EEC	0	0	20	20	10
		TOTAL		0	0	20	20	10

*If students undergo internship in Semester VII, then the courses offered during semester VII will be offeredduring semester VIII

TOTAL CREDITS: 166

MANDATORY COURSES I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX2561	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	MX2562	Elements of Literature	MC	3	0	0	3	0
3.	MX2563	Film Appreciation	MC	3	0	0	3	0
4.	MX2564	Disaster Management	MC	3	0	0	3	0

MANDATORY COURSES II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX2661	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	MC	3	0	0	3	0
2.	MX2662	History of Science and Technology in India	MC	3	0	0	3	0
3.	MX2663	Political and EconomicThought for a Humane Society	MC	3	0	0	3	0
4.	MX2664	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	MX2665	Industrial Safety	MC	3	0	0	3	0
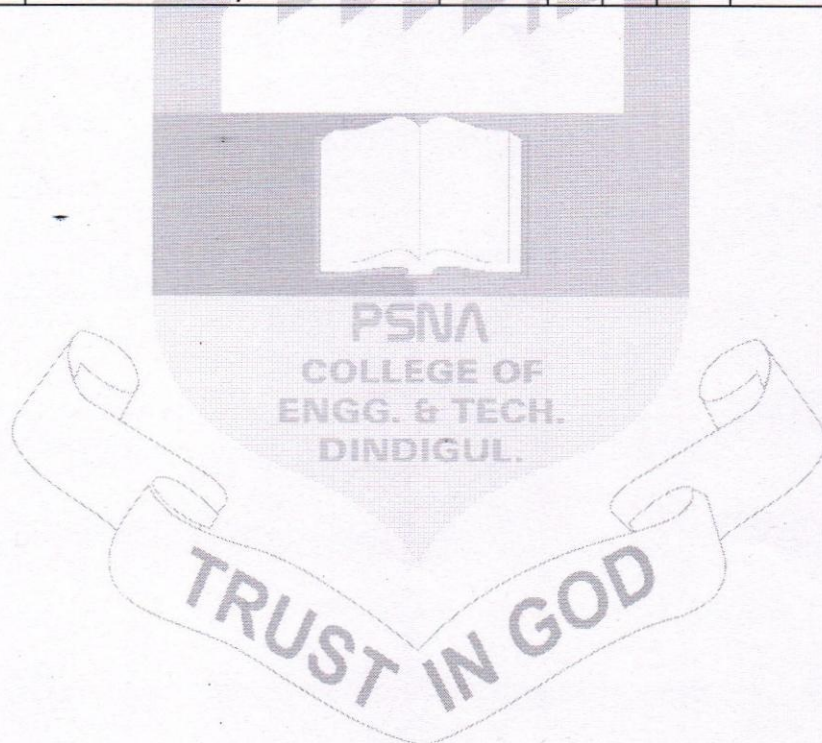
PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I (Structures)	VERTICAL II (Construction techniques and Practices)	VERTICAL III (Geotechnical)	VERTICAL IV (Geo-Informatics)	VERTICAL V (Transportation infrastructure)	VERTICAL VI (Environment)	VERTICAL VII (Water Resources)	VERTICAL VIII (Ocean Engineering)	VERTICAL IX (Diversified Course)
Concrete Structures	Formwork Engineering	Geo Environmental Engineering	Total Station and GPS Surveying	Airports and Harbours	Climate Change Adaptation and Mitigation	Participatory Water Resources Management	Ocean Wave Dynamics	Steel Concrete Composite Structures
Steel Structures	Construction Equipment and Machinery	Ground Improvement Techniques	Remote Sensing Concepts	Traffic Engineering and Management	Air and Noise Pollution Control Engineering	Groundwater Engineering	Marine Geotechnical Engineering	Finance For Engineers
Prefabricated Structures	Sustainable Construction and Lean Construction	Soil Dynamics and Machine Foundations	Satellite Image Processing	Urban Planning and Development	Environmental Impact Assessment	Water Resources Systems Engineering	Coastal Engineering	Earth and Rock fill Dams
Prestressed Concrete Structures	Digitalized Construction Lab.	Rock Mechanics	Cartography and GIS	Smart cities	Industrial Wastewater Management	Watershed Conservation and Management	Off shore Structures	Computational Fluid Dynamics
Rehabilitation/ Heritage Restoration	Advanced Construction Management and Safety	Earth and Earth Retaining Structures	Photogrammetry	Intelligent Transport Systems	Solid and Hazardous Waste Management	Integrated Water Resources Management	Port and Harbour Engineering	Rainwater Harvesting
Dynamics and Earthquake Resistant Structures	Advanced Construction Techniques	Pile foundation	Airborne and Terrestrial laser mapping	Pavement Engineering	Environmental Policy and Legislations	Urban Water Infrastructure	Coastal Hazards and Mitigation	Transport and Environment
Introduction to finite Element Method	Energy Efficient Buildings	Tunnelling Engineering	Hydrographic Surveying	Transportation planning Process	Environment, Health and Safety	Water Quality and Management	Coastal Zone Management and Remote Sensing	Environmental quality Monitoring

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversifiedgroup. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of Minor degree also. For more details on B.E./B.Tech Minor degree refer to our Regulations 2022.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I: STRUCTURES

S. NO.	COURSECODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V11	Concrete Structures	PEC	3	0	0	3	3
2.	CE2V12	Steel Structures	PEC	3	0	0	3	3
3.	CE2V13	Prefabricated Structures	PEC	3	0	0	3	3
4.	CE2V14	Prestressed Concrete Structures	PEC	3	0	0	3	3
5.	CE2V15	Rehabilitation/Heritage Restoration	PEC	3	0	0	3	3
6.	CE2V16	Dynamics and Earthquake Resistant Structures	PEC	3	0	0	3	3
7.	CE2V17	Introduction to Finite Element Method	PEC	3	0	0	3	3

VERTICAL II: CONSTRUCTION TECHNIQUES AND PRACTICES

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V21	Formwork Engineering	PEC	3	0	0	3	3
2.	CE2V22	Construction Equipment and Machinery	PEC	3	0	0	3	3
3.	CE2V23	Sustainable Construction And Lean Construction	PEC	3	0	0	3	3
4.	CE2V24	Digitalized Construction Lab	PEC	0	0	6	6	3
5.	CE2V25	Advanced Construction Management and Safety	PEC	2	0	2	4	3
6.	CE2V26	Advanced Construction Techniques	PEC	3	0	0	3	3
7.	CE2V27	Energy Efficient Buildings	PEC	3	0	0	3	3

VERTICAL III: GEOTECHNICAL

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V31	Geo Environmental Engineering	PEC	3	0	0	3	3
2.	CE2V32	Ground Improvement Techniques	PEC	3	0	0	3	3
3.	CE2V33	Soil Dynamics and Machine Foundations	PEC	3	0	0	3	3
4.	CE2V34	Rock Mechanics	PEC	3	0	0	3	3
5.	CE2V35	Earth and Earth Retaining Structures	PEC	3	0	0	3	3
6.	CE2V36	Pile Foundation	PEC	3	0	0	3	3
7.	CE2V37	Tunneling Engineering	PEC	3	0	0	3	3

VERTICAL IV: GEO-INFORMATICS

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V41	Total Station and GPS Surveying	PEC	3	0	0	3	3
2.	CE2V42	Remote Sensing Concepts	PEC	3	0	0	3	3
3.	CE2V43	Satellite Image Processing	PEC	3	0	0	3	3
4.	CE2V44	Cartography and GIS	PEC	3	0	0	3	3
5.	CE2V45	Photogrammetry	PEC	3	0	0	3	3
6.	CE2V46	Airborne and Terrestrial Laser Mapping	PEC	3	0	0	3	3
7.	CE2V47	Hydrographic Surveying	PEC	3	0	0	3	3

VERTICAL V: TRANSPORTATION INFRASTRUCTURE

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V51	Airports and Harbours	PEC	3	0	0	3	3
2.	CE2V52	Traffic Engineering and Management	PEC	3	0	0	3	3
3.	CE2V53	Urban Planning and Development	PEC	3	0	0	3	3
4.	CE2V54	Smart Cities	PEC	3	0	0	3	3
5.	CE2V55	Intelligent Transport Systems	PEC	3	0	0	3	3
6.	CE2V56	Pavement Engineering	PEC	3	0	0	3	3
7.	CE2V57	Transportation Planning Process	PEC	3	0	0	3	3

VERTICAL VI: ENVIRONMENT

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V61	Climate Change Adaptation and Mitigation	PEC	3	0	0	3	3
2.	CE2V62	Air and Noise Pollution Control Engineering	PEC	3	0	0	3	3
3.	CC2V63	Environmental ImpactAssessment	PEC	3	0	0	3	3
4.	CE2V64	Industrial Wastewater Management	PEC	3	0	0	3	3
5.	CE2V65	Solid and HazardousWaste Management	PEC	3	0	0	3	3
6.	CE2V66	Environmental Policy and Legislations	PEC	3	0	0	3	3
7.	CE2V67	Environment, Health andSafety	PEC	3	0	0	3	3

VERTICAL VII: WATER RESOURCES

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V71	Participatory Water Resources Management	PEC	3	0	0	3	3
2.	CE2V72	Ground Water Engineering	PEC	3	0	0	3	3
3.	CE2V73	Water Resources Systems Engineering	PEC	3	0	0	3	3
4.	CE2V74	Watershed Conservation and Management	PEC	3	0	0	3	3
5.	CE2V75	Integrated Water Resources Management	PEC	3	0	0	3	3
6.	CE2V76	Urban Water Infrastructure	PEC	3	0	0	3	3
7.	CE2V77	Water Quality and Management	PEC	3	0	0	3	3

VERTICAL VIII: OCEAN ENGINEERING

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V81	Ocean Wave Dynamics	PEC	3	0	0	3	3
2.	CE2V82	Marine Geotechnical Engineering	PEC	3	0	0	3	3
3.	CE2V83	Coastal Engineering	PEC	3	0	0	3	3
4	CE2V84	Off shore Structures	PEC	3	0	0	3	3
5	CE2V85	Port and Harbour Engineering	PEC	3	0	0	3	3
6	CE2V86	Coastal Hazards and Mitigation	PEC	3	0	0	3	3
7	CE2V87	Coastal Zone Management and Remote Sensing	PEC	3	0	0	3	3

VERTICAL IX: DIVERSIFIED COURSES

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CE2V91	Steel Concrete Composite Structures	PEC	3	0	0	3	3
2.	CE2V92	Finance for Engineers	PEC	3	0	0	3	3
3.	CE2V93	Earth and Rockfill Dams	PEC	3	0	0	3	3
4	CE2V94	Computational Fluid Dynamics	PEC	3	0	0	3	3
5	CE2V95	Rainwater Harvesting	PEC	3	0	0	3	3
6	CE2V96	Transport and Environment	PEC	3	0	0	3	3
7	CE2V97	Environmental Quality Monitoring	PEC	3	0	0	3	3

OPEN ELECTIVES

OPEN ELECTIVE I AND II

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AD2O15	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2.	IT2O11	IoT Concepts and Applications	OEC	2	0	2	4	3
3.	IT2O12	Data Science Fundamentals	OEC	2	0	2	4	3
4.	CS2O11	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVES – III

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2O11	Renewable Energy Technologies	OEC	3	0	0	3	3
2.	ME2O31	Applied Design Thinking	OEC	2	0	2	4	3
3.	ME2O45	Reverse Engineering	OEC	3	0	0	3	3
4.	EE2O32	Electric and Hybrid Vehicle	OEC	3	0	0	3	3
5.	CB2O33	Foundation of Robotics	OEC	3	0	0	3	3
6.	ME2O32	Nano Technology	OEC	3	0	0	3	3
7.	BM2O42	Biomedical Instrumentation	OEC	3	0	0	3	3
8.	ME2O21	Energy Conservation and Management	OEC	3	0	0	3	3
9.	ME2O13	Basics of Plastics Processing	OEC	3	0	0	3	3
10.	EC2O12	Signals and Systems	OEC	3	0	0	3	3
11.	BM2O11	Assistive Technology	OEC	3	0	0	3	3
12.	ME2O41	Operations Research	OEC	3	0	0	3	3
13.	GE2732	Total Quality Management	HSMC	3	0	0	3	3

OPEN ELECTIVES – IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2O33	Production and Operations Management for Entrepreneurs	OEC	3	0	0	3	3
2.	AD2O41	Multivariate Data Analysis	OEC	3	0	0	3	3
3.	ME2O42	Additive Manufacturing	OEC	3	0	0	3	3
4.	ME2O23	New Product Development	OEC	3	0	0	3	3
5.	ME2O43	Industrial Design and Rapid Prototyping Techniques	OEC	2	0	2	4	3

6.	ME2O34	Micro and PrecisionEngineering	OEC	3	0	0	3	3
7.	EE2O13	Batteries and Management system	OEC	3	0	0	3	3
8.	BM2O13	Sensors and Actuators	OEC	3	0	0	3	3
9.	EE2O11	Electrical, Electronic and Magnetic materials	OEC	3	0	0	3	3
10.	CB2O41	Concepts in Mobile Robotics	OEC	3	0	0	3	3
11.	IT2O42	Introduction to Industrial Automation Systems	OEC	3	0	0	3	3
12.	ME2O22	Energy Technology	OEC	3	0	0	3	3
13.	BM2O34	Food safety and Quality Regulations	OEC	3	0	0	3	3
14.	IT2O43	Industrial IoT and Industry 4.0	OEC	2	0	2	4	3
15.	BM2O44	Wearable devices	OEC	3	0	0	3	3

SUMMARY

S. No.	SubjectArea	CREDITS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII/VIII	VIII/VII	
1.	HSMC	4	2					2		8
2.	BSC	12	7	4	2					25
3.	ESC	5	12	3						20
4.	PCC		1.5	16	19	13	11	9		69.5
5.	PEC					9	9			18
6.	OEC						3	9		12
7.	EEC		1.5	1	1				10	13.5
	Total	21	24	24	22	22	23	20	10	166
8.	Mandatory Courses (Non credit)					✓	✓			

- **HSMC -** Humanities and Social Sciences including Management Courses
- **BSC -** Basic Science Courses
- **ESC -** Engineering Science Courses
- **PCC -** Professional Core Courses
- **PEC -** Professional Elective Courses
- **OEC -** Open Elective Courses
- **EEC -** Employability Enhancement Courses
- **MC –** Mandatory Courses

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2022.

VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other programmes)

VERTICAL I	VERTICAL II	VERTICAL III	VERTICAL IV	VERTICAL V
Fintech and Block Chain	Entrepreneurship	Public Administration	BusinessData Analytics	Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentalsof Investment	Team Building and Leadership Management for Business	Constitution ofIndia	Datamining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurship	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	FinancialAnalytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

(Choice of courses for Minor degree is to be made from any one vertical of other Programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MG2V11	Financial Management	PEC	3	0	0	3	3
2.	MG2V12	Fundamentals of Investment	PEC	3	0	0	3	3
3.	MG2V13	Banking, Financial Services and Insurance	PEC	3	0	0	3	3
4.	MG2V14	Introduction to Block chain and its Applications	PEC	3	0	0	3	3
5.	MG2V15	Fintech PersonalFinance and Payments	PEC	3	0	0	3	3
6.	MG2V16	Introduction to Fintech	PEC	3	0	0	3	3

VERTICAL 2: ENTREPRENEURSHIP

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MG2V21	Foundations of Entrepreneurship	PEC	3	0	0	3	3
2.	MG2V22	Team Building and Leadership Management for Business	PEC	3	0	0	3	3
3.	MG2V23	Creativity and Innovation in Entrepreneurship	PEC	3	0	0	3	3
4.	MG2V24	Principles of Marketing Management for Business	PEC	3	0	0	3	3
5.	MG2V25	Human Resource Management for Entrepreneurship	PEC	3	0	0	3	3
6.	MG2V26	Financing New Business Ventures	PEC	3	0	0	3	3

VERTICAL 3: PUBLIC ADMINISTRATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MG2V31	Principles of Public Administration	PEC	3	0	0	3	3
2.	MG2V32	Constitution of India	PEC	3	0	0	3	3
3.	MG2V33	Public Personnel Administration	PEC	3	0	0	3	3
4.	MG2V34	Administrative Theories	PEC	3	0	0	3	3
5.	MG2V35	Indian Administrative System	PEC	3	0	0	3	3
6.	MG2V36	Public Policy Administration	PEC	3	0	0	3	3

VERTICAL 4: BUSINESS DATA ANALYTICS

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MG2V41	Statistics for Management	PEC	3	0	0	3	3
2.	MG2V42	Datamining for Business Intelligence	PEC	3	0	0	3	3
3.	MG2V43	Human ResourceAnalytics	PEC	3	0	0	3	3
4.	MG2V44	Marketing and Social Media Web Analytics	PEC	3	0	0	3	3
5.	MG2V45	Operation and SupplyChain Analytics	PEC	3	0	0	3	3
6.	MG2V46	Financial Analytics	PEC	3	0	0	3	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MG2V51	Sustainable infrastructure Development	PEC	3	0	0	3	3
2.	MG2V52	Sustainable Agriculture and EnvironmentalManagement	PEC	3	0	0	3	3
3.	MG2V53	Sustainable Bio Materials	PEC	3	0	0	3	3
4.	MG2V54	Materials for Energy Sustainability	PEC	3	0	0	3	3
5.	MG2V55	Green Technology	PEC	3	0	0	3	3
6.	MG2V56	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3	3
7.	MG2V57	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3	3
8.	MG2V58	Energy Efficiency for Sustainable Development	PEC	3	0	0	3	3

SEMESTER I

Induction Programme

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character".

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:

- Guide to Induction program from AICTE.

HS2121	PROFESSIONAL ENGLISH AND FUNCTIONAL SKILLS	L T P C
		3 0 2 4

COURSE OBJECTIVES:

- To improve the communicative competence of the learners.
- To help the learners use the English language effectively in academic and work contexts.
- To enrich the English language skills of the students by engaging them in LSRW activities.
- To develop the learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- To use the English language efficiently in expressing their opinions through various media.

UNIT - I　　　　INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION　　　　9

Writing - Writing emails -formal and informal letters - **Grammar** - Present Tense- Question types:

Wh/ Yes or No / and Tags - **Vocabulary** – Synonyms- One word substitution.

UNIT - II　　　　NARRATION AND SUMMATION　　　　9

Writing – Reading comprehension skills- Report on an event (field trip, etc.), Dialogue writing- **Grammar** – Past tense- Subject-Verb Agreement and Prepositions - **Vocabulary** - Synonyms and Antonyms, Phrasal verbs.

UNIT - III　　　　DESCRIPTION OF A PROCESS / PRODUCT　　　　9

Writing - Writing single line definitions; instructions and Product / Process description - **Grammar** - Imperatives - **Vocabulary** - Future Tenses- Homonyms and Homophones.

UNIT - IV　　　　CLASSIFICATION AND RECOMMENDATIONS　　　　9

Writing – Note-making / Note-taking - Writing recommendations-Transferring information from non verbal (chart, graph, etc. to verbal mode) - **Grammar** – Articles-Pronouns - Relative pronouns - **Vocabulary** - Collocations.

UNIT - V   EXPRESSION   **9**

Writing – Essay Writing (Descriptive or narrative) - **Grammar** – Adjectives-Degrees of comparison, Negation (Statements & Questions) - **Vocabulary** - Cause & Effect Expressions, Abbreviations and Acronyms (as used in technical contexts).

TOTAL: 45 PERIODS

PRACTICAL SESSIONS:

UNIT - I   **6**

Listening – Listening for general information and specific details; Listening conversation; Listening and filling a passage (cloze listening). **Speaking** - Self Introduction; Introducing a friend; Conversation strategies; Telephone conversation. **Reading** – Reading different types of texts and brochures relevant to technical contexts.

UNIT - II   **6**

Listening - Listening to stories and event narration; documentaries and interviews with celebrities. **Speaking** - Narrating personal experiences and events; interviewing a celebrity; Reporting and summarizing of documentaries. **Reading** - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs.

UNIT – III   **6**

Listening - Listening to a product and process descriptions; classroom lecture; and advertisements about a products. **Speaking** – Picture description; giving instruction to use a product and Present a product. **Reading** – Reading advertisements, gadget reviews; user manuals.

UNIT - IV   **6**

Listening – Listening to TED Talks; Scientific lectures; and educational videos. **Speaking** – Small Talk; Mini presentations and making recommendations. **Reading** – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc,.)

UNIT – V   **6**

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. **Speaking** – group discussions, Debates, and Expressing opinions through Simulations & Role-play. **Reading** – Reading editorials and Opinion Blogs.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS:

1. Listening comprehension

2. Reading comprehension

3. English for every day conversation

4. Telephone conversation etiquettes

5. Self Introduction strategies

6. Listening to stories

7. Narrating events/experiences

8. Listening to TED Talks/ Lectures

9. Mini Presentation/ Small Talks

10. Group Discussion/ Debates

LANGUAGE LAB SOFTWARE:

- Globarena

TOTAL: 75 PERIODS

COURSE OUTCOMES FOR THEORY:

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

CO1: Frame questions, tags and one word substitutes, use correct tenses, write letters and emails

CO2: Use Concord, phrasal verbs, and write suitable and meaningful dialogues

CO3: Use imperatives, homonyms and homophones and write instructions and process descriptions.

CO4: Make notes, reports and recommendations and use articles, pronouns and collocations.

CO5: Write essays, use negations, degrees of adjectives, and cause and effect expressions.

CO6: Use LSRW Skills effectively in the required contexts of personal and professional life.

TEXT BOOKS:

1. English for Engineers & Technologists, Orient Blackswan Private Ltd., Department of English, Anna University, (2020 edition)

2. English for Science & Technology, Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.

3. English for Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.

4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.

5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	3	3	3	2	3	-	-
2	-	-	-	-	-	-	-	3	3	3	2	3	-	-
3	-	-	-	-	-	-	-	3	3	3	2	3	-	-
4	-	-	-	-	-	-	-	3	3	3	2	3	-	-
5	-	-	-	-	-	-	-	3	3	3	1	3	-	-
6	-	-	-	-	-	-	-	3	3	3	3	3	-	-
Low (1); Medium (2); High (3)														

MA2122   **CALCULUS FOR ENGINEERS**   **L T P C**
                                            3 1 0 4

COURSE OBJECTIVES:

- To achieve conceptual understanding and to retain the best practices of traditional calculus.
- To provide the basic ideas of calculus mainly for the purpose of modelling the engineering problems and obtaining solutions.
- To focus mainly on topics such as matrix algebra, calculus of a single variable, multi-variable and differential equations plays an important role in the understanding of concepts in science and engineering.

UNIT I   MATRICES   12

Characteristic equation -Eigen values and Eigen vectors of a real matrix –Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem – Diagonalization of matrices by orthogonal transformation –Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic Forms-Application Problems.

UNIT II   DIFFERENTIAL CALCULUS   12

Limit of a function (one sided limits, infinite limits, limits of trigonometric functions and limits with exponential and logarithmic functions) - Continuity-Types of discontinuity–Derivatives (Chain rule, Addition rule, multiplication rule, Division rule, implicit function, Parametric equations, Hyperbolic and its inverse) –Maxima and Minima of functions of one variable-concavity-points of Inflection-Application Problems.

UNIT III   FUNCTIONS OF SEVERAL VARIABLES   12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians-Properties of Jacobians- Jacobians of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables – Constrained Maxima and Minima- Lagrange's method of undetermined multipliers.

UNIT IV   INTEGRAL CALCULUS   12

Definite and indefinite integrals-integration by substitution-integration using by parts formula-integration of trigonometric functions of products and powers-integration of irrational functions - Applications: Hydrostatic force and pressure, moments and centre of Mass.

UNIT V   ORDINARY DIFFERENTIAL EQUATIONS   12

Second order linear differential equations with constant Coefficients-Method of variation of Parameters-Cauchy and Legendre's linear Equations-Simultaneous first order linear equations with constant Coefficients-Application Problems.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Applying matrix concepts to solve the problems for system of equations in engineering.

CO2: Apply the concept of functions, limit and continuity in solving the problems in engineering.

CO3: Employing the partial derivatives to find jacobians and maxima and minima of functions of two variables.

CO4: Utilizing the integration concepts to compute the various types of integrals.

CO5: Using the differential equations concepts to solve the problems occurred in engineering.

UNIT II   ELECTROMAGNETIC WAVES   9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum – Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - propagation of electromagnetic waves - polarization - Producing electromagnetic waves – Energy, momentum, intensity and Radiation pressure in EM waves (qualitative).

UNIT III   OSCILLATIONS, OPTICS AND LASERS   9

Simple harmonic motion - resonance – waves on a string - standing waves - traveling waves - Energy transfer of a wave - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, semiconductor laser – Basic applications of lasers.

UNIT IV   BASIC QUANTUM MECHANICS   9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - Meaning of wave function - Particle in a infinite potential well: 1D – Normalization – Extension to 2D and 3D Boxes (qualitative).

UNIT V   APPLIED QUANTUM MECHANICS   9

The harmonic oscillator (qualitative) - Barrier penetration and quantum tunnelling (qualitative)- Scanning Tunnelling microscope - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential – Basics of Kronig-Penney model and origin of energy bands: classification of materials based on energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: understand the importance of mechanics.

CO2: express their knowledge in electromagnetic waves.

CO3: demonstrate a strong foundational knowledge in oscillations, optics and lasers

CO4: understand the importance of quantum physics.

CO5: comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.

2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2020.

2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.

3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.

4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.

5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	2	1	-	1	-	-	-	2	-	-
2	3	3	3	2	2	1	1	1	-	-	-	2	-	-
3	3	3	3	2	2	1	2	1	-	-	-	2	-	-
4	3	3	3	2	2	1	2	1	-	-	-	2	-	-
5	3	3	3	2	2	1	1	1	-	-	-	2	1	-

Low (1); Medium (2); High (3)

CY2124	ENGINEERING CHEMISTRY	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.

- To impart knowledge on the basic principles and preparatory methods of nanomaterials.

- To introduce the basic concepts and applications of phase rule and composites.

- To facilitate the understanding of different types of fuels, their preparation, properties and Combustion characteristics.

- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I   WATER AND ITS TREATMENT   9

Water: Sources and impurities, Water quality parameters: Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II   NANO CHEMISTRY   9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III   PHASE RULE AND COMPOSITES   9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: 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: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV: FUELS AND COMBUSTION   9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method.

UNIT V: ENERGY SOURCES AND STORAGE DEVICES   9

Stability of nucleus: mass defect, binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles-working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able,

CO1: To infer the quality of water from quality parameter data and propose suitable treatment

· methodologies to treat water.

CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the

synthesis of nanomaterials for engineering and technology applications.

CO3: To apply the knowledge of phase rule and composites for material selection requirements.

CO4: To recommend suitable fuels for engineering processes and applications.

CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.

2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.

3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2020.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.

2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2017.

4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.

5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	-	3	3	1	-	-	-	2	-	2
2	3	3	2	2	-	3	3	1	-	-	-	2	-	-
3	2	3	2	2	-	3	2	1	-	-	-	2	-	-
4	3	3	2	2	-	3	3	1	-	-	-	2	-	-
5	3	3	2	2	-	3	3	1	-	-	-	2	-	-
	Low (1); Medium (2); High (3)													

GE2125   **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python

UNIT I   **COMPUTATIONAL THINKING AND PROBLEM SOLVING**   **9**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II   **DATA TYPES, EXPRESSIONS, STATEMENTS**   **9**

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III   **CONTROL FLOW, FUNCTIONS, STRINGS**   **9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV   **LISTS, TUPLES, DICTIONARIES**   **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V   FILES, MODULES, PACKAGES   9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Develop and execute simple Python programs.

CO3: Write simple Python programs using conditionals and loops for solving problems.

CO4: Decompose a Python program into functions.

CO5: Represent compound data using Python lists, tuples, dictionaries etc.

CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

3. Reema Thareja, "Python Programming using Problem Solving Approach", First edition, Oxford University Press, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021

4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5. https://www.python.org/

6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018

CO	PO												PSO	
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2	3	2	2	3	3	-	-	-	-	-	-	2	-	-
3	3	2	2	3	3	-	-	-	-	-	-	2	-	-
4	3	2	2	3	3	-	-	-	-	-	-	2	-	-
5	3	2	2	3	3	-	-	-	-	-	-	2	-	-
6	3	2	2	3	3	-	-	-	-	-	-	2	-	-
Low (1); Medium (2); High (3)														

GE2181　　　　　**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**　　**L T P C**

　　　0 0 4 2

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)

2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).

3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)

4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)

5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)

6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)

7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)

8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)

9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)

10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)

11. Exploring Pygame tool.

12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, students will be able to:

CO1: Develop algorithmic solutions to simple computational problems

CO2: Develop and execute simple Python programs.

CO3: Implement programs in Python using conditionals and loops for solving problems.

CO4: Deploy functions to decompose a Python program.

CO5: Process compound data using Python data structures.

CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

3. Reema Thareja, "Python Programming using Problem Solving Approach", First edition, Oxford University Press, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021

4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5. https://www.python.org/

6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	3	3	-	-	-	3	-	1	2	-	-
2	3	2	2	3	3	-	-	-	3	-	1	2	-	-
3	3	2	2	3	3	-	-	-	3	-	1	2	-	-
4	3	2	2	3	3	-	-	-	3	-	1	2	-	-
5	3	2	2	3	3	-	-	-	3	-	1	2	-	-
6	3	2	2	3	3	-	-	-	3	-	1	2	-	-

Low (1); Medium (2); High (3)

BS2182	PHYSICS AND CHEMISTRY LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.

- To learn how data can be collected, presented and interpreted in a clear and concise manner.

- To learn problem solving skills related to physics principles and interpretation of experimental data. To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, chloride and copper.

- To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

PHYSICS LABORATORY: (Any Six Experiments)

List of Experiments:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.

2. Simple harmonic oscillations of cantilever.

3. Non-uniform bending - Determination of Young's modulus

4. Uniform bending – Determination of Young's modulus

5. Laser- Determination of the wave length of the laser using grating

6. Air wedge - Determination of thickness of a thin sheet/wire

7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle

    b) Compact disc- Determination of width of the groove using laser.

8. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids

9. Post office box -Determination of Band gap of a semiconductor.

10. Photoelectric effect

11. Michelson Interferometer.

12. Melde's string experiment

13. Spectrometer Prism – Determination of refractive index.

TOTAL: 30 PERIODS

CHEMISTRY LABORATORY: (Any six experiments)

List of Experiments:

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.

2. Determination of types and amount of alkalinity in water sample.
   – Split the first experiment into two

3. Determination of total, temporary & permanent hardness of water by EDTA method.

4. Determination of DO content of water sample by Winkler's method.

5. Determination of chloride content of water sample by Argentometric method

6. Estimation of copper content of the given solution by Iodometry.

7. Estimation of TDS of a water sample by gravimetry.

8. Determination of strength of given hydrochloric acid using pH meter.

9. Determination of strength of acids in a mixture of acids using conductivity meter.

10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration).

11. Estimation of iron content of the given solution using potentiometer.

12. Estimation of sodium /potassium present in water using flame photometer.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students should be able to

CO1: Understand the functioning of various physics laboratory equipment.

CO2: Use graphical models to analyze laboratory data.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reallty.

CO4: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.

CO5: To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOK:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	-	2	-	-	3	-	-	2	-	-
2	3	3	3	2	2	2	-	-	3	-	-	2	-	-
3	3	3	3	2	2	2	-	-	3	-	-	2	-	-
4	3	3	3	2	-	3	3	2	3	-	-	2	-	2
5	3	3	3	2	2	3	2	1	3	-	-	2	-	-
Low (1); Medium (2); High (3)														

SEMESTER II

HS2221	⁻ COMMUNICATIVE ENGLISH	L T P C
		2 0 0 2

COURSE OBJECTIVES:

- To engage the learners in meaningful language activities to improve their LSRW skills.
- To enhance the learners' awareness of general rules of writing for specific audiences.
- To help the learners' understand the purpose, audience, contexts of different types of writing.
- To develop the analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT – I   MAKING COMPARISONS   **6**

Reading - Reading advertisements, user manuals, brochures - **Writing** – Proposal Writing, Itinerary - **Grammar** – Articles, Compound Words - **Vocabulary** – Contextual meaning of words

UNIT – II   EXPRESSING CAUSAL RELATIONS IN WRITING   **6**

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint - **Writing** - Writing responses to complaints - **Grammar** - Active Passive Voice transformations, Infinitive and Gerunds - **Vocabulary** –Adverbs, Purpose and Expressions

UNIT – III   PROBLEM SOLVING   **6**

Reading - Case Studies, excerpts from literary texts, news reports etc. - **Writing** – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay - **Grammar** – Error correction, If conditional sentences - **Vocabulary** - Compound Words.

UNIT – IV   REPORTING OF EVENTS AND RESEARCH   **6**

Reading – Newspaper articles - **Writing** – Recommendations, Accident Report, Survey Report - **Grammar** –Modals - **Vocabulary** – Conjunctions.

UNIT - V   THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY   **6**

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals - **Writing** – Job / Internship application – Cover letter & Resume - **Grammar** – Numerical adjectives - **Vocabulary** – Idioms.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

- **CO1:** Use contextual meaning of words and construct grammatically correct sentences.
- **CO2:** Apply cause and effect structures in the technical texts and write perfect emails.
- **CO3:** Write formal and informal letters, Checklists and Argumentative Essays.
- **CO4:** Read and comprehend articles and write reports and recommendations.
- **CO5:** Draft effective resume and cover letter in context of job search.
- **CO6:** Use the English language both for technical and functional situations.

TEXT BOOKS:

1. English for Engineers & Technologists (2020 edition), Orient Blackswan Private Ltd. Department of English, Anna University.

2. English for Science & Technology, Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.

3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.

4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.

5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	3	3	3	2	3	-	-
2	-	-	-	-	-	-	-	3	3	3	2	3	-	-
3	-	-	-	-	-	-	-	3	3	3	2	3	-	-
4	-	-	-	-	-	-	-	3	3	3	2	3	-	-
5	-	-	-	-	-	-	-	3	3	3	3	3	-	-
6	-	-	-	-	-	-	-	3	3	3	3	3	-	-
Low (1); Medium (2); High (3)														

MA2221	INTEGRALS AND COMPLEX FUNCTIONS	L T P C
		3 1 0 4

COURSE OBJECTIVES:

- To provide the idea of calculating area and volume involving ordinary and vector functions using integrals.
- To cater the needs of techniques to solve the problems occurring in fluid dynamics, electro-magnetic field theory and structural analysis.
- To solve integrals involving complex functions and also to solve the differential equations using Laplace transform techniques.

UNIT-I   MULTIPLE INTEGRALS   12

Double integrals – Change of order of integration – Double integrals in Cartesian and polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids in cartesian coordinates – Applications: Momentsand centres of mass, moment of inertia.

UNIT-II   VECTOR CALCULUS   12

Gradient and directional derivative – Divergence and curl, irrotational and solenoidal vector fields – line, surfaceand volume integral - Green's theorem in a plane, Gauss's divergence theorem and Stoke's theorem (excluding proofs) verification and applications in evaluating line, surface and volume integrals.

UNIT-III   ANALYTIC FUNCTIONS   12

Analytic functions - Necessary and Sufficient conditions for analyticity in Cartesian and polar coordinates - properties - Harmonic conjugates - Construction of analytic functions - Conformal mapping : $w = z+c$, cz, $1/z$, z^2 and Bilinear transformation.

UNIT-IV   COMPLEX INTEGRATION   12

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansion – Singularities – Types of Residues - Cauchy's Residue theorem - evaluation of real definite integrals as contour integrals around unit circle and semi - circle (poles on the real axis excluded).

UNIT-V   LAPLACE TRANSFORMS   12

Sufficient condition for existence of Laplace Transform – Transform of elementary functions – Transforms of unit step and unit impulse functions – Basic properties – Shifting Theorems – Transforms of derivatives - periodic functions – Initial and final value theorems – Inverse transforms– Convolution theorem – partial fraction method – Laplace transform technique for solving linear second order ordinary differential equations and simultaneous first order linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On Completion of the course, students will exhibit their ability in the following:

CO1: Apply multiple integrals techniques to evaluate area and volume.

CO2: Solve engineering problems using the concepts of vector calculus.

CO3: Construct an analytic function, when its real or imaginary part is known.

CO4: Evaluating integrals using cauchy's integral formula and residue theorem.

CO5: Apply Laplace Transform techniques to solve ordinary differential equations

TEXT BOOKS:

1. Grewal.B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 44th edition, 2017.

2. Jain R.K. and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 4th Edition, 2014.

REFERENCES:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 7th edition, LaxmiPublications(P) Ltd.,Reprint 2010.

2. Reading material prepared by Department of Mathematics, PSNA College of Engineering and Technology, Dindigul – 624 622.

3. Ramana B.V, "Higher Engineering Mathematics", Tata Mc Graw Hill Publishing Company,New Delhi, 11th Reprint, 2010.

4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Pvt. Ltd, 9th Edition Singapore 2006, Reprint 2013.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	2	-	-	-	-	-	-	2	-	-
2	3	3	3	2	2	-	-	-	-	-	-	2	-	-
3	3	3	3	2	2	-	-	-	-	-	-	2	-	-
.4	3	3	3	2	2	-	-	-	-	-	-	2	1	-
5	3	3	3	2	2	-	-	-	-	-	-	2	-	-

Low (1); Medium (2); High (3)

PH2215	MECHANICS OF MATERIALS	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of heat transfer through different materials, thermal performance of building and various thermal applications
- To impart knowledge on the ventilation and air conditioning of buildings
- To introduce the concepts of sound insulation and lighting designs
- To give an introduction to the processing and applications of new engineering materials
- To create an awareness on natural disasters and safety measures

UNIT I   **THERMAL APPLICATIONS**   9

Principles of heat transfer, steady state of heat flow, conduction through compound media - series and parallel and conductivity of rubber tube - heat transfer through fenestrations, thermal insulation and its benefits - factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices - central heating.

UNIT II   **VENTILATION AND REFRIGERATION**   9

Requirements, principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners - chilled water plant - fan coil systems - water piping - cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C.Systems.

UNIT III   **ACOUSTICS AND LIGHTING DESIGNS**   9

Methods of sound absorptions - absorbing materials - noise and its measurements, sound insulation and its measurements. Visual field glare, colour - day light calculations - day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV   **NEW ENGINEERING MATERIALS**   9

Composites - Definition and Classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics.

UNIT V   **NON DESTRUCTIVE TESTING**   **9**

Non destructive testing – methods – liquid penetrant method – advantages and limitations – Ultrasonic flaw detection-principle-testing devices-testing methods-visual display units (A, B & C scan) - advantages, limitations and applications – Radiography- X-Ray radiography and fluoroscopy.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Students will understand the basics of heat transfer through different materials, thermal performance of building and various thermal applications.

CO2: Students will acquire knowledge on the ventilation and air conditioning of buildings.

CO3: Students will able to explain concepts of sound insulation and lighting designs.

CO4: Students will get introduction to the processing and applications of new engineering materials.

CO5: Students can get awareness on Non destructive testing methods.

TEXT BOOKS:

1. Marko Pinteric, Building Physics, Springer 2018.

2. D.S.Mathur. Elements of Properties of Matter. S Chand &Company, 2021.

3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai publishers, 2012.
4. Hugo Hens, Building Physics: Heat, Air and Moisture, Wiley, 2017

REFERENCES:

1. W.R.Stevens. Building Physics: Lighting. Pergamon Press, 2013.

2. Hugo Hens, Applied Building Physics, Wiley, 2016

3. K.G.Budinski and M.K.Budinski. Engineering Materials: Properties and Selection. Pearson Education, 2016.

4. Peter A. Claisse, Civil Engineering Materials, Elsevier, 2016.

5. Patrick L. Abbott, Natural Disasters, McGraw-Hill, 2019.

CO	PO												PSO	
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1	3	-	3	-	2	-	2	-	-	-	-	-	-	-
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3	-	-	3	3	3	-	3	-	-	-	-	-	-	-
4	-	-	1	-	3	-	-	-	2	-	-	-	-	-
5	-	-	2	-	-	3	3	-	2	-	-	-	1	-
Low (1); Medium (2); High (3)														

GE2221	ENGINEERING GRAPHICS	L T P C
		2 0 4 4

COURSE OBJECTIVES:

- Drawing engineering curves and orthographic projection of Points, Lines.
- Drawing orthographic projection of Planes and freehand sketch of simple objects.
- Drawing orthographic projection of solids.
- Drawing section of solids and development of surfaces
- Drawing isometric and perspective projections of simple solids.
- Enhancing the imagination capacity of the students.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments – BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

UNIT I	PLANE CURVES, PROJECTION OF POINTS AND LINES	6+12

Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves. Orthographic projection-principles -Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method and traces.

UNIT II	PROJECTION OF PLANE SURFACE AND FREEHAND SKETCHING	6+12

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT III	PROJECTION OF SOLIDS	6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	6+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids, cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	6+12

Principles of isometric projection - isometric scale -isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids -Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: 90 PERIODS

COURSE OUTCOMES:

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

CO1: Use BIS conventions and specifications for engineering drawing; Construct the conic curves, involutes, cycloid, and Draw the projection of points, lines.

CO2: Solve practical problems involving projection of Planes and Free Hand Sketching.

CO3: Solve practical problems involving projection of Solids.

CO4: Draw the section of Solids and Development of simple solids.

CO5: Draw the orthographic, isometric and perspective projections of simple solids.

CO6: Apply the concepts of drawing in Practical applications.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House,53rd Edition, 2019.

2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1. BasantAgarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.

2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore,27th Edition, 2017.

3. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introductionto Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hallof India Pvt. Ltd, New Delhi, 2005.

4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

5. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.

2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.

3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.

4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.

5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.

2. All questions will carry equal marks of 20 each making a total of 100.

3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

4. The examination will be conducted in appropriate sessions on the same day

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	-	2	-	-	2	-	2	-	2	-	-
2	3	3	-	-	2	-	-	2	-	2	-	2	-	-
3	3	3	-	-	2	-	-	2	-	2	-	2	-	-
4	3	3	-	-	2	-	-	2	-	2	-	2	-	-
5	3	3	-	-	2	-	-	2	-	2	-	2	1	-
6	3	3	-	-	2	-	-	2	-	2	-	2	-	-

Low (1); Medium (2); High (3)

EC2213   BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING   L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of Electric Circuits Analysis and Magnetic Circuit.
- To impart knowledge in the basics of domestic wiring, Protective devices and working principles of Electrical Machines.
- To introduce Analog Devices and their characteristics
- To educate on the fundamental concepts of Digital Electronics
- To impart knowledge in the Sensors And Transducers

UNIT I   ELECTRICAL CIRCUITS AND MAGNETIC CIRCUITS   9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws (Simple problems)- Nodal Analysis, Mesh analysis with Independent sources only (Steady state).

Magnetic circuits-definitions-MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances (simple problems).

UNIT II   ELECTRICAL INSTALLATIONS AND ELECTRICAL MACHINES   9

Domestic wiring, types of wires and cables, earthing, protective devices- switch fuse unit-Miniature circuit breaker-moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid.

Construction and Working Principle of DC motors-Applications. Construction, Working principle and Applications of Transformer, Synchronous motor and Three Phase Induction Motor.

UNIT III   ANALOG ELECTRONICS   9

Introduction to semiconductors - PN junction diode, zener diode and its characteristics – Half wave and full wave rectifiers, Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics – Power conditioning Equipments: Linear mode power supply, SMPS and UPS -Display devices: LED and LCD.

UNIT IV   DIGITAL ELECTRONICS   9

Review of number systems, binary codes, error detection and correction codes, - Introduction to sequential Circuits– Flip-Flops – Registers and Counters – A/D and D/A Conversion, K-map representations - minimization using K maps (Simple Problems only)

| UNIT V | SENSORS AND TRANSDUCERS | 9 |

Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To understand the concept of Electric Circuits Analysis and Magnetic Circuit.

CO2: To discuss about the basics of domestic wiring and working principles of Electrical Machines.

CO3: Analyze the characteristics of analog electronic devices.

CO4: To understand the concept of Digital Electronics.

CO5: Explain the types and operating principles of sensors and transducers

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020

2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.

3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008

4. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.

5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCES:

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.

2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.

3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.

4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	1	-	-	-	-	-	1	-	-
2	3	2	2	3	2	1	-	-	-	-	-	1	-	-
3	3	3	3	2	1	2	-	-	-	-	-	1	-	-
4	3	3	2	3	2	1	-	-	-	-	-	1	-	-
·5	3	2	3	2	2	1	-	-	-	-	-	1	-	-
Low (1); Medium (2); High (3)														

CE2211	ENGINEERING GEOLOGY	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- The student shall be able to understand about geological formations, classification and morphology of rocks, and the importance of the study of geology for civil engineers with regard to founding structures like dams, bridges, buildings, etc.

- The student shall also be able to appreciate the importance of geological formation in causing earthquakes and landslides.

- Finally, the student should be in a position to conceive and understand the importance of any geo-environmental impacts caused due to anthropogenic activities.

Unit I	PHYSICAL AND DYNAMIC GEOLOGY	9

Role of Geology in Civil engineering - Branches of geology - Earth structures and composition - Elementary knowledge on continental drift and plate tectonics - Earth processes - Weathering - Geological work of rivers, wind and sea - Engineering importance – Volcanoes, tsunamis, Earthquake belts in India.

Unit II	GEOMORPHOLOGY AND GEOTECHNIQUES	9

Mountains, Valleys, landslides, Soil mass movement, coastal erosion, Hydrology, aquifer, ground water, karst topography. Soil- definition, formation, classification, clay minerals, behaviour of clay on Engineering structures, Geophysical investigations - seismic survey, electrical methods.

Unit III	PETROLOGY	9

Rock forming minerals, Classification of rocks - Distinction between Igneous, Sedimentary and Metamorphic rocks - Occurrence, engineering properties and distribution – Igneous - Granite, pegmatite, charnockite, and basalt - Sedimentary rocks - sandstone, limestone, shale, conglomerate, breccia, Metamorphic rocks - quartzite, marble, slate, phyllite, gneiss and schist.

Unit IV	STRUCTURAL GEOLOGY	9

Introduction - Basic terminologies – attitude of beds, Study of structural features - Folds, faults and joints - Engineering considerations - Engineering properties of rock as a construction material.

Unit V	APPLIED GEOLOGY	9

Geological conditions necessary for construction of dams, tunnels, buildings, road cuttings – Landslides - Thematic maps using RS and GIS - Causes and preventions - Improvement of sites - Coastal protection. Applications for sub-surface investigation and groundwater exploration.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Understand the importance of geological concepts such as earth, earthquake, volcanism and the action of various geological agencies.

CO2: Understand the engineering properties of minerals and its significance.

CO3: Know the properties of rocks and interpretation of geological conditions under the ground surface.

CO4: Acquire knowledge about investigation methods, primarily geophysical methods, for determining the rock mass properties, their strengths and weaknesses, revealing sub surface nature.

42

CO5: Identify the potential problems of Civil engineering associated with slope stability, drilling and excavation of tunnels, design and construction of dams.

CO6: Assess the complexity in Civil engineering issues and evolve mitigation strategies for Coastal Erosion, Landslides and apply the remote sensing techniques to investigate the land use changes for proper town planning.

TEXT BOOKS:

1. Parbin Singh. A "Text book of Engineering and General Geology", Katson Publishing House, Ludhiana 2013.

2. Duggal S.K., Pandey H.K. and Rawal N., "Engineering Geology", McGraw Hill Education Private Limited, 2017.

REFERENCE BOOKS:

1. Varghese P. C, "Engineering Geology for Civil Engineers", PHI Learning Private Limited, Delhi, 2012.

2. Blyth F.G.H. and M.H.de Freitas, "Geology for Engineers", CRC Press, Boca Raton, 2017.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	-	-	2	2	-	-	-	-	-	-	-
2	2	2	-	-	-	-	2	-	-	-	-	-	-	-
3	2	3	-	3	-	-	2	-	-	-	-	-	-	-
4	2	2	-	3	-	-	2	-	-	-	-	-	2	-
5	3	3	2	-	-	3	2	-	-	-	-	-	-	-
6	3	-	3	-	3	-	3	-	-	3	-	3	-	-
Low (1); Medium (2); High (3)														

GE2281	ENGINEERING PRACTICES LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVES:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.

- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment's; Making a tray out of metal sheet using sheet metal work.

- Basic Wiring connections like residential house wiring, fluorescent lamp wiring and staircase wiring.

- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL)

PART I   **CIVIL ENGINEERING PRACTICES**   **6**

PLUMBING WORK:

   a) Connecting various basic pipe fittings like valve, tap, coupling, union, reducer, elbow and other components which are commonly used in household.

   b) Preparing plumbing line sketches for fixing various household things like washbasin, pump etc.

WOOD WORK:

   a) Basic Operations

   b) Preparing T-Joint, Mortise joint and Tenon joint and Dovetail joint.

   c). Preparing a pen/Mobile stand

PART II   **MECHANICAL ENGINEERING PRACTICES**   **15**

WELDING WORK:

   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

   b) Practicing gas welding.

BASIC MACHINING WORK:

   a) Simple Operations (Facing/Turning/Step turning/Chamfering)

   b) Taper Turningand knurling

   c) Drilling and Tapping

SHEET METAL WORK:

   a) Making of a square tray

   b) Making of Funnel

DEMONSTRATION:

   a) Demonstrating basic foundry operations

   b) Thread cutting demo using lathe

   c) Studying common industrial trusses using models.

   d) Assembling a centrifugal pump.

   e) Assembling an air conditioner.

PART III   **GREEN TECHNOLOGY**   **3**

   a) a). An overview of parts in E-Vehicle (Four wheeler)

   b) b). Assembling of e-vehicle (Two Wheeler)

   c) c). Solar based electric fan assembly.

PART IV   **PLANT VISIT (optional)**   **6**

   a) A visit to Renewable Energy Sources

GROUP - B (ELECTRICAL & ELECTRONICS)

PART V   **ELECTRICAL ENGINEERING PRACTICES**   **15**

a) Residential house wiring using switches, fuse, indicator, lamp and energy meter

b) Fluorescent Lamp Wiring with introduction to CFL and LED types.

c) Stair case wiring - Single Lamp controlled by two switches.

d) Measurement of energy using single phase energy meter.

e) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/Quadrac)

PART VI   **ELECTRONIC ENGINEERING PRACTICES**   **15**

a) Study of Electronic components and equipment:

i) Resistor color coding

ii) Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.

b) Study of logic gates: AND, OR, NOT, EX-OR, NAND and NOR

c) Verification of Ohm's Law and Kirchhoff's Law

d) Soldering practice – Components Devices and Circuits – Using general purpose PCB.

e) Study of Arduino UNO

f) Troubleshooting and Installation of OS in Computer/Laptop

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Able to understand the basics of Plumbing and carpentry works

CO2: Apprehend the basic fabrication process like welding and sheet metal operations

CO3: Understanding the machining operations -Turning/Facing/Step turning, Chamfering & Knur

CO4: Study about different types of Electrical wiring and analyze basic parameters of   Electrical circuits

CO5: Study basic electronic components and equipment's and acquire knowledge in PCB fabrication and Soldering.

CO6: Study the features of Arduino UNO and Installation of OS

REFERENCES:

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer of Engineering Practices Laboratory", Anuradha Publications, (2007).

2. T. Jeyapoovan, M.Saravanapandian & S.Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt.Ltd, (2006)

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

LIST OF EQUIPMENTS

GROUP – A (CIVIL & MECHANICAL)

SL.NO	NAME OF THE EQUIPMENT'S	NO'S
1	Centre Lathe	9
2	Drilling Machine	1
3	Welding Machines	5
4	Carpentry Tools	15 Set
5	Sheet Metal Tools	15 Set
6	Electric Two Wheeler	1
7	Electric Four Wheeler	1
8	Centrifugal Pump model	1
9	Split AC model	1
10	Solar based Fan Kit	1
11	Truss Model	1 Set
12	Foundry Equipment's	2 Set

GROUP – B (ELECTRICAL & ELECTRONICS)

SL.NO	NAME OF THE EQUIPMENT'S	NO'S
1	Residential House Wiring Setup	2
2	Fluorescent Lamp Wiring Setup	2
3	Staircase Wiring Setup	2
4	Energy meter wiring	2
5	Resistive Load	4
6	Fan Regulator	2
7	Resistors	50
8	CRO	10
9	Logic Gates IC's	30
10	Soldering Kit	10
11	Arduino Kit	10
12	Computer/Laptop	2

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	1	2	-	-	-	-	-	2	2	-	-
2	3	2	2	2	2	-	-	-	-	-	2	2	-	-
3	3	2	2	2	3	-	-	-	-	-	2	2	-	-
4	3	2	2	2	3	-	-	-	-	-	2	2	-	-
5	3	3	3	3	3	-	-	-	-	-	2	2	-	-
6	3	3	3	3	3	-	-	-	-	-	2	2	-	-
Low (1); Medium (2); High (3)														

CE2281   **COMPUTER AIDED BUILDING DRAWING**   **L T P C**

                                                                              0 0 3 1.5

COURSE OBJECTIVES:

- To introduce the students to draft the plan, elevation, sectional views and 3D visualization of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS

1. Principles of planning, orientation and joinery details (Paneled and Glazed Doors and Windows).
2. Buildings with load bearing walls.
3. R.C.C. framed structures.
4. Industrial buildings – North light roof structures.
5. 3D Modelling of building.

TOTAL: 45 PERIODS

OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To do planning, orientation and joinery details of Paneled doors, Glazed doors and windows

CO2: To plan the building with load bearing walls.

CO3: To plan for the R.C.C framed structures.

CO4: To plan the Industrial structure with north light roof structures

CO5: To visualize the building in 3D view.

TEXTBOOKS:

1. Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008.

REFERENCES:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook:A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc.,2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
4. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	-	-	-	3	-	-	1	1	2	-	-	-	-
2	1	-	-	-	3	-	-	1	1	2	-	-	1	-
3	1	-	-	-	3	-	-	1	1	2	-	-	1	-
4	1	-	-	-	3	-	-	1	1	2	-	-	-	-
5	1	-	-	-	3	-	-	1	1	2	-	-	-	-

Low (1); Medium (2); High (3)

HS2281   **COMMUNICATION AND SOFT SKILLS LABORATORY**   **L T P C**
                                                                          0 0 3 1.5

COURSE OBJECTIVES:

- To enhance the employability and career skills of students.
- To orient the students and groom them as professionals.
- To make them employable graduates.
- To develop their confidence and help them attend interviews successfully.

UNIT - I   9

Elements of Communication – barriers of communication - verbal and non verbal communication - 7C's of communication- Conversation skills- Listening for information - Speak with correct pronunciation - Reading for information - Writing Paragraphs – essays – letters – resume - reports.

UNIT - II   9

Self-introduction - organizing the material – Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice – presenting the visuals effectively

UNIT- III   9

Introduction to Group Discussion - Participating in group discussions – understanding group dynamics – brainstorming the topic – questioning and clarifying – GD strategies - activities to improve GD skills

UNIT - IV   9

Interview etiquette – dress code – body language – attending job interviews – telephonic interview - one to one interview & panel interview – FAQs related to job interviews

UNIT - V   9

Introduction to Soft Skills – hard skills & soft skills – employability and career skills - Grooming as a professional with values - Time and Stress Management, Leadership Skills, Decision Making Skills, Creative Thinking, and Problem Solving Skills

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. Self Introduction
2. Presentation Skills
3. Group Discussion & Conversation Skills
4. Interview Skills
5. Cover Letter and Resume
6. Report Writing
7. Time and Stress Management Techniques
8. Leadership Traits
9. Creative Thinking Skills and Problem Solving Skills
10. English for Competitive Exams

LANGUAGE LAB SOFTWARE:

- Globarena

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Apply the strategies of effective communication and use LSRW skills productively.

CO2: Give an effective self introduction, present on topics with effective visual aids and answer questions effectively in the query sessions.

CO3: Identify the etiquettes of participating in a group discussion and execute them in real time discussions.

CO4: Illustrate the different types of interviews and master the etiquettes of interview skills and apply them effectively in job interviews.

CO5: Distinguish hard and soft skills, achieve mastery in the etiquettes of those skills and apply them in social and professional environment.

CO6: Identify the procedures of taking part in competitive exams like IELTS, TOEFL with reference to listening, speaking, reading and writing skills.

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.

2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students, Orient Balckswan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	2	-	-	-	-	-	3	3	3	3	3	-	-
2	-	-	-	-	-	-	-	3	3	3	3	3	-	-
3	-	-	-	-	-	-	-	3	3	3	3	3	-	-
4	-	-	-	-	-	-	-	3	3	3	3	3	-	-
5	-	-	-	-	-	2	-	3	3	3	3	3	-	-
6	-	-	-	-	-	-	-	3	3	3	-	2	-	-
Low (1); Medium (2); High (3)														
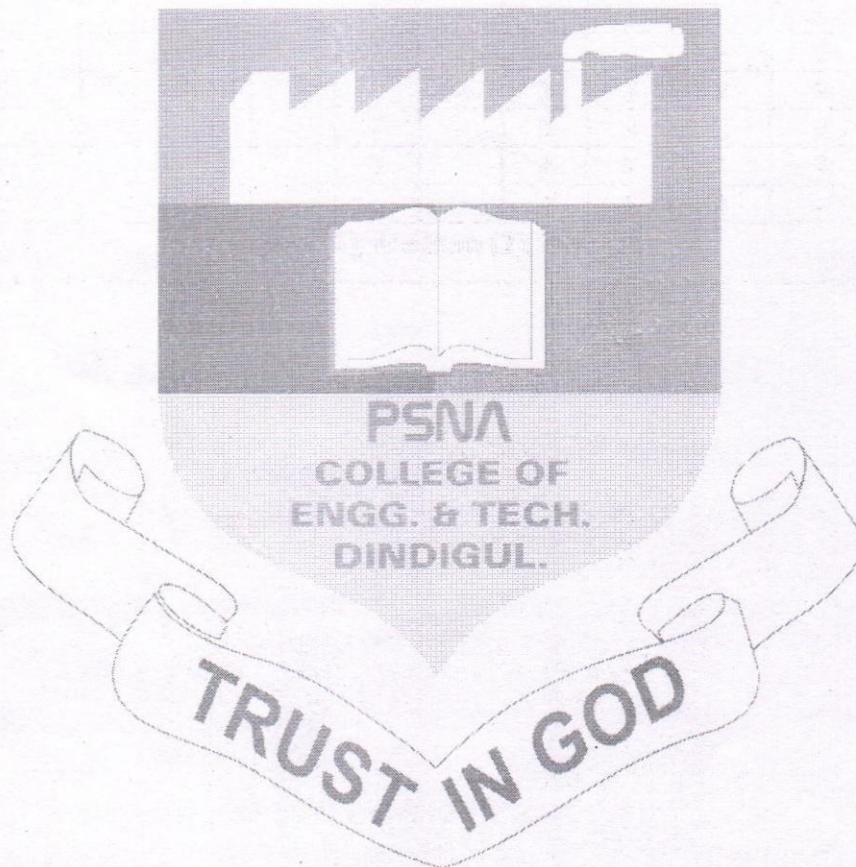
PSNA College of Engineering and Technology

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Dindigul – 624 622.

Estd : 1984

B. E. CIVIL ENGINEERING

Syllabus of III and IV Semesters for Regulations 2022
(Choice Based Credit System)

For the Students admitted in the Academic year 2022-23 onwards

February 2023

PSNA College of Engineering and Technology, Dindigul – 624 622

(An Autonomous Institution Affiliated to Anna University, Chennai)
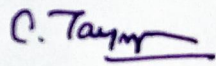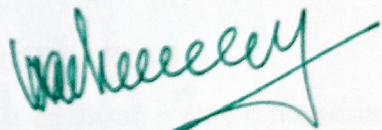
SECOND MEETING OF THE ACADEMIC COUNCIL

28th April 2023

Regulations R 2022

BE CIVIL ENGINEERING

Approved copy of syllabus (III and IV Semesters)

Sl. No	Name and Affiliation	Signature
Chairman		
1.	Dr. D. Vasudevan, Principal, PSNACET.	
Registrar		
2.	Dr. C. Jayaguru, Registrar – Academic, PSNACET.	
Chairman BoS		
3.	Dr. N. Mahendran, Professor and Dean, Department of Civil Engineering, PSNACET.	

PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY, DINDIGUL

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Estd : 1984

REGULATIONS 2022

B. E. CIVIL ENGINEERING

SEMESTER III

MA2324   **TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**   **L T P C**

3 1 0 4

COURSE OBJECTIVES:

- To study the formation and solve the Partial Differential Equations.
- To understand the concepts of Dirichelt's conditions and Fourier series.
- To solve the boundary value problems by using Fourier series.
- To Study the application of transform techniques using Fourier Transforms.
- To provide the basic concepts of Z-Transform and solve the difference equations.

UNIT- I   PARTIAL DIFFERENTIAL EQUATIONS   12

Formation of partial differential equations - Elimination of arbitrary constants and functions – Solutions of   five standard types of first order partial differential equations - Lagrange's linear equation - Homogenous type of Second order Linear differential equations with constant coeffiecients.

UNIT-II   FOURIER SERIES   12

Dirichlet's conditions – General Fourier series –Half range sine and cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT-III   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   12

Classification of PDE –Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT-IV   FOURIER TRANSFORMS   12

Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS   12

Z-transforms- Elementary properties–Inverse Z-transform (using partial fraction and residues) - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To describe real time Engineering problems using PDEs.

CO2: To design general periodic functions and apply in problems of Fourier series, which are sums of sines and cosines.

CO3: To describe real time engineering problems using PDE in 1-D wave vibrating membrane and heat passing through rod, two dimensional heat conduction problems.

CO4: To use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing.

CO5: To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z - Transform techniques for discrete time systems.

TEXT BOOKS:

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint,2012.

2. Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.

REFERENCES:

1. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd,2007.

2. 2.Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.

3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India,2007.

4. Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics"TataMcGraw Hill Education

   Pvt Ltd, Sixth Edition, New Delhi,2012.

5. 5.Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi,2013.

6. Online resources: https://nptel.ac.in/courses

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	1	-	-	-	-	-	-	-	-	-
2	2	2	2	1	-	-	-	-	-	-	-	-	-	-
3	3	1	2	-	1	-	-	-	-	-	-	-	-	-
4	2	2	2	1	-	-	-	-	-	-	-	-	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	-	-
Low (1); Medium (2); High (3)														

CE2311   **ENGINEERING MECHANICS**   L T P C

3 0 0 3

COURSE OBJECTIVES:

- To Learn the use scalar and vector analytical techniques for analyzing forces in Statically determinate structures

- To introduce the equilibrium of rigid bodies

- To study and understand the distributed forces, surface, loading on beam and intensity.

- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.

- To learn the fundamental concepts of Stress, Strain and deformation of solids.

UNIT I   **STATICS OF PARTICLES**   **9**

Introduction to Engineering Mechanics, Units and Dimensions, Basic Mechanics, Laws of Mechanics, Representation of a Vector. Statics of particles: Force, System of forces, Resultant of forces, Principle of Transmissibility of Forces, Free-Body Diagrams, moment, Moment of a Force about a Point, Moment of force about line, Moment of a Force about an Axis, Varignon's Theorem of moments, Equilibrium of Particles.

UNIT II   **EQUILIBRIUM OF RIGID BODIES**   **9**

Equilibrium of three forces in a plane, Lame's theorem, Couple - Moment of a Couple, Condition of Equilibrium of Rigid Body in Two Dimensions, Types of Beams, Loads, Supports, Determination of support reactions.

UNIT III   **DISTRIBUTED FORCES**   **9**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Parallel-Axis Theorem, Moments of Inertia of Areas – Perpendicular Axis Theorem, Polar Moment of Inertia, Radius of Gyration of an Area, Moments of Inertia of Composite Areas.

UNIT IV   **FRICTION**   **9**

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V   **SIMPLE STRESS AND SIMPLE STRAIN**   **9**

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To illustrate the vectorial representation of forces and moments

CO2: To analyse the rigid body in equilibrium

CO3: To evaluate the properties of distributed forces

CO4: To determine the friction and the effects by the laws of friction

CO5: To apply the skills learned in mathematics and statics in the stress and strain analysis and principal stresses and principal planes

TEXTBOOKS:

1. K V Natarajan "Engineering Mechanics", McGraw Higher Education., 11thEdition, 2017.

2. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2018.

3. Khurmi, R.S. and Khurmi, N., 2019. A textbook of Engineering Mechanics. S. Chand Publishing.

4. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

References:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.

2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

3. Irving H. Shames, Krishna MohanaRao G, Engineering Mechanics – Statics and Dynamics,4thEdition, Pearson Education Asia Pvt. Ltd., 2005.

4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.

5. Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition,McGraw Hill Higher Education, 2013.

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
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3	3	3	3	3	-	-	-	-	1	-	-	-	-	-
4	3	3	3	3	-	-	-	-	1	-	-	-	-	-
5	3	3	3	3	-	-	-	-	1	-	-	-	-	-
Low (1); Medium (2); High (3)														

CE2312	**FLUID MECHANICS**	**L T P C**
		3 0 0 3

COURSE OBJECTIVES:

- To introduce the students about properties and behaviour of the fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach and 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   10

Scope of fluid mechanics – Definitions of a fluid –Fluid properties – Fluid statics – Manometry – Forces on plane and curved surfaces – Buoyancy and floatation.

UNIT II   BASIC CONCEPTS OF FLUID FLOW   10

Kinematics: Classification of flows – continuity equation (one and three dimensional differential forms) - velocity field and acceleration - Streamline, streak-line and path-lines – Stream function and velocity potentials – Flow nets;

Dynamics : Euler's equation of motion along a stream line – Bernoulli's equation – Applications to velocity and discharge measurements – Linear momentum equation – Moment of momentum equation.

UNIT III   DIMENSIONAL ANALYSIS AND MODEL STUDIES   7

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   10

Reynolds experiment – Laminar flow in pipes and between parallel plates – Development of laminar and turbulent flows in pipes – Darcy-Weisbach equation – Moody diagram – Major and minor losses of flow in pipes – Total energy line – Hydraulic grade line – Pipes in series and parallel –Equivalent pipes.

UNIT V   BOUNDARY LAYERS   8

Definition of boundary layers – Laminar and turbulent boundary layers – Displacement, momentum and energy thickness – Momentum integral equation – Applications – Separation of boundary layer – Concept of drag and lift forces.

TOTAL: 45PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.

CO2: To apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.

CO3: To formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.

CO4: To estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO5: To explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.

TEXTBOOKS:

1. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines Standard Book House New Delhi. 2015.

REFERENCES:

1. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.

2. Narayana Pillai N. Principles of Fluid Mechanics and Fluid Machines, (3rd Ed.) University Press (India) Pvt. Ltd. 2009.

3. Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

4. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.

5. Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9th Ed.) Tata McGraw Hill, New Delhi, 1998.

CO	PO												PSO	
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3	2	-	-	-	-	3	3	-	-	-	-	-	-	-
4	2	-	3	2	-	-	3	-	-	-	-	-	-	-
5	-	-	3	2	-	2	-	-	-	-	-	1	-	-
Low (1); Medium (2); High (3)														

CE2313	CONSTRUCTION MATERIALS AND TECHNOLOGY	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- To introduce students to various construction materials and the techniques that are commonly used in civil engineering construction.

Unit I   STONES - BRICKS - CONCRETE BLOCKS - LIME   9

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive strength – Water Absorption – Efflorescence – Lime – Preparation of lime mortar – Concrete hollow blocks – Lightweight concrete blocks.

Unit II   OTHER MATERIALS   9

Timber – Market forms – Plywood – Veneer – False ceiling materials – Steel – Mechanical treatment

– Aluminum – Uses – Market forms – Glass – Ceramics – Refractories – Composite Materials – Types and applications – FRP – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

Unit III   CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS   9

Types of Foundations – Shallow and Deep Foundations – Stone Masonry – Brick Masonry – Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding – Underpinning – Roofing – Flooring – Joints in concrete – Contraction/Construction/Expansion joints – Fire Protection – Thermal Insulation – Ventilation and Air conditioning – Acoustics and Sound Insulation – Damp Proofing.

Unit IV   CONSTRUCTION EQUIPMENTS   9

Selection of equipment for earthwork excavation, concreting, material handling and erection of structures – Dewatering and pumping equipment.

Unit V   CONSTRUCTION PLANNING   9

Introduction to construction planning – Scheduling for activities – Critical path method (CPM) and PERT network modelling and time analysis – Case illustrations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

    CO1: To identify the good quality brick, stone and blocks for construction.

    CO2: To recognize the market forms of timber, steel, aluminum and applications of various composite materials.

CO3: To identify the best construction and service practices such as thermal insulations and air conditioning of the building

CO4: To select various equipments for construction works conditioning of building

CO5: To understand the construction planning and scheduling techniques

TEXT BOOKS:

1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015

2. Arora S.P and Bindra S.P Building construction, DhanpatRai and sons, 2013.

REFERENCE BOOKS:

1. Varghese.P.C, Building Construction, Second Edition PHI Learning ltd., 2016.

2. Punmia ,B.C Building construction , Laxmi publication (p)ltd..,2008.

3. Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., Construction Planning Equipment and Methods, Tata McGraw-hill, 2011.

4. Srinath L.S.,PERT and CPM -Principles and applications, Affliated East West Press 2001

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	-	3	-	2	2	-	-	-	-	2	-	-
2	3	-	-	2	-	-	2	-	-	-	-	2	-	-
3	3	-	-	2	-	-	3	-	-	-	2	-	-	-
4	2	-	-	-	-	-	-	-	-	-	2	-	-	-
5	2	3	2	3	2	2	-	-	2	-	3	2	-	-
Low (1); Medium (2); High (3)														

CE2314	**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, water treatment methods, water storage distribution system, sewage treatment and disposal and deign of intake structures and sewerage system.

UNIT I   **WATER SUPPLY**   **12**

Estimation of surface and subsurface water resources - Predicting demand for water- 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, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator - Sand filters - Disinfection - Removal of iron and manganese - Defluoridation - Softening - 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 - House service connections

UNIT IV   **PLANNING AND DESIGN OF SEWERAGE SYSTEM**   **12**

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow and storm runoff estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Sewer appurtenances - Corrosion in sewers - Prevention and control – 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 - 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

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

   CO1: To understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission.

   CO2: To understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations.

   CO3: To understand the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process and biological treatment process.

   CO4: To design and evaluate water distribution system and water supply in buildings and understand the sludge and septage disposal methods.

   CO5: To understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process and reuse of sewage.

TEXTBOOKS

1. Garg, S.K. Environmental Engineering, Vol.IKhanna Publishers, New Delhi, 2010.

2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.

3. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015.

4. Punmia, B.C., Jain, A.K., and Jain.A.K.., Environmental Engineering, Vol.II, Laxmi Publications, 2010

REFERENCES

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

2. Syed R. Qasimand Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

3. Metcalf and Eddy – Waste water Engineering – Treatment and Reuse, Tata McGraw – Hill Company, New Delhi, 2010.

4. Syed R.Qasim "Wastewater Treatment Plants", CRCPress,WashingtonD.C.,2010

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	2	-	-	-	-	-	-	-	-	-	-	3
2	3	2	3	-	-	-	-	-	-	-	-	-	-	2
3	-	-	3	-	-	-	2	-	-	-	-	-	-	2
4	-	2	3	-	2	-	2	2	-	-	-	-	-	3
5	-	-	-	-	-	-	2	3	1	-	-	2	-	3
Low (1); Medium (2); High (3)														

CE2315   **SURVEYING AND LEVELLING**   **L T P C**

                                                                                                                3 0 0 3

COURSE OBJECTIVES:

- To introduce the rudiments of plane surveying and geodetic 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 Astronomical 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 AND COMPUTATIONS**   **9**

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of levelling – Fly leveling – Check levelling – Procedure in levelling – Booking –

Reduction – Curvature and refraction – Reciprocal levelling – Precise levelling – Contouring – Computation of cross sectional areas and volumes - Earthwork calculations - Mass haul diagrams.

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 – Curves – Introduction of simple, circular, transition, reverse curve and setting out.

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 availabilityand antispoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

   CO1: To introduce the rudiments of various surveying and its principles.

   CO2: To imparts knowledge in computation of levels and volumes of terrain and ground features.

   CO3: To imparts concepts of Theodolite Surveying for complex surveying operations and basics of curve concepts.

   CO4: To   understand the procedure for establishing horizontal and vertical control.

   CO5: To imparts the knowledge on modern surveying instruments.

   CO6: To learn the need of surveying concepts and its importance of lifelong learning in ethical manner

TEXTBOOKS:

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. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.

REFERENCES:

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

2. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

3. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.

4. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.

5. S. K. Roy, Fundamentals of Surveying, Second Edition, Prenticeˆ Hall of India2010.

6. C. Venkatramaiah, Textbook of Surveying, Universities Press, Second Edition, 2011.

7. Online Material : https://nptel.ac.in/courses/105107122

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	2	2	3	-	2	2	-	2	-	-	-
2	2	2	3	2	2	3	-	2	2	-	2	-	-	2
3	2	2	3	2	2	3	-	2	2	-	2	-	-	2
4	2	2	3	2	2	3	2	2	3	-	2	2	-	2
5	2	2	3	2	2	3	2	3	2	-	2	2	-	2
6	-	-	-	-	-	-	-	1	-	-	-	2	-	-
Low (1); Medium (2); High (3)														

CE2381	SURVEYING AND LEVELLING LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES:

- At the end of the course the student will possess knowledge about survey field techniques

LIST OF EXPERIMENTS:

Chain Survey

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicularoffset

Compass Survey

2. Compass Traversing – Measuring Bearings & arriving included angles

Levelling - Study of levels and levelling staff

3. Fly levelling

4. Check levelling

Theodolite - Study of Theodolite

5. Measurements of horizontal angles by reiteration and repetition and vertical angles

6. Determination of elevation of an object using single plane method when base is Accessible / inaccessible.

Tacheometry – Tangential system – Stadia system

7. Determination of Tacheometric Constants

8. Heights and distances by stadia Tacheometry

9. Heights and distances by Tangential Tacheometry

Setting out works

10. Setting out works – Using tapes / Cross staff / Theodolite / Total Station

11. Simple Curve Setting – Using Theodolite / Total Station

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

12. Traverse using Total station and Area of Traverse

13. Determination of distance and difference in elevation between two inaccessible pointsusing Total station

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To impart knowledge on the usage of basic surveying instruments like chain/tape, compassand levelling instruments.

CO2 To use levelling instrument for surveying operations.

CO3 To use theodolite for various surveying operations.

CO4 To carry out necessary surveys for social infrastructures.

CO5 To prepare planimetric maps.

REFERENCES:

1. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint, 2015.

2. Dr. B. C. Punmia, Ashok K. Jainand Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition, 2016.

3. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001

4. Bannisterand S. Raymond, Surveying, Seventh Edition, Longman 2004 a. David Clark, Planeand Geodetic Surveying for Engineers, Volume I, Constable and Company Ltd, London, CBS, 6th Edition, 2004.

5. David Clark and James Clendinning, Plane and Geodetic Surveying for Engineers, VolumeII, Constable and Company Ltd, London, CBS, 6th Edition, 2004.

6. S. K. Roy, Fundamentals of Surveying, Second Edition, Prentice 'Hall of India 2004

7. K. R. Arora, Surveying Vol. I & II, Standard Book house, Eleventh Edition, 2013.

8. Online Material: https://sl-iitr.vlabs.ac.in/List%20of%20experiments.html

CO	PO												PSO	
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1	3	2	3	3	2	3	2	3	3	3	3	1	-	1
2	3	2	3	-	3	3	3	3	3	3	3	1	-	2
3	3	1	2	-	3	2	-	-	3	-	-	2	-	2
4	3	3	2	2	2	3	3	2	3	3	3	1	-	3
5	3	3	3	2	2	3	3	2	3	3	3	1	-	3
Low (1); Medium (2); High (3)														

CE2382   **WATER AND WASTEWATER ANALYSIS LABORATORY**   **L T P C**

                                                                             0 0 3 1.5

COURSE OBJECTIVES:

• This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS:

ANALYSIS OF WATER SAMPLE

1. Sampling and preservation methods for water and wastewater (Demonstration only)

2. Measurement of Electrical conductivity and turbidity

3. Determination of fluoride, iron and sulphate in water by spectrophotometric method /ISE

4. Determination of Optimum Coagulant Dosage by Jar test apparatus

5. Determination of available chlorine in bleaching powder and residual chlorine in water

6. Determination of calcium, potassium and sodium in water suing flame photometer

ANALYSIS OF WASTEWATER SAMPLE

1. Estimation of suspended, volatile and fixed solids

2. Determination of Sludge Volume Index in waste water

3. Determination of Dissolved Oxygen

4. Estimation of B.O.D.

5. Estimation of C.O.D. (Demonstration only)

6. Determination of TKN and Ammonia Nitrogen in wastewater

7. Determination of total and faecal coliform (Demonstration only)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

    CO1: To calibrate and standardize the equipment

    CO2: To collect proper sample for analysis

    CO3: To know the sample preservation methods

    CO4: To perform field oriented testing of water, wastewater

    CO5: To perform coliform analysis

REFERENCES:

1. APHA, "Standard Methods for the Examination of Water and Waste water", 22nd Ed. Washington, 2012.

2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist,H. – Second Edition, VCH, Germany, 3rd Edition, 1999.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	-	-	2	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	2	-	-	-	-	1	-	3
3	2	-	-	1	-	-	-	-	-	-	-	-	-	2
4	-	-	2	2	2	2	3	1	3	2	1	2	-	3
5	-	-	2	-	-	-	3	-	-	-	-	1	-	3
Low (1); Medium (2); High (3)														

GE2381	PROFESSIONAL DEVELOPMENT	L T P C
		0 0 2 1

COURSE OBJECTIVES:

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.

  - To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.

  - To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize,interlink, and utilizing many more critical features offered

  - To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: **10 Hours**

    Create and format a document Working with tables

    Working with Bullets and Lists

    Working with styles, shapes, smart art, charts

    Inserting objects, charts and importing objects from other office toolsCreating and Using document templates

Inserting equations, symbols and special characters working with Table of contents and References, citationsInsert and review comments

Create bookmarks, hyperlinks, endnotes footnoteviewing document in different modes

Working with document protection and securityInspect document for accessibility

MS EXCEL: **10 Hours**

Create worksheets, insert and format data

Work with different types of data: text, currency, date, numeric etc.Split, validate, consolidate, Convert data

Sort and filter data

Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)Work with Lookup and reference formulae

Create and Work with different types of charts Use pivot tables to summarize and analyse data

Perform data analysis using own formulae and functions

Combine data from multiple worksheets using own formulae and built-in functions to generate results

Export data and sheets to other file formats Working with macros

Protecting data and Securing the workbook

MS POWERPOINT: **10 Hours**

Select slide templates, layout and themes

Formatting slide content and using bullets and numberingInsert and format images, smart art, tables, charts

Using Slide master, notes and handout masterWorking with animation and transitions Organize and Group slides

Import or create and use media objects: audio, video, animation

Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Use MS Word to create quality documents, by structuring and organizing content for their dayto day technical and academic requirements

CO2: Use MS EXCEL to perform data operations and analytics, record, retrieve data as perrequirements and visualize data for ease of understanding

CO3: Use MS PowerPoint to create high quality academic presentations by including commontables, charts, graphs, interlinking other elements, and using media objects.

SEMESTER IV

CE2411   APPLIED HYDRAULICS ENGINEERING   L T P C

                                                                                     3 1 0 4

COURSE OBJECTIVES:

- To impart basic knowledge to the students about the open channel flows with analysis of uniform flow, gradually varied flow and rapidly varied flow and to expose them 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   10 + 3

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

UNIT II   VARIED FLOWS   9 + 3

Dynamic equations of gradually varied - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method – Change in Grades.

UNIT III   RAPIDLY VARIED FLOWS   8 + 3

Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Positive and Negative surges.

UNIT IV   TURBINES   9 + 3

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

UNIT V   PUMPS   9 + 3

Classification of Pumps - Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in workdone.

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

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application

CO2: To analyze steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.

CO3: To derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges.

CO4: To design turbines and explain the working principle

CO5: To differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.

TEXT BOOKS:

1. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

2. Subramanya.K ,"Flow in open channels", Tata McGraw Hill, New Delhi, 2000.

3. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.

REFERENCES:

1. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.

2. Subramanya.K., " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

3. Chandramouli P.N.,"Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	2	-	-	-	-	2	-	-	-	-	-
2	2	3	3	2	-	-	-	-	-	-	-	-	-	-
3	3	2	-	2	-	-	3	-	-	-	-	-	-	-
4	3	-	3	2	-	-	2	-	-	-	-	-	-	-
5	3	2	3	-	-	-	-	-	-	-	2	-	-	-
Low (1); Medium (2); High (3)														

CE2412   **STRENGTH OF MATERIALS**   **L T P C**

                                                                      3 0 0 3

COURSE OBJECTIVES:

• To learn the mechanism of load transfer in beams and the induced stresses due to simple bending and unsymmetrical bending and to determine the deformation in determinate beams and to know the basic concepts of analysis of indeterminate beams.

• To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

UNIT I   BENDING OF BEAMS   9

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

UNIT II   DEFLECTION OF BEAMS   9

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

UNIT III   INDETERMINATE BEAMS   9

Propped Cantilever and Fixed Beams – Fixed end moments reactions- Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams.

UNIT-IV   COLUMNS AND CYLINDERS   9

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions -Thick cylinders - shrinking on stresses.

UNIT V   ADVANCED TOPICS   9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections- Shear Center applied - Determination of principal stresses and principal planes – Volumetric strain-Theories of failure –shear stress, strain energy and distortion energy theories –application problems.

                                                                        TOTAL - 45 PERIODS

COURSE OUTCOMES:

 After completion of the course, students are able to have the proficiency in the following:

CO1: To determine Shear force and bending moment in beams and understand concept of theory of simple bending.

CO2: To calculate the deflection of beams by different methods and selection of method for determining slope or deflection.

CO3: To analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements.

CO4: To find the load carrying capacity of columns and stresses induced in columns and cylinders.

CO5: To determine the stresses due to Unsymmetrical bending of beams and study the various theories of failure.

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2018.

2. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.

3. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi,2017.

4. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010

REFERENCES :

1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van NosReinbhold, New Delhi1999.

2. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995.

3. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi2016.

4. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi,2016

5. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad,2010.

6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi,2009.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	-	-	-	-	1	-	-	-	-	-
2	3	1	1	-	-	-	-	-	1	-	-	-	-	-
3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
4	3	2	1	-	-	-	-	-	1	-	-	-	-	-
5	3	2	-	-	-	-	-	-	1	-	-	-	-	-
Low (1); Medium (2); High (3)														

CE2413   **CONCRETE TECHNOLOGY**   **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To study the properties of concrete making materials.

- To have better knowledge about the chemical and mineral admixtures in concrete.

- To familiarize with the IS method of mix design as per the latest code .

- To understand the fresh and hardened properties of concrete. To know the importanceand applications of special concretes

UNIT I   **CONSTITUENT MATERIALS**   **9**

Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT II   **CHEMICAL AND MINERAL ADMIXTURES**   **9**

Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties

| **UNIT III** | **PROPORTIONING OF CONCRETE MIX** | **9** |

Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design – Mix Design Examples

| **UNIT IV** | **FRESH AND HARDENED PROPERTIES OF CONCRETE** | **9** |

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity.

| **UNIT V** | **SPECIAL CONCRETE** | **9** |

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON - Shotcrete – Polymer concrete - High performance concrete- self compacting concrete - Geopolymer Concrete – Self healing concrete – Bacterial Concrete.

TOTAL: 45 PERIODS

TEXT BOOKS:

1.   Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.

2.   Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

REFERENCES:

1.   Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995

2.   Gambhir.M.L.ConcreteTechnology,Fifth Edition, McGraw Hill Education,2017.

3.   Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015.

3.   IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhii.

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1:   To know the properties of concrete making materials.

CO2:   To gain better knowledge about the chemical and mineral admixtures in concrete.

CO3:   To understand the concept and procedure of mix design as per IS method.

CO4:   To understand the properties of concrete at fresh and hardened state.

CO5:   To understand the importance and application of special concretes.

CO	**PO**												**PSO**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	1	1	2	1	3	3	2	1	1	1	2	-	1
2	3	1	1	1	1	3	3	1	1	1	1	2	-	-
3	3	2	3	3	1	3	3	1	1	1	1	2	2	-
4	3	1	1	1	1	3	3	2	1	1	1	2	-	-
5	3	1	1	1	1	3	3	2	1	1	2	2	-	-
Low (1); Medium (2); High (3)														

CE2414	**SOIL MECHANICS**	**L T P C**
		3 0 0 3

COURSE OBJECTIVES:

- 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	**SOILWATER AND WATER FLOW**	**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. - Vt 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

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems.

CO2: To show the basic understanding of flow through soil medium and its impact of engineering solution.

CO3: To understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation.

CO4: To show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils.

CO5: To demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.

TEXTBOOKS:

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005

2. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015

REFERENCES:

1. GopalRanjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.

2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.

3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.

4. Online Material : https://archive.nptel.ac.in/courses/105/105/105105168/

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	2	2	3	1	1	1	2	1	2	3	3	1
2	3	2	3	2	3	1	1	1	2	1	2	3	2	1
3	3	3	2	2	2	2	1	1	2	1	2	3	2	1
4	2	3	3	2	2	1	1	1	1	1	2	3	2	1
5	3	3	2	2	2	1	1	1	1	1	1	3	3	1
Low (1); Medium (2); High (3)														

CE2415   **HIGHWAY AND RAILWAY ENGINEERING**   **L T P C**

                                                                             3 0 0 3

COURSE OBJECTIVES:

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

UNIT I   **HIGHWAY ENGINEERING**   **9**

Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment –Typical cross sections of Urban and Rural roads – Engineering surveys for alignment- Conventional and Modern method.

UNIT II   **DESIGN OF HIGHWAY ELEMENTS**   **9**

Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients– pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT III   **HIGHWAY CONSTRUCTION AND MAINTENANCE**   **9**

Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavement- Highway drainage – Evaluation and Maintenance of pavements.

UNIT IV   **RAILWAY PLANNING AND CONSTRUCTION**   **9**

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage- Level Crossings-Signalling.

UNIT V   **RAILWAY TRACK CONSTRUCTION MAINTENANCE AND OPERATION**   **9**

Points and Crossings - Design of Turnouts, Working Principle-Track Circuiting - Construction& Maintenance – Conventional, Modern methods and Materials, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance - Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS Feasibility study, Planning and construction.

                                                                    TOTAL : 45 PERIODS

TEXTBOOKS:

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

2. Saxena S.C., and Arora S.P., Text Book of Railway Engineering, Dhanapat   Rai Publications, Delhi, 2019.

REFERENCES:

1. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai,2010

2. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications,6th edition Delhi,2015.

3. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, NewDelhi

4. IRC 58-2012. The Indian Road Congress, Guideline for the Design of RigidPavements for Highways, NewDelhi

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To plan a highway according to the principles and standards adopted in various institutions inIndia.

CO2: To design the geometric features of road network and components of pavement.

CO3: To test the highway materials and construction practice methods and know its properties andable to perform pavement evaluation and management.

CO4: To understand the methods of route alignment and design elements in railway planning andconstructions.

CO5: To understand the construction techniques and maintenance of track laying and railway stations

CO6: To get the theoretical knowledge and its practical application on the planning, design and maintenance of highways and railways.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	2	-	3	1	3	-	-	-	-	-	-
2	2	3	3	2	2	-	2	3	2	-	2	3	-	-
3	2	3	2	2	2	3	3	3	-	-	3	3	-	-
4	3	-	-	-	-	3	-	3	-	1	-	-	1	-
5	-	-	3	-	2	-	-	-	2	-	-	2	-	2
6	-	-	-	-	-	2	2	-	-	-	-	3	3	-
Low (1); Medium (2); High (3)														

GE2421   **ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**   **L T P C**

2 0 0 2

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.

- To impart knowledge on the causes, effects and control or preventive measures of environmental pollution

- To identify new renewable energy resources and contribute to the sustainable measures to conserve them for future generations.

- To facilitate the understanding of global and Indian scenario of regional and local environmental issues and providing solutions to lead sustainability.

- To demonstrate the knowledge of green technology to conserve the environment.

UNIT I   **ENVIRONMENT AND BIODIVERSITY**   **6**

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

UNIT II   **ENVIRONMENTAL POLLUTION**   **6**

Definition, Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions.

Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection Acts. Environmental Impact Assessment.

UNIT III   **RENEWABLE SOURCES OF ENERGY**   **6**

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV   **SUSTAINABILITY AND MANAGEMENT**   **6**

Sustainable Development-Definition, concept, needs and challenges-GDP-economic and social aspects of sustainability-measures of sustainability-millennium development goals, and protocols-targets, indicators and intervention areas.

Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V   **SUSTAINABILITY PRACTICES**   **6**

Zero waste and 3R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio- economical and technological change.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.

2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.

3. Anjali Bagad, " Environmental Sciences and Sustainablity",1st Edition, Technical Publications, Pune, 2022.

REFERENCE BOOKS:

1. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.

2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" 3rd Edition. Orient BlackswanPvt. Ltd. 2021.

3. Tyler Miller, G and Scott Spoolman " Environmental Science" Cengage Learning; 16th edition, 2018.

4. Ravikrishnan, A " Environmental Sciences and Sustainablity",15th Edition, Sri Krishna Hitech Publishing Company Pvt Ltd. 2023.

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: To identify the causes, effects of various environmental pollution and contribute to the preventive measures in the immediate society.

CO3: To recognize different forms of renewable energy resources and apply them for suitable applications for technological advancement and societal development.

CO4: To identify and apply the knowledge of engineering & technology for environmental management to achieve sustainability.

CO5: To facilitate the understanding of global and Indian scenario of green technologies for future generations.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
2	3	-	3	-	-	-	2	-	3	-	-	-	-	-
3	-	-	-	-	-	2	2	-	-	-	-	-	-	-
4	-	3	3	-	-	-	2	3	-	-	-	-	-	-
5	-	3	3	-	-	-	2	3	-	-	-	-	-	-
Low (1); Medium (2); High (3)														

CE2481   **HYDRAULIC ENGINEERING LABORATORY**   **L T P C**

0 0 3 1.5

COURSE OBJECTIVES:

- To provide hands on experience in calibration of flow meters, performance characteristics ofpumps and turbines.

LIST OF EXPERIMENTS (Any 10 of the following)

A. FLOW MEASUREMENT

1. Calibration of Rotameter

2. Flow through Orifice meter/mouthpiece,Venturimeter and Notches

3. Bernoulli's Experiment

B. LOSSES IN PIPES

4. Determination of friction factor in pipes.

5. Determination of minor losses

C. PUMPS

6. Characteristics of Centrifugal pumps

7. Characteristics of Gear pump

8. Characteristics of Submersible pump

9. Characteristics of Reciprocating pump

D. TURBINES

10. Characteristics of Pelton wheel turbine

11. Characteristics of Francis turbine

E. DETERMINATION OF METACENTRIC HEIGHT

12. Determination of metacentric height of floating bodies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To explore the fundamental principles of fluid mechanics through experimentation.

CO2: To understand various discharge measuring instruments for liquid and air.

CO3: To investigate engineering design principles for pipe networks, Major losses and Minor losses.

CO4: To analyse various types of pumps for performance characteristics.

CO5: To analyse various types of turbines for performance characteristics.

CO6: To develop skills for analysing experimental data and working in teams.

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.

2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2017.

3. Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd. 2011

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	1	-	-	-	-	-	-	-	-	-	-
2	3	3	3	1	-	-	-	-	-	-	-	-	-	-
3	3	3	3	1	-	-	-	-	-	-	-	-	-	-
4	3	3	3	1	-	-	-	-	-	-	-	-	-	-
5	3	3	3	1	-	-	-	-	-	-	-	-	-	-
6	-	2	-	-	-	-	-	-	3	-	-	-	-	-
Low (1); Medium (2); High (3)														

CE2482   **SOIL MECHANICS LABORATORY**   **L T P C**

0 0 3 1.5

COURSE OBJECTIVES:

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

EXERCISES:

1. DETERMINATION OF INDEX PROPERTIES

    a) Specific gravity of soil solids

    b) Grain size distribution – Sieve analysis

    c) Grain size distribution - Hydrometer analysis

    d) Liquid limit and Plastic limit tests

    e) Shrinkage limit and Differential free swell test

 2. DETERMINATION OF INSITU DENSITY AND COMPACTIONCHARACTERISTICS

    a) Field density Test (Sand replacement method)

    b) Determination of moisture – density relationship using standard proctor compaction test.

3. DETERMINATION OF ENGINEERING PROPERTIES

    a) Permeability determination (constant head and falling head methods)

    b) One dimensional consolidation test (Determination of co-efficient of consolidation only)

    c) Direct shear test in cohesion less soil

d) Unconfined compression test in cohesive soil

e) Laboratory vane shear test in cohesive soil

f) Tri-axial compression test in cohesion less soil (Demonstration only)

g) California Bearing Ratio Test

4. TEST ON GEOSYNTHETICS (Demonstration only)

a) Determination of tensile strength and interfacial friction angle.

b) Determination of apparent opening sizes and permeability.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To conduct tests to determine the index properties of soils

CO2: To determine the insitu density and compaction characteristics.

CO3: To conduct tests to determine the compressibility, permeability and shear strength of soils.

CO4: To understand the various tests on Geosynthetics.

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. Online Material https://smfeiiith.vlabs.ac.in/List%20of%20experiments.html

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	3	1	1	1	1	3	1	1	3	3	1
2	1	2	3	3	1	1	1	1	3	2	1	3	3	1
3	3	3	3	3	1	1	1	1	3	1	1	3	3	1
4	1	2	2	3	2	1	1	1	3	1	1	3	3	1
Low (1); Medium (2); High (3)														

CE2483   **SURVEY CAMP**   **L T P C**

(During III semester Vacation 2 weeks)   **0 0 0 1**

The objective of the survey camp is to enable the students to get practical training in the field work.

The camp must involve work on a large area of not less than 25 acres outside the campus (Survey camp should not be conducted inside the campus). Two weeks Survey Camp will be conducted during vacation to expose on field surveying such as triangulation, horizontal control and vertical control. The camp record shall include all original field observations, calculations and draftings.

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1 :   Familiarize in handling different survey instruments.

CO2 :   Apply modern surveying techniques in field to establish horizontal control.

CO3 :   Understand the surveying techniques infield to establish vertical control network.

CO4 :   Exposed to different survey adjustment techniques.

CO5 :   Familiarize in setting outwork different computation process.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	1	1	-	3	1	-	-	2	-	-	3	-	2
2	-	1	1	-	3	1	-	-	2	-	-	1	-	2
3	-	1	2	-	3	2	-	-	3	-	-	2	-	2
4	-	3	2	-	2	1	-	-	2	-	-	1	-	2
5	-	1	2	-	3	1	-	-	2	-	-	2	-	2
Low (1); Medium (2); High (3)														