B.E-CIVIL ENGINEERING
Regulation 2024
CURRICULUM & SYLLABI

DEPARTMENT VISION

To excel by fostering excellence in technical education, pioneering impactful research, and nurturing a culture of ethical leadership and entrepreneurial spirit among engineers who passionately serve society on a global scale driving positive change.

DEPARTMENT MISSION

As a department, we are committed

- ❖ To provide an exceptional technical education that equips engineers with the knowledge, skills, and practical experience to excel in their professional endeavours and make significant contributions to society.
- ❖ To conduct ground breaking research that addresses societal challenges and pushes the boundaries of innovation in civil engineering, fostering a culture of inquiry and discovery among our faculty and students.
- ❖ To cultivate ethical leadership and entrepreneurial mind set among engineers, instilling a sense of responsibility towards society
- ❖ To nurture engineers who are committed to serve society on a global scale, driving positive change through their work and embodying the values of integrity, empathy, and sustainability.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Possess a broad-based civil engineering education to successfully obtain professional positions, and practice civil engineering in a wide range of professional settings including consulting firms, industries, and government agencies.

PEO 2: Exhibit professional growth throughout their careers by taking increasing professional responsibilities and pursue life-long learning by obtaining a professional engineering license.

PEO 3: Demonstrate success and leadership in the practice of engineering by contributing to the economic well being of their employers and society, and by dedicated their service to professional societies.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

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

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

PO 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.

PO 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.

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

PO 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.

PO 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.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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.

PO 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.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Graduates will be able to:

PSO 1: Ability to analyze and solve complex problems in structural, geotechnical, transportation, and environmental engineering, applying appropriate theories, methodologies, and innovative approaches to address real-world challenges effectively.

PSO 2: Develop comprehensive design solutions for various systems including buildings and hydraulic structures, integrating detailed specifications and accurate estimates to ensure the functionality, safety, and sustainability of the constructed infrastructure.

PSO 3: Apply concepts of construction engineering and management throughout project lifecycles, effectively coordinating resources, schedules, and budgets to ensure the successful execution of projects while adhering to sustainability principles and industry standards.

B.E-CIVIL ENGINEERING
CURRICULUM AND SYLLABI (Regulation 2024)
(Applicable for students admitted from the Academic Year 2024-2025)
Minimum Credits to be Earned: 163

SEMESTER I										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA / ES**	**Course Type**	**Category**
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC
2	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC
3	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC
4	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC
5	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC
6	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC
7	24MC111	Induction Program	3 Weeks						MC	MC
TOTAL						20	24			

SEMESTER II										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24MA201	Transforms and Partial Differential Equations	3	1	0	4	4	40/60	T	BSC
2	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC
3	24EE204	Basic Electrical and Electronics Engineering	3	0	0	3	3	40/60	T	ESC
4	24ME202	Engineering Mechanics	3	0	0	3	3	40/60	T	ESC
5	24CE201	Engineering Geology	3	0	0	3	3	40/60	T	PCC
6	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC
7	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC
8	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC
		Work Integrated Learning (Industrial Practice)	Regulation 2024, Clause 4.4							AP
TOTAL						20	25			

SEMESTER III										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
2	24MA301	Statistics and Numerical Methods	3	1	0	4	4	40/60	T	BSC
3	24CE301	Fluid Mechanics	3	0	0	3	3	40/60	T	PCC
4	24CE302	Construction Materials and Technology	3	0	0	3	3	40/60	T	PCC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
5	24CE303	Strength of Materials	3	1	0	4	4	40/60	T	PCC
6	24CE304	Surveying and Levelling	3	0	2	4	5	50/50	TP	PCC
7	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC
8	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC
		Work Integrated Learning (Industrial Training-I)	Regulation 2024, Clause 4.4							AP
TOTAL						22	25			

SEMESTER IV										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE401	Applied Hydraulics Engineering	3	1	0	4	4	40/60	T	PCC
2	24CE402	Structural Analysis I	3	0	0	3	3	40/60	T	PCC
3	24CE403	Soil Mechanics	3	0	4	5	7	50/50	TP	PCC
4	24CE404	Environmental Engineering	3	0	2	4	5	50/50	TP	PCC
5	24CE405	Concrete technology	3	0	0	3	3	40/60	T	PCC
6	24CE411	Hydraulics Engineering Laboratory	0	0	4	2	4	60/40	P	PCC
7	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC
8	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC
9		Mandatory Course- 3 (Choose from list)	2	0	0	0	2	100/0	MC	MC
		Work Integrated Learning (Industrial Training-II)	Regulation 2024, Clause 4.4							AP
TOTAL						23	32			

SEMESTER V										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE501	Design of RCC Structures	3	0	0	3	3	40/60	T	PCC
2	24CE502	Structural Analysis II	3	0	0	3	3	40/60	T	PCC
3	24CE503	Foundation Engineering	3	0	0	3	3	40/60	T	PCC
	24CE504	Construction Techniques and Practices	3	0	0	3	3	40/60	T	PCC
5		PEC-1	3	0	0	3	3	40/60	T	PEC
6		OEC-1	3	0	0	3	3	40/60	T	OEC
7	24CE511	Materials Testing Laboratory	0	0	4	2	4	60/40	P	PCC
8	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
9	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC
10		Mandatory Course- 4 (Choose from list)	2	0	0	0	2	100/0	MC	MC
		Work Integrated Learning (Industrial Problem Solving-I)	Regulation 2024, Clause 4.4							AP
					TOTAL	22	28			

SEMESTER VI										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE601	Design of Steel Structures	3	1	0	4	4	40/60	T	PCC
2	24CE602	Transportation Engineering	3	0	0	3	3	40/60	T	PCC
3		PEC-2	3	0	0	3	3	40/60	T	PEC
4		PEC-3	3	0	0	3	3	40/60	T	PEC
5		OEC-2	3	0	0	3	3	40/60	T	OEC
6	24CE611	Highway Engineering Laboratory	0	0	4	2	4	60/40	P	PCC
	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC
9	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC
10	24EL611	Innovation and Product Development–4 (Patent Filing / Startup Registration)	0	0	2	1	1	100/0	EL	EEC
		Work Integrated Learning (Industrial Problem Solving-II)	Regulation 2024, Clause 4.4							AP
						TOTAL	23	29		

SEMESTER VII										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE701	Estimation, Costing and Valuation Engineering	3	0	0	3	3	40/60	T	PCC
2		PEC-4	3	0	0	3	3	40/60	T	PEC
3		PEC-5	3	0	0	3	3	40/60	T	PEC
4		PEC-6	3	0	0	3	3	40/60	T	PEC
5		OEC-3	3	0	0	3	3	40/60	T	OEC
6		OEC-4	3	0	0	3	3	40/60	T	OEC
7	24CE711	Mini Project	0	0	4	2	4	60/40	P	EEC
8	24CE712	Building Drawing and Detailing Laboratory	0	0	4	2	4	60/40	P	PCC
9	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC
						TOTAL	23	28		

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
SEMESTER VIII										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC
2	Personality and Character Development Activity Points (Refer Regulation 2024, Clause 4.2)									AP
3	Work Integrated Learning Activity Points (Refer Regulation 2024, Clause 4.4)									AP
		TOTAL				10	20			

Humanities, Social Science and Management Courses (9 Credits)										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC
2	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC
3	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC
4	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
5	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC

Basic Science Courses (20 Credits)										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC
2	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC
3	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC
4	24MA201	Transforms and Partial Differential Equations	3	1	0	4	4	40/60	T	BSC
5	24MA301	Statistics and Numerical Methods	3	1	0	4	4	40/60	T	BSC

Engineering Science Courses (16 Credits)										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC
2	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC
3	24EE204	Basic Electrical and Electronics Engineering	3	0	0	3	3	40/60	T	ESC
4	24ME202	Engineering Mechanics	3	0	0	3	3	40/60	T	ESC
5	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
Professional Core Courses (66 Credits)										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CE201	Engineering Geology	3	0	0	3	3	40/60	T	PCC
2	24CE301	Fluid Mechanics	3	0	0	3	3	40/60	T	PCC
3	24CE302	Construction Materials and Technology	3	0	0	3	3	40/60	T	PCC
4	24CE303	Strength of Materials	3	1	0	4	4	40/60	T	PCC
5	24CE304	Surveying and Levelling	3	0	2	4	5	50/50	TP	PCC
6	24CE401	Applied Hydraulics Engineering	3	1	0	4	4	40/60	T	PCC
7	24CE402	Structural Analysis I	3	0	0	3	3	40/60	T	PCC
8	24CE403	Soil Mechanics	3	0	4	5	7	50/50	TP	PCC
9	24CE404	Environmental Engineering	3	0	2	4	5	50/50	TP	PCC
10	24CE405	Concrete technology	3	0	0	3	3	40/60	T	PCC
11	24CE411	Hydraulics Engineering Laboratory	0	0	4	2	4	60/40	P	PCC
12	24CE501	Design of RCC Structures	3	0	0	3	3	40/60	T	PCC
13	24CE502	Structural Analysis II	3	0	0	3	3	40/60	T	PCC
14	24CE503	Foundation Engineering	3	0	0	3	3	40/60	T	PCC
15	24CE504	Construction Techniques and Practices	3	0	0	3	3	40/60	T	PCC
16	24CE511	Materials Testing Laboratory	0	0	4	2	4	60/40	P	PCC
17	24CE601	Design of Steel Structures	3	1	0	4	4	40/60	T	PCC
18	24CE602	Transportation Engineering	3	0	0	3	3	40/60	T	PCC
19	24CE611	Highway Engineering Laboratory	0	0	4	2	4	60/40	P	PCC
20	24CE701	Estimation, Costing and Valuation Engineering	3	0	0	3	3	40/60	T	PCC
21	24CE712	Building Drawing and Detailing Laboratory	0	0	4	2	4	60/40	P	PCC

Professional Elective Courses - Vertical-1 (Environment)										
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Prds. /wk.**	**CA/ ES**	**Course Type**	**Category**
1	24CEE01	Air and Noise Pollution Control Engineering	3	0	0	3	3	40/60	T	PEC
2	24CEE02	Environmental Policy and Legislations	3	0	0	3	3	40/60	T	PEC
3	24CEE03	Environment, Health and Safety	3	0	0	3	3	40/60	T	PEC
4	24CEE04	Industrial Wastewater Management	3	0	0	3	3	40/60	T	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
5	24CEE05	Solid and Hazardous Waste Management	3	0	0	3	3	40/60	T	PEC
6	24CEE06	Climate Change Adaptation and Mitigation	3	0	0	3	3	40/60	T	PEC
7	24CEE07	Environmental Impact Assessment	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-2 (Geotechnical & Geo-Informatics)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEE08	Ground Improvement Techniques	3	0	0	3	3	40/60	T	PEC
2	24CEE09	Pile Foundation	3	0	0	3	3	40/60	T	PEC
3	24CEE10	Geo-Environmental Engineering	3	0	0	3	3	40/60	T	PEC
4	24CEE11	Rock Mechanics	3	0	0	3	3	40/60	T	PEC
5	24CEE12	Remote Sensing Concepts	3	0	0	3	3	40/60	T	PEC
6	24CEE13	Total Station and GPS Surveying	3	0	0	3	3	40/60	T	PEC
7	24CEE14	Satellite Image Processing	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-3 (Construction Techniques, Practices And Management)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEE15	Formwork Engineering	3	0	0	3	3	40/60	T	PEC
2	24CEE16	Advanced Construction Techniques	3	0	0	3	3	40/60	T	PEC
3	24CEE17	Construction Management and Safety	3	0	0	3	3	40/60	T	PEC
4	24CEE18	Construction Equipment and Machinery	3	0	0	3	3	40/60	T	PEC
5	24CEE19	Energy Efficient Buildings	3	0	0	3	3	40/60	T	PEC
6	24CEE20	Sustainable Construction and Lean Construction	3	0	0	3	3	40/60	T	PEC
7	24CEE21	Construction Planning and Scheduling	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-4 (Structures)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEE22	Prefabricated Structures	3	0	0	3	3	40/60	T	PEC
2	24CEE23	Structural Health Monitoring	3	0	0	3	3	40/60	T	PEC
3	24CEE24	Rehabilitation/Heritage Restoration	3	0	0	3	3	40/60	T	PEC
4	24CEE25	Dynamics and Earthquake Resistant Structures	3	0	0	3	3	40/60	T	PEC
5	24CEE26	Prestressed Concrete Structures	3	0	0	3	3	40/60	T	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
6	24CEE27	Concrete Structures	3	0	0	3	3	40/60	T	PEC
7	24CEE28	Steel Structures	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-5 (Water Resources)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEE29	Hydrology and Irrigation Engineering	3	0	0	3	3	40/60	T	PEC
2	24CEE30	Watershed Conservation and Management	3	0	0	3	3	40/60	T	PEC
3	24CEE31	Water Quality and Management	3	0	0	3	3	40/60	T	PEC
4	24CEE32	Groundwater Engineering	3	0	0	3	3	40/60	T	PEC
5	24CEE33	Urban Water Infrastructure	3	0	0	3	3	40/60	T	PEC
6	24CEE34	Water Resources Systems Engineering	3	0	0	3	3	40/60	T	PEC
7	24CEE35	Integrated Water Resources Management	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-6 (Transportation Infrastructure)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CEE36	Railways, Airports, Docks and Harbour Engineering	3	0	0	3	3	40/60	T	PEC
2	24CEE37	Traffic Engineering and Management	3	0	0	3	3	40/60	T	PEC
3	24CEE38	Smart cities	3	0	0	3	3	40/60	T	PEC
4	24CEE39	Intelligent Transport Systems	3	0	0	3	3	40/60	T	PEC
5	24CEE40	Urban Planning and Development	3	0	0	3	3	40/60	T	PEC
6	24CEE41	Pavement Engineering	3	0	0	3	3	40/60	T	PEC
7	24CEE42	Transportation Planning Process	3	0	0	3	3	40/60	T	PEC

Open Elective Courses (12 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24CSO01	Introduction to Algorithms	3	0	0	3	3	40/60	T	OEC
2	24CSO02	Fundamentals of Software Engineering	3	0	0	3	3	40/60	T	OEC
3	24CSO03	Introduction to Cloud Computing	3	0	0	3	3	40/60	T	OEC
4	24CSO04	Principles of Blockchain Technology	3	0	0	3	3	40/60	T	OEC
5	24CSO05	Machine Learning using Python for Beginner	3	0	0	3	3	40/60	T	OEC
6	24CSO06	Multimedia and Computer Graphics	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
7	24CSO07	Introduction to App Development	3	0	0	3	3	40/60	T	OEC
8	24CSO08	Data Analytics	3	0	0	3	3	40/60	T	OEC
9	24EEO01	Electrical Safety	3	0	0	3	3	40/60	T	OEC
10	24EEO02	Introduction to E-Vehicle	3	0	0	3	3	40/60	T	OEC
11	24EEO03	Hybrid Energy Technology	3	0	0	3	3	40/60	T	OEC
12	24EEO04	Solar Photovoltaic System	3	0	0	3	3	40/60	T	OEC
13	24EEO05	Energy Forecasting, Modeling, and Project Management	3	0	0	3	3	40/60	T	OEC
14	24EEO06	Energy Efficient Buildings Design	3	0	0	3	3	40/60	T	OEC
15	24EEO07	Government Rules, Opportunities, Testing, and Certification of EV	3	0	0	3	3	40/60	T	OEC
16	24EEO08	PLC and Automation	3	0	0	3	3	40/60	T	OEC
17	24ECO01	Micro Sensors and Nano Sensors	3	0	0	3	3	40/60	T	OEC
18	24ECO02	Fundamentals of VLSI	3	0	0	3	3	40/60	T	OEC
19	24ECO03	Mass Communication	3	0	0	3	3	40/60	T	OEC
20	24ECO04	Sensor Technology	3	0	0	3	3	40/60	T	OEC
21	24ECO05	Nanomaterials and Devices	3	0	0	3	3	40/60	T	OEC
22	24ECO06	ML for Electronic Systems	3	0	0	3	3	40/60	T	OEC
23	24ECO07	Wireless and Mobile Communication	3	0	0	3	3	40/60	T	OEC
24	24ECO08	Internet of Things and Applications	3	0	0	3	3	40/60	T	OEC
25	24MEO01	Introduction to MEMS and NEMS	3	0	0	3	3	40/60	T	OEC
26	24MEO02	Energy Conservation and Management	3	0	0	3	3	40/60	T	OEC
27	24MEO03	Fundamentals of Additive Manufacturing	3	0	0	3	3	40/60	T	OEC
28	24MEO04	Lean Six Sigma	3	0	0	3	3	40/60	T	OEC
29	24MEO05	Agriculture Technology	3	0	0	3	3	40/60	T	OEC
30	24MHO01	Robots and systems in smart Manufacturing	3	0	0	3	3	40/60	T	OEC
31	24MHO02	Robotics and Automation	3	0	0	3	3	40/60	T	OEC
32	24MHO03	Autonomous Mobile Robots	3	0	0	3	3	40/60	T	OEC
33	24MHO04	Introduction to Drone Technology	3	0	0	3	3	40/60	T	OEC
34	24MHO05	Medical Mechatronics	3	0	0	3	3	40/60	T	OEC
35	24MHO06	Sensors and Actuators	3	0	0	3	3	40/60	T	OEC
36	24MHO07	Micro Electro Mechanical System	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
37	24MHO08	Industry 4.0	3	0	0	3	3	40/60	T	OEC
38	24BMO01	Fundamentals of Radiological Equipment's	3	0	0	3	3	40/60	T	OEC
39	24BMO02	Biomedical Instrumentation Basics	3	0	0	3	3	40/60	T	OEC
40	24BMO03	Medical Robotics	3	0	0	3	3	40/60	T	OEC
41	24BMO04	Principles of Telemedicine	3	0	0	3	3	40/60	T	OEC
42	24BMO05	Hospital Management	3	0	0	3	3	40/60	T	OEC
43	24BMO06	Bio MEMS and Applications	3	0	0	3	3	40/60	T	OEC
44	24BMO07	Fundamentals of Brain Computer Interface	3	0	0	3	3	40/60	T	OEC
45	24BMO08	Principles of Rehabilitation Engineering	3	0	0	3	3	40/60	T	OEC
46	24CHO01	Industrial pollution prevention and control	3	0	0	3	3	40/60	T	OEC
47	24CHO02	Petroleum Technology	3	0	0	3	3	40/60	T	OEC
48	24CHO03	Green Chemistry and Engineering	3	0	0	3	3	40/60	T	OEC
49	24CHO04	Bio-Energy Technology	3	0	0	3	3	40/60	T	OEC
50	24CHO05	Carbon capture utilization and storage	3	0	0	3	3	40/60	T	OEC
51	24CHO06	Battery Technology	3	0	0	3	3	40/60	T	OEC
52	24CHO07	Energy Management	3	0	0	3	3	40/60	T	OEC
53	24CHO08	Environmental Audit	3	0	0	3	3	40/60	T	OEC
54	24ITO01	Introductions to Full Stack Web Development	3	0	0	3	3	40/60	T	OEC
55	24ITO02	Introduction to Digital Marketing	3	0	0	3	3	40/60	T	OEC
56	24ITO03	Social Media Marketing	3	0	0	3	3	40/60	T	OEC
57	24ITO04	Ethical Hacking	3	0	0	3	3	40/60	T	OEC
58	24ITO05	Information Storage Management	3	0	0	3	3	40/60	T	OEC
59	24ITO06	Introductions to Cyber Security	3	0	0	3	3	40/60	T	OEC
60	24ITO07	Software Testing Essentials	3	0	0	3	3	40/60	T	OEC
61	24ITO08	Introductions to UI and UX Design	3	0	0	3	3	40/60	T	OEC
62	24ADO01	Introduction to Machine Learning	3	0	0	3	3	40/60	T	OEC
63	24ADO02	Introduction to Artificial Intelligence	3	0	0	3	3	40/60	T	OEC
64	24ADO03	Introduction to Big Data	3	0	0	3	3	40/60	T	OEC
65	24ADO04	Basics of Data Science	3	0	0	3	3	40/60	T	OEC
66	24ADO05	R Programming	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
67	24ADO06	Fundamentals of Deep Learning	3	0	0	3	3	40/60	T	OEC
68	24ADO07	AI in Healthcare Applications	3	0	0	3	3	40/60	T	OEC

Employability Enhancement Courses (22 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC
2	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC
3	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC
4	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC
5	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC
6	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC
7	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC
9	24EL611	Innovation and Product Development–4 (Patent Filing / Startup Registration)	0	0	2	1	1	100/0	EL	EEC
10	24CE711	Mini Project	0	0	4	2	4	60/40	P	EEC
11	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC
12	24CE811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC

MANDATORY COURSES –1 & 2										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24MC111	Induction Program	3 Weeks						MC	MC
2	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC

MANDATORY COURSES – 3										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24MC301	Introduction to Women and Gender Studies	2	0	0	0	2	100/0	MC	MC
2	24MC302	Elements of Literature	2	0	0	0	2	100/0	MC	MC
3	24MC303	Film Appreciation	2	0	0	0	2	100/0	MC	MC
4	24MC304	Well, Being with Traditional Practices Yoga, Ayurveda and Siddha	2	0	0	0	2	100/0	MC	MC
5	24MC305	History of Science and Technology in India	2	0	0	0	2	100/0	MC	MC
6	24MC306	Political and Economic Thought for a Humane Society	2	0	0	0	2	100/0	MC	MC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
7	24MC307	Indian Constitution	2	0	0	0	2	100/0	MC	MC
8	24MC308	Bureau of Indian Standards (BIS)	2	0	0	0	2	100/0	MC	MC

MANDATORY COURSES - 4										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA/ ES	Course Type	Category
1	24MC401	Japanese Language	2	0	0	0	2	100/0	MC	MC
2	24MC402	German Language	2	0	0	0	2	100/0	MC	MC
3	24MC403	Korean Language	2	0	0	0	2	100/0	MC	MC
4	24MC404	French Language	2	0	0	0	2	100/0	MC	MC
5	24MC405	Hindi Language	2	0	0	0	2	100/0	MC	MC
6	24MC406	Industrial Safety	2	0	0	0	2	100/0	MC	MC
7	24MC407	Disaster Risk Reduction and Management	2	0	0	0	2	100/0	MC	MC
8	24MC408	State, Nation Building and Politics in India	2	0	0	0	2	100/0	MC	MC

B.E-CIVIL ENGINEERING

CURRICULUM AND SYLLABI (Regulation 2024)

SEMESTERWISE CREDITS DISTRIBUTION									
Category	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Credits**
HSMC	4	1	2			2			9
BSC	12	4	4						20
ESC	4	12							16
PCC		3	14	21	14	9	5		66
PEC					3	6	9		18
OEC					3	3	6		12
EEC			2	2	2	3	3	10	22
MC									
Total	**20**	**20**	**22**	**23**	**22**	**23**	**23**	**10**	**163**

Semester-I

Course Code	24HS101	Course Name	TECHNICAL ENGLISH	Course Category	TP	Humanities, Social Science and Management Courses	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is :***

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Employ grammar and appropriate terminologies for day-to-day situations	U								2	2	3		2			
CO-2:	Understand the nuances within both spoken and written interactions	U								3	2	3		2			
CO-3:	Utilize vivid and analytical vocabulary, expressions, and sentence structures	R								2	2	3		2			
CO-4:	Read various forms of writing and grasp both their literal and implied interpretations	E								2	2	3		2			
CO-5:	Compose various kinds of writing employing suitable structures	AP								2	2	3		2			

Unit-1 BASICS OF COMMUNICATION	**6 Periods**
Grammar – Simple present tense, Present continuous tense, Asking questions (Wh-questions); Vocabulary: One-word substitutions, Synonyms; Writing: Personal profile	
Unit-2 NARRATION	**6 Periods**
Grammar – Subject – verb agreement, Simple past, Past continuous tense; Vocabulary – Antonyms, Word formation (Prefixes and Suffixes). Writing – Narrative (Event: Festivals, Birthday, personal experience)	
Unit-3 DESCRIPTION	**6 Periods**
Writing – Definitions, Descriptive writing, Checklists; Grammar: Future tense, Perfect tense, Preposition; Vocabulary: Adjectives and Adverbs	
Unit-4 CLASSIFICATION	**6 Periods**
Writing – Note-making, Note-taking; Grammar: Connectives, Transition words (linkers); Vocabulary: Contextual vocabulary, Words used Both as Noun and Verb, Classification-related words	
Unit-5 EXPRESSION OF VIEWS	**6 Periods**
Writing – Letter writing / Email writing (Enquiry / Permission, Letter to Editor); Grammar: Question tags, Indirect questions, Yes / No questions; Vocabulary: Compound words, Phrasal verbs.	
	Total Theory: 30 Periods

List of Experiments	Total Practical: 30 Periods

1. Listening – Telephone conversation & Writing message, gap filling
2. Reading – Telephone message, bio-note; Writing – Personal profile
3. Listening – Travel podcast / Watching a travel documentary
4. Reading – An excerpt from a travelogue, Newspaper Report
5. Writing – Narrative (Event: Festivals, Birthday, and personal experience: Excursion, Sports, Conference, etc.)
6. Listening – Conversation, Radio/TV advertisement, Commentary
7. Reading – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature
8. Listening – Announcements and filling a table, Catalogue, List of Equipments
9. Reading – An article, social media posts and classifying (channel conversion – text to table)
10. Listening – Debate / Discussion; Reading – Formal letters, Letters to the Editor, Opinion articles / Blogs

	Text Books	References
Learning Resources	1.Using English: A Course book for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015. 2.Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.	1.Anderson, Paul V. Technical Communication: A Reader–Centered Approach. Cengage, New Delhi, 2008. 2.Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

* The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

Course Code	24MA101	Course Name	MATRICES AND CALCULUS	Course Category	T	Basic Science Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is:***

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines..

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Use the matrix algebra methods for solving practical problems.	U	3	2	2	2								2			
CO-2:	Use differential calculus ideas on several variable functions.	R	3	2	2	2								2			
CO-3:	Apply different methods of integration in solving practical problems by using Beta and Gamma functions.	AP	3	2	2	2								2			
CO-4:	Apply multiple integral ideas in solving areas and volumes problems.	AP	3	2	2	2								2			
CO-5:	Apply the concept of vectors in solving practical problems.	AN	3	2	2	2								2			

Unit-1 MATRICES ***12 Periods***

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form - Applications: Stretching of an elastic membrane.

Unit-2 FUNCTIONS OF SEVERAL VARIABLES ***12 Periods***

Limit, continuity, partial derivatives – Homogeneous functions and Euler's theorem - Total derivative – Differentiation of implicit functions - Taylor's formula for two variables - Errors and approximations – Lagrange's method of undetermined multipliers - Applications of Maxima and Minima in Temperature problems.

Unit-3 INTEGRAL CALCULUS ***12 Periods***

Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule –Beta and Gamma functions - Properties – Evaluation of integrals by using Beta and Gamma functions – Error functions.

Unit-4 MULTIPLE INTEGRALS ***12 Periods***

Double integrals – Change of order of integration – Double integrals in polar coordinates – Triple integrals – Volume of Solids –Change of variables in double and triple integrals-Area enclosed by plane curves using MATLAB.

Unit-5 VECTOR CALCULUS ***12 Periods***

Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green's theorem, Stoke's and Gauss divergence theorems – Applications and Verification in evaluating line, surface and volume integrals.

Total: 60 Periods

	Text Books	References
Learning Resources	1.Joel Hass, Christopher Heil, Maurice D.Weir "'Thomas' Calculus", Pearson Education., New Delhi, 2018. 2.Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017. 3.Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009. 4.Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012. 5.Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010	1.Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015. 2.Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009. 3.Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5 th Edition, New Delhi, 2017.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24PH101	Course Name	ENGINEERING PHYSICS	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Make the students effectively to achieve an understanding of mechanical properties of materials.
- Enable the students to gain knowledge of oscillations, sounds and applications of thermal physics.
- Introduce the basics of optics and lasers and its applications.
- Equipping the students to successfully understand the importance of quantum physics.
- Introduce the significance and structure of crystal physics.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the important mechanical properties of materials.	U	3	2	2		2				1			2			
CO-2:	Analyze and apply the principles of oscillations, sound, and thermal physics to solve real-world problems.	AN	3	2	2		2				1			2			
CO-3:	Applying the principles of optics and lasers to analyze and design optical systems and devices.	AP	3	2	2		2				1			2			
CO-4:	Apply quantum mechanical principles to analyze and predict the behavior of particles and systems at the atomic and subatomic levels.	AP	3	2		2								2			
CO-5:	Understanding and predicting material properties based on crystal structure and symmetry principles.	U	3	2			2							2			

Unit-1 MECHANICS OF MATERIALS **9 Periods**

Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke's law - Poisson's ratio -stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination- I shaped girders and application in Engineering field –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

Unit-2 OSCILLATIONS, SOUND AND THERMAL PHYSICS **9 Periods**

Simple harmonic motion - Torsional pendulum –- Damped oscillations –Shock Absorber –Forced oscillations and Resonance –Applications of resonance.- Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion– Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

Unit-3 OPTICS AND LASERS **9 Periods**

Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer -– Diffraction - CD as diffraction grating – Diffraction by crystals - Polarization -polarizers -– Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO2 laser, Semiconductor laser -Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers

Unit-4 QUANTUM MECHANICS	**9 Periods**
Black body radiation (Qualitative) – Planck's hypothesis – Einstein's theory of Radiation - Matter waves–de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Meaning and Physical significance of wave function - Normalization -Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope and its application in nano field.	
Unit-5 CRYSTAL PHYSICS	**9 Periods**
Crystal Bonding – Ionic – covalent – metallic and vander Walls's/ molecular bonding. Crystal systems -unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures – crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czocharalski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.	
	Total Theory: 45 Periods

List of Experiments	**Total Practical: 30 Periods**
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects. 2. Non-uniform bending - Determination of Young's modulus 3. Uniform bending – Determination of Young's modulus 4. Simple harmonic oscillations of cantilever. 5. Laser- Determination of the wavelength of the laser using grating 6. Air wedge - Determination of thickness of a thin sheet/wire 7. Optical fibre -Determination of Numerical Aperture and acceptance angle 8. Compact disc- Determination of width of the groove using laser. 9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids. 10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids 11. Post office box -Determination of Band gap of a semiconductor. 12. Photoelectric effect 13. Michelson Interferometer. 14. Melde's string experiment 15. Experiment with lattice dynamics kit.	

	Text Books	**References**
Learning Resources	1.Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013. 2.D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 2011. 3.N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer Verlag, 2012. 4.Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.	1.R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016. 2.D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017. 3.K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				**End Semester Examination (50% weightage)**
Theory (25% weightage)		**Practical (25% weightage)**		
Average of Internal Test (15%)	**Critical Thinking Assessment (10%)**	**Evaluation of Laboratory Observation, Record (15%)**	**Model Lab Exam (10%)**	

* The expected levels for Bloom's Taxonomy should be:
  - Lower-order thinking skills: not more than 40%
  - Higher-order thinking skills: not less than 60%

Course Code	24CY101	Course Name	ENGINEERING CHEMISTRY	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is :***

- To inculcate knowledge on different types of polymers, their properties and preparation techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of different types of corrosion and its control methods.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand and apply basic knowledge on different types of polymeric materials, their properties and various techniques of their fabrication.	U	3	2	1		2			1				2			
CO-2:	Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technological applications.	AP	3	3	3		3							2			
CO-3:	Proficiently identify corrosion mechanisms, select control methods, and apply protective coatings.	AP	3	3	2	2		2			1			1			
CO-4:	Analyze and compare energy sources, discerning characteristics and applications.	AN	3	2	2		3					1					
CO-5:	Develop competence in assessing water quality, applying treatment methods, and implementing conditioning techniques.	AP	3	2	2		1		3	2	1			2			

Unit-1 POLYMER CHEMISTRY **9 Periods**

Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: Tg, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index .Techniques of polymerization: Bulk, emulsion, solution and suspension.

Unit-2 NANOCHEMISTRY **9 Periods**

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, chemical vapour deposition and electrospinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

Unit-3 CORROSION AND ITS CONTROL **9 Periods**

Introduction to corrosion - chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-differential aeration corrosion-pitting, water line corrosions, factors influencing corrosion. Corrosion control-material selection and design- - sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions

Unit-4 ENERGY SOURCES	9 Periods
Batteries - Characteristics - types of batteries – primary battery (dry cell), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H2-O2 fuel cell - Supercapacitors-Types and Applications, Renewable Energy:Solar- solar cells, DSSC	
Unit-5 WATER TECHNOLOGY	**9 Periods**
Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD and heavy metals. Boiler feed water – requirement –troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis.	
	Total Theory: 45 Periods

List of Experiments	Total Practical: 30 Periods

1. Estimation of HCl using Na2CO3 as primary standards
2. Determination of alkalinity in water sample.
3. Determination of 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. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10 - Phenanthroline/thiocyanate method).
10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer
11. Determination of strength of an acid using conductivity meter.
12. Estimation of nickel content of the given solution by EDTA method

	Text Books	References
Learning Resources	1.Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi,2015. 2.Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi,2012. 3.Dara S.S., "A Textbook of Engineering Chemistry", Chand Publications, 2004.	1.Sachdeva M.V., "Basics of Nano Chemistry", Anmol Publications Pvt Ltd, 2011. 2. Friedrich Emich, "Engineering Chemistry", Medtech, 2014. 3.Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

* The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

Course Code	24GE201	Course Name	COMPUTER AIDED ENGINEERING GRAPHICS	Course Category	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mechanical Engineering	Databook/Codes/ Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Understand universal technical drawing standards
- Provide training on drafting software to draw simple sketches
- Demonstrate the concepts of orthographic and isometric projections
- Use drawing skills for communicating concepts, ideas for engineering product design
- Use pictorial views to visualize and draw the isometric view of the objects

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Perform freehand sketching of basic geometrical constructions and multiple views of objects	R	3	2	2							2		2			
CO-2:	Understand the concept of orthographic projections of lines and plane surfaces.	U	3	2	2							2		2			
CO-3:	Apply the Projection concepts and drafting software to draw projection of solids.	AP	3	2	2		3					2		2			
CO-4:	Draw projections of the section of solids and development of surfaces using CAD software and basic manual tools.	AP	3	2	2		3					2		2			
CO-5:	Utilize modern drafting tools and software to visualize and project isometric and perspective sections of simple solids.	AP	3	2	2		3					2		2			

Unit-1 CONCEPTS, CONVENTIONS, PLANE CURVES AND FREEHAND SKETCHING **9 Periods**

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning. Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity 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 (Draw without using drawing instruments)

Unit-2 PROJECTION OF POINTS, LINES AND PLANE SURFACE **9 Periods**

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. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Unit-3 PROJECTION OF SOLIDS **9 Periods**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes

Unit-4	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	9 Periods
Sectioning of simple solids like prisms, pyramids, cylinder, and cone in a simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones		
Unit-5	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**9 Periods**
Principles of isometric projection - isometric scale -Isometric projections and isometric views 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		
		Total Theory: 45 Periods

List of Experiments	**Total Practical: 30 Periods**
1. Drawing of a Title Block with necessary text and projection symbol. 2. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning 3. Drawing front view, top view and side view of objects from the given pictorial views (eg. V- block, Base of a mixie, Simple stool, Objects with hole and curves 4. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.) 5. Drawing of a simple steel truss. 6. Drawing sectional views of prism, pyramid, cylinder, cone, etc, 7. Drawing isometric projection of simple objects. 8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.	

	Text Books	**References**
Learning Resources	1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, Twenty ninth edition 2017 2. Dr. M.H Annaiah, Dr. B Sudheer Prem Kumar & Dr. C N Chandrappa, Computer Aided Engineering Drawing, New Age International (P) Limited, 7th Edition, 2023. 3. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.	1. S. Ramachandran and K. Pandian, “Engineering Graphics” Airwalk Publications; 8th edition 2014. 2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2018. 3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2018. 4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				**End Semester Examination (50% weightage)**
Theory (25% weightage)		**Practical (25% weightage)**		
Average of Internal Test (15%)	**Critical Thinking Assessment (10%)**	**Evaluation of Laboratory Observation, Record (15%)**	**Model Lab Exam (10%)**	
* The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24GE102	Course Name	தமிழர் மரபு /HERITAGE OF TAMILS	Course Category	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

Pre-requisite Courses	NIL	Co- requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	NIL		

Course Objective: ***The purpose of learning this course is to:***

- Explore the history, significance, and classical status of the Tamil language and analyze the timeless management principles found in Thiruvalluvar's Thirukural.
- Learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.
- Familiarize the students with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.
- Get the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.
- Explore the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Gain comprehensive knowledge about the linguistic diversity in India and the Dravidian language family and appreciate the classical status of Tamil and its rich literary heritage.	U															
CO-2:	Students will learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.	U															
CO-3:	Students will become familiar with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.	U															
CO-4:	Students will understand the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.	U															
CO-5:	Students will learn about the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.	U															

Unit-1 மொழி மற்றும் இலக்கியம் **/LANGUAGE AND LITERATURE** ***3 Periods***

இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - சங்க இலக்கியத்தின் மதச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல்அறம் - திருக்குறளில் மேலாண்மைக் கோட்பாடுகள் - தமிழ் இதிகாசங்கள் மற்றும் தமிழ் நிலத்தில் பௌத்தம் மற்றும் சமணத்தின் தாக்கம் - பக்தி இலக்கியம் ஆழ்வார்களும் நாயன்மார்களும் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கிய வளர்ச்சி - பாரதியார் மற்றும் பாரதிதாசன் பங்களிப்பு

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

Unit-2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை/ **HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	***3 Periods***
நடுகல் முதல் நவீன சிற்பம் - ஐம்பொன்சிற்பங்கள் - பழங்குடியினர் மற்றும் அவர்களின் கைவினைப்பொருட்கள் - கோவில் தேர் செய்யும் கலை - - சுடுமண் சிற்பங்கள், கிராம சிறுதெய்வங்கள், கன்னியாகுமரியில் திருவள்ளுவர் சிலை, இசைக்கருவிகள் தயாரித்தல் - மிருதங்கம், பறை, வீணை, யாழ் மற்றும் நாதஸ்வரம். தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் கோவில்களின் பங்களிப்பு. Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
Unit-3	நாட்டுப்புற மற்றும் தற்காப்பு கலைகள்/ **FOLK AND MARTIAL ARTS**	***3 Periods***
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியன் கூத்து, ஒயிலாட்டம், தோல் பொம்மலாட்டம், சிலம்பாட்டம், வளரி, புலி நடனம் - தமிழர்களின் தனி மற்றும் குழு விளையாட்டுகள். Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
Unit-4	தமிழர்களின் திணைக் கோட்பாடுகள்/**THINAI CONCEPT OF TAMILS**	***3 Periods***
தமிழக தாவரங்கள் மற்றும் விலங்கினங்கள் & தொல்காப்பியம் மற்றும் சங்க இலக்கியம் குறிப்பிடும் அகம் மற்றும் புறம் பற்றியக் கோட்பாடுகள் - தமிழர்களின் அறக் கோட்பாடுகள் - சங்க காலத்தில் கல்வி மற்றும் எழுத்தறிவு - பண்டைய நகரங்கள் மற்றும் சங்க காலத்தில் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - சோழர்களின் வெளிநாட்டு வெற்றி. Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
Unit-5	இந்திய தேசிய இயக்கத்திற்கும் இந்திய கலாச்சாரத்திற்கும் தமிழர்களின் பங்களிப்பு/**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	***3 Periods***
இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு - இந்தியாவின் பிற பகுதிகளில் தமிழர்களின் கலாச்சார தாக்கம் - சுயமரியாதை இயக்கம் - சுதேச மருத்துவ முறைகளில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள் மற்றும் கையெழுத்துப் பிரதிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு. Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
		Total: 15 Periods

	Text Books	**References**
Learning Resources	1.தமிழக வரலாறு – மக்களும் பண்பாடும் – கே .கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2.கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) 3.பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 4.Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print) 5.Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.	1.Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies). 2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 3.Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author) 5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24MC111	Course Name	INDUCTION PROGRAMME	Course Category	P	Humanities and Management Courses	L	T	P	C

Pre-requisite Courses		Co- requisite Courses		Progressive Courses	
Course Offering Department	Science and Humanities (First year)	Data Book / Codes / Standards			

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, take 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 dont's, 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 under privileged.

(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

Semester-II

Course Code	24MA201	Course Name	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	Course Category	T	Basic Science Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is:***

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in a wide variety of situations.
- 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand how to solve the given standard partial differential equations.	U	3	3	2												
CO-2:	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	AP	3	3	2	2	1										
CO-3:	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations	AP	3	3	2	2											
CO-4:	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	U	3	3		3	2							1			
CO-5:	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.	AN	3	3		2	3							2			

Unit-1 PARTIAL DIFFERENTIAL EQUATIONS ***12 Periods***

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

Unit-2 FOURIER SERIES ***12 Periods***

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series–Root mean square value–Parseval's identity–Practical Harmonic analysis in signal processing and Quantum mechanics.

Unit-3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS ***12 Periods***

Classification of PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction– Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).

Unit-4 FOURIER TRANSFORMS ***12 Periods***

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity- Application of Transform to boundary value Problems in Digital signals.

Unit-5	**Z-TRANSFORMS AND DIFFERENCE EQUATIONS**	***12 Periods***
Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Applications: Formation of difference equations–Solution of difference equations using Z-transforms.		
		Total: 60 Periods

	Text Books	**References**
Learning Resources	1.Grewal B.S.,"Higher Engineering Mathematics" 44th Edition, Khanna Publishers, NewDelhi,2018. 2.Kreyszig E, "Advanced Engineering Mathematics", 10th Edition, John Wiley, New Delhi, India, 2016 3.Narayanan.S.,Manicavachagom Pillay.T.K and Ramanaiah.G" Advanced Mathematics for Engineering Students", Vol.II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai,1998. 4.Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,NewDelhi,2018.	1.Andrews. L.C and Shivamoggi.B, "Integral Transforms for Engineers" SPIE Press,1999. 2.Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics",10th Edition, Laxmi Publications Pvt .Ltd,2015. 3.James.G.,"Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, NewDelhi,2016. 4.Wylie.R.C.and Barrett.L.C.,"Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6th Edition, NewDelhi,2012.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24GE101	Course Name	PROBLEM SOLVING USING PYTHON PROGRAMMING	Course Category	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Understand the basics of algorithmic problem solving.
- Learn to solve problems using Python conditionals and loops
- Define Python functions and use function calls to solve problems
- Use Python data structures – lists, tuples, and dictionaries to represent complex data.
- Perform input/output operations with files in Python

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Develop algorithmic solutions to simple computational problems	AP	3	2	2	2	3										
CO-2:	Develop and execute simple Python programs	AP	3	2	2	2	3										
CO-3:	Develop Python programs using conditionals and loops for solving problems and decompose a Python program into functions.	AN	3	2	2	2	3										
CO-4:	Represent compound data using Python lists, tuples, dictionaries etc.	AP	3	2	2	2	3										
CO-5:	Read and write data from/to files in Python programs	AP	3	2	2	2	3										

Unit-1 COMPUTATIONAL THINKING AND PROBLEM SOLVING **9 Periods**

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).

Unit-2 DATA TYPES, EXPRESSIONS, STATEMENTS **9 Periods**

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments.

Unit-3 CONTROL FLOW, FUNCTIONS, STRINGS **9 Periods**

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.

Unit-4 LISTS, TUPLES, DICTIONARIES **9 Periods**

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.

Unit-5 FILES, MODULES, PACKAGES **9 Periods**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages;

Total Theory: 45 Periods

Suggested List of Experiments	**Total Practical: 30 Periods**

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tool.
12. Developing a game activity using Pygame.

	Text Books	**References**
Learning Resources	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	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. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				**End Semester Examination (50% weightage)**
Theory (25% weightage)		**Practical (25% weightage)**		
Average of Internal Test (15%)	**Critical Thinking Assessment (10%)**	**Evaluation of Laboratory Observation, Record (15%)**	**Model Lab Exam (10%)**	

* The expected levels for Bloom’s Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

Course Code	24EE204	Course Name	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	Course Category	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Electrical And Electronics Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Understand the principles of DC and AC circuits, including circuit components, Ohm's Law, Kirchhoff's Laws, and analysis techniques such as nodal and mesh analysis
- Learn about the construction, working principles, and applications of various electrical machines, including generators, motors, transformers, and special machines
- Comprehend semiconductor materials and electronic devices such as diodes, transistors, SCR, and MOSFET, along with their characteristics, biasing, and applications in communication engineering
- Review and understand the fundamentals of digital electronics, including number systems, binary codes, logic functions, and minimization techniques using Karnaugh maps
- Gain knowledge of measurement principles and instrumentation techniques, including instrument components, standards, calibration, and various types of meters and instruments used in electrical engineering

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Analyse the electric circuit parameters for solving engineering problems. Also understand basic electrical safety concepts.	AP	3	2	1			3					2	2			
CO-2:	Explain the working principle and applications of AC/DC machines	U	2	2	1					1			2	2			
CO-3:	Analyse the characteristics of analog electronic devices to develop projects in multidisciplinary environment.	AN	2	1	1					1			2	2			
CO-4:	Explain the basic concepts of digital electronics and analyse complex engineering problems.	E	2	2	1					1			2	2			
CO-5:	Explain the operating principles of measuring instruments.	U	2	2	1					1			2	2			

Unit-1 ELECTRICAL CIRCUITS ***9 Periods***

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws– Nodal Analysis, Mesh analysis

Introduction to alternating voltage and currents: Waveforms, Average value, RMS Value, Powers in AC circuits, power factor – Star and Delta connection - Electrical safety-Fuses and Earthing.

Unit-2 ELECTRICAL MACHINES ***9 Periods***

DC Machine: Construction, Working principle, EMF equation, Types and Applications. Transformers: Construction, Working principle, EMF Equation and Applications. Three Phase Induction Motors: Construction, Working principle, and Applications. Special Machines: Stepper motor, Servo Motor and BLDC Motor - Construction, Working and Applications

Unit-3 ANALOG ELECTRONICS ***9 Periods***

Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, SCR, GTO, MOSFET, IGCT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

Unit-4	**DIGITAL ELECTRONICS** ***9 Periods***
Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps.	
Unit-5	**MEASUREMENTS AND INSTRUMENTATION** ***9 Periods***
Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.	
	Total: 45 Periods

	Text Books	**References**
Learning Resources	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	1. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018. 2. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015. 3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017. 4. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2022

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24ME202	Course Name	ENGINEERING MECHANICS	Course Category	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mechanical Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- To Learn the use scalar and vector analytical techniques for analyzing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Illustrate vector and scalar representations of forces and moments, and their applications in mechanics.	AP	3	2	2									2	2		
CO-2:	Analyze equilibrium conditions of rigid bodies under applied forces and moments.	AN	3	2	2									2	2		
CO-3:	Evaluate the properties of distributed forces in symmetrical and unsymmetrical shapes	AN	3	2	2									2	2		
CO-4:	Determine the friction and the effects by the laws of friction	AN	3	2	2									2	2		
CO-5:	Calculate dynamic forces exerted in rigid body	AP	3	2	2									2	2		

Unit-1 STATICS OF PARTICLES ***9 Periods***

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

Unit-2 EQUILIBRIUM OF RIGID BODIES ***9 Periods***

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections

Unit-3 DISTRIBUTED FORCES ***9 Periods***

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

Unit-4 FRICTION ***9 Periods***

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

Unit-5	**DYNAMICS OF PARTICLES**	***9 Periods***
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.		
	Total	**45 Periods**

	Text Books	**References**
Learning Resources	1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 12th Edition, Tata McGraw-Hill Publishing company, 2019. 2. Vela Murali, "Engineering Mechanics", Oxford University Press 2018. 3. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2018.	1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 2017. 2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010. 3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics - Statics and Dynamics", 4th Edition, Pearson Education 2006. 4. Meriam J.L. and Kraige L.G., "Engineering Mechanics - Statics" - John Wiley&Sons,2017.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE201	Course Name	ENGINEERING GEOLOGY	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Soil Mechanics
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Understand the significance of geology in civil engineering, including the internal structure of the Earth, types of weathering, landforms, plate tectonics, and groundwater movement in construction projects.
- Identify and describe the physical and chemical properties of common rock-forming minerals and important rocks, and perform field and laboratory tests to determine their engineering properties.
- Interpret attitudes of beds, recognize different types of folds, faults, joints, and fractures in rocks, and evaluate geomechanical properties of rocks using Rock Quality Designation (RQD), Rock Mass Rating (RMR), and Geological Strength Index (GSI).
- Apply geological mapping techniques, remote sensing, and geophysical methods such as electrical, seismic, and ground-penetrating radar for subsurface investigations, and interpret subsurface logging data for civil engineering projects.
- Identify geological conditions necessary for designing important structures and mitigate geohazards such as landslides, earthquakes, and tsunamis through case studies and appropriate measures.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand geology's role in civil engineering, from Earth's structure to groundwater dynamics. (Understand)	U	3	2	2	3	2	2	2	2	2	2	2	3			
CO-2:	Apply knowledge of mineral properties and rock testing methods in civil engineering contexts. (Apply).	AP	2	2	3	2	3	1	2	2	2	2	2	3	2		
CO-3:	Analyze rock attitudes, structures, and properties using geomechanical assessments. (Analyze)	AN	3	3	2	2	2	1	2	1	2	2	2	3			2
CO-4:	Apply geological mapping, remote sensing, and geophysical methods in subsurface investigations. (Apply)	AP	2	3	2	3	3	1	2	3	2	2	2	3	2	2	
CO-5:	Evaluate geological conditions and mitigate geohazards for designing structures. (Evaluate)	AP	2	2	3	2	2	1	1	2	2	2	2	3	2	2	2

Unit-1 PHYSICAL GEOLOGY AND GEOMORPHOLOGY ***9 Periods***

Significance of Geology in Civil Engineering; Internal structure of the Earth; Weathering: types, engineering classification of weathered rocks and relevance to Civil Engineering; Fluvial, Marine, Glacial and Aeolian landforms and their importance in Civil Engineering; Plate tectonics and its relevance to earthquakes; Groundwater: types of aquifers, origin, movement and role of groundwater in Civil Engineering constructions.

Unit-2 MINERALOGY AND ROCK FORMATION ***9 Periods***

Physical and Chemical properties of common rock forming minerals: Quartz family, Feldspar family, Mica (Muscovite, Biotite & Vermiculite), Pyroxene (Augite & Hypersthene), Amphibole (Hornblende),Calcite, Gypsum and Clay minerals and their significance. Formation of Igneous, Metamorphic and Sedimentary rocks; Description of important

rocks: Granite, Syenite, Dolerite, Basalt, Quartzite, Slate, Schist, Gneiss, Marble, Sandstone, Limestone, Shale and Conglomerate. Engineering properties of rocks: field and laboratory tests.
Unit-3 STRUCTURAL GEOLOGY AND ROCK MECHANICS ***9 Periods***
Attitudes of beds: Strike and Dip measurements and their relevance to civil engineering; Different types of folds, faults, joints and fractures in rocks and their significance in civil engineering constructions; Geomechanical properties of rocks: Rock Quality Designation (RQD), Rock Mass Rating (RMR) and Geological Strength Index (GSI) and their importance in various civil engineering projects.
Unit-4 GEOPROSPECTING ***9 Periods***
Geological mapping techniques; Remote Sensing: Fundamentals and its role in geological mapping; Geophysical methods for subsurface investigations: Electrical, Seismic & Ground Penetrating Radar (GPR); Subsurface logging and their importance in civil engineering projects.
Unit-5 GEOLOGICAL CONSIDERATIONS AND GEOHAZARDS ***9 Periods***
Geological conditions necessary for designing and construction of important structures: Dams,Reservoirs, Tunnels, Road cuttings and Coastal protection; Landslides: Causes and mitigation;Earthquakes & Tsunamis: Causes and mitigation; Case studies for the above topics
Total: 45 Periods

	Text Books	**References**
Learning Resources	1. Parbin Singh, “A Textbook of Engineering and General Geology”, S. K. Kataria and Sons, 2021. 2.Chenna Kesavulu, N. “Textbook of Engineering Geology”, Macmillan India Ltd., 2018. 3.Venkat Reddy, D. “Engineering Geology”, Vikas Publishing House Pvt. Lt, 2021. 4.Gokhale, K.V.G.K, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2019. 5.Varghese, P.C., “Engineering Geology for Civil Engineering”, Prentice Hall of India Learning Private Limited, New Delhi, 2012	1.Legget, “Geology and Engineering”, McGraw Hill Book company, 1998 Blyth, “Geology for Engineers”, ELBS 1995. 2.Krynine and Judd, “Principals of Engineering Geology and Geotechnics” Tata McGraw Hill, New Delhi, 2018. 3.Bell, F.G. “Fundamentals of Engineering Geology”, B.S. Publications. Hyderabad 2011

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24GE111	Course Name	ENGINEERING PRACTICES LABORATORY	Course Category	P	Engineering Science Courses	L	T	P	C
							0	0	4	2

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mechanical Engineering	Data Book / Codes /Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- To identify tools, work material and measuring instruments useful for welding, Machining, Plumbing and carpentry
- To provide exposure to the students with hands on experience on various wiring system
- To provide exposure to the students with hands on experience on various Electronic Components

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		***BL***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the concepts of welding safety protocols, equipment operation essential for successful welding practices in engineering applications.	U	3	2				1	1					2			
CO-2:	Make simple metal joints using welding equipment and wooden joints using carpentry tools	AP	3	2				1	1					2			
CO-3:	Apply the knowledge of pipeline connections to household fittings.	AP	3	2				1	1					2			
CO-4:	Demonstration on centrifugal pump and air conditioning working principles	U	3	2				1	1					2			
CO-5:	Apply the skills of basic electrical engineering for house wiring practice	AP	3	2				1	1					2			

List of Experiments **60 Periods**

1. PLUMBING WORK:
   a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
   b) Preparing plumbing line sketches.
   c) Laying pipe connection to the suction & delivery side of a pump
   d) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.
2. WOOD WORK:
   a) Sawing, b) Planing and c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.
3. Wood Work Study:
   a) Studying joints in door panels and wooden furniture b) Studying common industrial trusses using models.
4. WELDING WORK:
   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. b) Practicing gas welding
5. BASIC MACHINING WORK:
   a) (simple)Turning. b) (simple)Drilling. c) (simple)Tapping.
6. ASSEMBLY WORK:
   a) Assembling a centrifugal pump. b) Assembling an air conditioner
7. SHEET METAL WORK:
   a) Making of a square tray

8. FOUNDRY WORK:
    a) Demonstrating basic foundry operations.
9. ELECTRICAL ENGINEERING PRACTICES
    a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
    b) Staircase wiring
    c) Fluorescent Lamp wiring with introduction to CFL and LED types.
    d) Energy meter wiring and related calculations/ calibration
    e) Study of Iron Box wiring and assembly
    f) Study of Fan Regulator (Resistor type and Electronic type using DIAC/TRIAC/QUADRAC)
    g) Study of emergency lamp wiring/Water heater
10. ELECTRONIC ENGINEERING PRACTICES- SOLDERING WORK:
    a) Soldering simple electronic circuits and checking continuity.
11. ELECTRONIC ASSEMBLY AND TESTING WORK:
    a) Assembling and testing electronic components on a small PCB.
12. ELECTRONIC EQUIPMENT STUDY:
    a) Study elements of smart phone.
    b) Assembly and dismantle of LED TV.
    c) Assembly and dismantle of computer/ laptop

Learning Assessment		
Continuous Learning Assessment (CLA) (60% weightage)		**End Semester Examination (40% weightage)**
Evaluation of Laboratory Observation, Record (45%)	**Model Lab Exam (15%)**	

* The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

Course Code	24GE202	Course Name	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	Course Category	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- Provide a comprehensive understanding of the weaving industry and ceramic technology during the Sangam Age, with a particular focus on Black and Red Ware (BRW) Potteries and the graffiti found on these artifacts..
- Students will gain insight into the cultural, technological, and socio-political contexts that shaped temple constructions..
- Study of the iron and steel industries, coin minting, and bead making, alongside archaeological evidence and literary references Silappathikaram.
- Understand the ancient agricultural practices and irrigation technologies, focusing on various water management systems, animal husbandry, and agro-processing. It also explores ancient knowledge of the sea, including fisheries, pearl and conch diving, and oceanic knowledge.
- Learn the knowledge and skills to engage with modern technologies for the preservation and advancement of the Tamil language.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the technological and cultural developments of the Sangam Age, particularly in the areas of weaving and ceramics	U															
CO-2:	Appreciate the cultural and technological advancements reflected in the structural designs and materials used.	U															
CO-3:	Understand the technological and industrial advancements in ancient societies, particularly in the areas of metallurgy, shipbuilding, coin minting, and bead making.	U															
CO-4:	Gain the knowledge about the agricultural and irrigation technologies of ancient societies, as well as their maritime knowledge and practices,	U															
CO-5:	Understand the development and application of Scientific Tamil and Tamil computing.	U															

Unit-1 **நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் / WEAVING AND CERAMIC TECHNOLOGY** ***3 Periods***

சங்க காலத்தில் நெசவுத் தொழில் - பீங்கான் தொழில்நுட்பம் - கருப்பு மற்றும் சிவப்பு பாத்திரங்கள் (BRW) - மட்பாண்டங்கள் மீது கீறல் குறியீடுகள்.

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

Unit-2 **வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம்/ DESIGN AND CONSTRUCTION TECHNOLOGY** ***3 Periods***

சங்க காலத்தில் வீடு வடிவமைத்தல், கட்டுமானம் மற்றும் வீட்டு உபயோகப் பொருட்களின் வடிவமைப்புகள் - சங்க காலத்தில்கட்டுமானப் பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை பற்றிய பற்றிய விவரங்கள்-மாமல்லபுரத்தின் சிற்பங்கள் மற்றும் கோவில்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் -நாயக்கர் கால கோவில்கள் -மாதிரி கட்டமைப்புகள் பற்றி அறிதல்-மதுரை மீனாட்சி கோயில்- திருமலை நாயக்கர் மஹால் - செட்டி நாடு வீடுகள், இந்தோ - பிரிட்டிஷ் காலத்தில் மதராஸில் உள்ள சரசனிக் கட்டிடக்கலை.

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit-3 உற்பத்தி தொழில்நுட்பம் /MANUFACTURING TECHNOLOGY ***3 Periods***

கப்பல் கட்டும் கலை - உலோகவியல் ஆய்வுகள் - இரும்புத் தொழில் - இரும்பு உருக்குதல், எஃகு - தாமிரம் மற்றும் தங்கம் - வரலாற்றின் ஆதாரமாக நாணயங்கள் - நாணயங்கள் - மணிகள் செய்யும் தொழில்கள் கல் மணிகள் - கண்ணாடி மணிகள் - டெரகோட்டா மணிகள் - ஷெல் மணிகள் / எலும்பு துடிப்புகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் விவரிக்கப்பட்டுள்ள ரத்தினக் கற்கள்.

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

Unit-4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்/AGRICULTURE AND IRRIGATION TECHNOLOGY ***3 Periods***

அணை, ஏரி, குளங்கள், மதகு-சோழர் கால குமிழித் தூம்பு முக்கியத்துவம், கால்நடை பராமரிப்பு - கால்நடை பயன்பாட்டுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் அறிவு - மீன்வளம் - முத்து - முத்துக்குளித்தல் - கடல் பற்றிய பண்டைய அறிவு - அறிவு சார்ந்த சமூகம்.

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Unit-5 அறிவியல் தமிழ் & கணினித்தமிழ்/ SCIENTIFIC TAMIL & TAMIL COMPUTING ***3 Periods***

அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி- தமிழ் நூல்கள் மின்பதிப்பு செய்தல்- தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணைய தமிழ் அகராதி - சொற்குவைத்திட்டம்.

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total: 15 Periods

	Text Books	**References**
Learning Resources	1.தமிழக வரலாறு - மக்களும் பண்பாடும் - கே .கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2.கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) 3.பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 4.Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print) 5.Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.	1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies). 2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 3.. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author) 5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 6. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Learning Assessment	
Continuous Learning Assessment (CLA) (40% weightage)	**End Semester Examination**

Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	**(60% weightage)**
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24MC201	Course Name	ENVIRONMENTAL SCIENCE	Course Category	T	Mandatory Course	L	T	P	C
							2	0	0	0

Pre-requisite Courses	NIL	Co- requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	NIL		

Course Objective: ***The purpose of learning this course is :***

- 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 prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of the global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human rights, value education and role of technology in monitoring human and environmental issues.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the functions of the environment, ecosystems and biodiversity and their conservation.	U						3	3					2			
CO-2:	Analyze the causes and effects of environmental pollution and contribute to the preventive measures in the immediate society.	AN						3	3	1							
CO-3:	Identify various natural resources and their contribution to mankind and apply sustainable measures to preserve them for future generations.	AP						3	3		2			2			
CO-4:	Identify the various sustainable measures for environmental protection against climatic changes and apply them for sustainable and societal development.	AP	3		2			3	3								
CO-5:	Demonstrate the knowledge of environmental issues and analyse the effect of population dynamics and role of technology in environmental issues.	U						3	3	2			2				

Unit-1 ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY ***6 Periods***

Definition, scope and importance of environment -concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem– Introduction to biodiversity definition: genetic, species and ecosystem diversity –value of biodiversity-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 conservation of biodiversity.

Unit-2 ENVIRONMENTAL POLLUTION ***6 Periods***

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies.

Unit-3	NATURAL RESOURCES	*6 Periods*
Forest resources: Use and over-exploitation, deforestation, Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.		
Unit-4	**SOCIAL ISSUES AND THE ENVIRONMENT**	***6 Periods***
From unsustainable to sustainable development, rain water harvesting, Environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products.		
Unit-5	**HUMAN POPULATION AND THE ENVIRONMENT**	***6 Periods***
Population growth, variation among nations – population explosion – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.		
		Total: 30 Periods

	Text Books	**References**
Learning Resources	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.Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).	1.R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 2.Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001. 3.Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007. 4.Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005). 5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013).

Learning Assessment		
Continuous Learning Assessment (CLA) (100% weightage)		**End Semester Examination (0% weightage)**
Average of Internal Test (50%)	***Critical Thinking Assessment (50%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

SEMESTER III

Course Code	24MA301	Course Name	STATISTICS AND NUMERICAL METHODS	Course Category	T	Basic Science Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Mathematics knowledge in higher secondary level	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Science and Humanities	Data Book / Codes / Standards	Statistical Table		

Course Objective: ***The purpose of learning this course is to:***

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

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Apply the concept of testing of hypothesis for small and large samples in real life problems	AP	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO-2:	Apply the basic concepts of classifications of design of experiments in the field of agriculture	AP	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO-3:	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems	AN	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO-4:	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations	U	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO-5:	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications	E	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-

Unit-1 **TESTING OF HYPOTHESIS** ***9+3 Periods***

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes

Unit-2 **DESIGN OF EXPERIMENTS** ***9+3 Periods***

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – 22 factorial design.

Unit-3 **SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS** ***9+3 Periods***

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

Unit-4 **INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION** ***9+3 Periods***

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

Unit-5	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	***9+3 Periods***
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.		
		Total 60 Periods

	Text Book	**Reference**
Learning Resources	1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015. 2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.	1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, C engage Learning, 2016. 2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", C engage Learning, New Delhi, 8th Edition, 2014. 3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007. 4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020. 5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012. 6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE301	Course Name	FLUID MECHANICS	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Applied Hydraulics Engineering
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	To Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.	U	3	2	1	1	1	2	2	1	1	1	1	2	2	3	1
CO-2:	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	AP	3	2	1	1	1	2	2	1	1	1	1	2	2	3	1
CO-3:	To Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.	AP	3	2	3	2	1	2	2	1	1	1	1	2	2	3	1
CO-4:	To Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.	AN	3	3	3	2	1	3	2	1	1	1	1	3	2	3	2
CO-5:	To Apply the principles of the boundary layer to determine the drag force on a flat solid surface.	AP	3	3	2	2	1	3	2	1	1	1	1	3	2	3	2

Unit-1 **FLUIDS PROPERTIES AND FLUID STATICS** ***10 Periods***

Scope of fluid mechanics – Definitions of a fluid – Methods of analysis – Continuum hypothesis – System and Control volume approach – Reynold's transportation theorem – Fluid properties – Fluid statics – Manometry – Forces on plane and curved surfaces – Buoyancy and floatation – Stability of floating bodies.

Unit-2 **BASIC CONCEPTS OF FLUID FLOW** ***10 Periods***

Kinematics: Classification of flows – Streamline, streak-line and path-lines – Stream function and velocity potentials – Flow nets; Dynamics : Application of control volume to continuity, energy and momentum – Euler's equation of motion along a stream line – Bernoulli's equation – Applications to velocity and discharge measurements – Linear momentum equation – Application to Pipe bends – Moment of momentum equation.

Unit-3 **DIMENSIONAL ANALYSIS AND MODEL STUDIES** ***7 Periods***

Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi theorem – Dimensionless parameters – Similitude and model studies – Distorted and undistorted models.

Unit-4 **INCOMPRESSIBLE VISCOUS FLOW** ***10 Periods***

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 – Siphon – Pipes in series and parallel – Equivalent pipes.

Unit-5 **BOUNDARY LAYERS** ***8 Periods***

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

Total: 45 Periods

	Text Books	References
Learning Resources	1. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, 11th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2024. 2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines Standard Book House New Delhi. 2015. 3. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.	1. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012. 2. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016. 3. Narayana Pillai N. Principles of Fluid Mechanics and Fluid Machines, (3rd Ed.) University Press (India) Pvt. Ltd. 2009. 4. Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9th Ed.) Tata McGraw Hill, New Delhi, 1998.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE302	Course Name	CONSTRUCTION MATERIALS AND TECHNOLOGY	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Concrete technology
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

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

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Identify the good quality brick, stone and blocks for construction.	U	3	2	2				2					2	3		
CO-2:	Demonstrate understanding on the production and applications of lime, cement, Aggregates and concrete.	U	3	2					2	1					3		2
CO-3:	Recognize the market forms of timber, steel, aluminum and applications of various composite materials.	U	3	1	3								2		3		2
CO-4:	Select various equipments for construction works conditioning of building.	U	2										2		3	3	
CO-5:	Understand the construction planning and scheduling techniques	U	2	3	2	3	2	2			2		3	2	3	3	3

Unit-1 **STONES - BRICKS - CONCRETE BLOCKS** ***9 Periods***

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Tests on bricks – Sustainable Brick– Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks.

Unit-2 **LIME – CEMENT – AGGREGATES – CONCRETE** ***9 Periods***

Lime –Types – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and assessment – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Aggregates- Types- properties- Grading. Concrete – Ingredients – Manufacturing Process –mixing – transporting – placing – compaction –curing and finishing – Workability. Ready mix Concrete – Mix specification.

Unit-3 **STEEL, TIMBER AND OTHER MATERIALS** ***9 Periods***

Steel- Manufacture- Types- Properties and uses. Timber- Market forms – Plywood. Glass – Ceramics – Sealants for joints–Refractories. Composite materials – Types – Applications of laminar composites – Fibre textiles – Sustainable Construction Materials.

Unit-4 **CONSTRUCTION EQUIPMENTS** ***9 Periods***

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

Unit-5 **CONSTRUCTION PLANNING** ***9 Periods***

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

Total: 45 Periods

	Text Books	References
Learning Resources	1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015. 2. Duggal, S.K., " Building Materials",5th Edition, New Age International Pvt Ltd, 2019. 3. Varghese, P.C., "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2018.	1. Punmia ,B.C Building construction , Laxmi publication (p)ltd..,2008. 2. Jha, J., Sinha, S.K., "Construction and Foundation Engineering", Khanna,Publishers,2014. 3. Srinath L.S.,PERT and CPM -Principles and applications, Affliated East West Press 2001.

	4. Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.	4. Jagadish, K.S., "Alternative Building Materials Technology", New Age International, 2016. 5. Gambhir, M.L., Neha Jamwal., "Building Materials, products", properties and systems,Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2016.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE303	Course Name	STRENGTH OF MATERIALS	Course Category	T	Professional Core Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Engineering Mechanics	Co- requisite Courses	Nil	Progressive Courses	Structural Analysis I
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- To learn the fundamental concepts of Stress in simple and complex states and to know 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Calculate the principal stresses and determine the corresponding principal planes for a given material under stress.	AP	3	3	3	3	2	3	1	3	2	3	1	3	3	3	3
CO-2:	Determine Shear force and bending moment in beams and understand concept of theory of simple bending.	AP	3	3	3	3	2	3	1	3	2	3	1	3	3	3	3
CO-3:	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.	AP	3	3	3	3	2	3	1	3	2	3	1	3	3	3	3
CO-4:	Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements.	AN	3	3	3	3	2	3	1	3	2	3	1	3	3	3	3
CO-5:	Analyze columns using different theories and design cylindrical shells.	AN	3	3	3	3	2	3	1	3	2	3	1	3	3	3	3

Unit-1	**SIMPLE AND COMPOUND STRESSES**	***12 Periods***
Stresses in simple and compound bars – Thermal stresses – Elastic constants – Biaxial state of stress – Principal stresses and principal planes – Mohr's circle of stresses - Torsion on circular shafts.		
Unit-2	**BENDING OF BEAMS**	***12 Periods***
Introduction to Beams - 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-3	**DEFLECTION OF BEAMS**	***12 Periods***
Double Integration method – Macaulay's method – Area moment method – Conjugate beam method - Strain energy method for determinate beams – Introduction to determinate structures.		
Unit-4	**INDETERMINATE BEAMS**	***12 Periods***
Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading –– Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams.		
Unit-5	**COLUMNS AND CYLINDERS**	***12 Periods***
Introduction to Columns- Eccentrically loaded short Columns-Euler's column theory -Crippling load for prismatic columns with different end conditions -Effective length-limitations -Rankine-Gordon formula- Introduction to Cylinders - Thin cylindrical and spherical shells-stresses and change in dimensions -Thick cylinders.		
	Total:	**60 Periods**

	Text Books	References
Learning Resources	1. Bansal R.K. Strength of materials, Laxmi Publications, 7th Edition, New Delhi – 2024. 2. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.	1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol -II, Laxmi Publishing Pvt Ltd, New Delhi 2017. 2. Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2017. 3. William A .Nash, “Theory and Problems of Strength of Materials”, Schaum’s Outline Series,Tata McGraw Hill Publishing company, 2017. 4. Singh. D.K.,“ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2021. 5. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE304	Course Name	SURVEYING AND LEVELLING	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the fundamental principles and various methodologies used in surveying.	U	3	3	2	2									3	3	2
CO-2:	Apply appropriate leveling techniques to compute elevations of terrain and ground features.	AP	3	3	2	2									3	3	2
CO-3:	Apply the principles of theodolite surveying to perform complex surveying operations, including angle measurement and traversing.	AP	3	3	3	2	3	3		2	2		2		3	3	2
CO-4:	Understand the procedures for establishing accurate horizontal and vertical control networks.	U	3	3	2	2		2		2					3	3	2
CO-5:	Understand the capabilities and limitations of modern surveying instruments and apply this knowledge to select appropriate instruments for various surveying projects.	U	3	2	2	2	2	2						1	3	3	2

Unit-1 FUNDAMENTALS OF SURVEYING, DISTANCE AND ANGLE MEASUREMENTS **9 Periods**

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

Unit-2 LEVELLING APPLICATIONS **9 Periods**

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling – Contouring - Computation of cross-sectional areas and volumes: irregular boundaries, reservoir capacity.

Unit-3 THEODOLITE SURVEYING **9 Periods**

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

Unit-4 CONTROL SURVEYING AND ADJUSTMENT **9 Periods**

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-5 MODERN SURVEYING **9 Periods**

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

Total Theory: 45 Periods

List of Experiments	Total Practical: 30 Periods

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset
2. Setting out works – Foundation marking using tapes single Room and Double Room
3. Compass Traversing – Measuring Bearings & arriving included angles
4. Fly levelling using Dumpy level / Tilting level
5. Check levelling
6. Measurements of horizontal angles by reiteration and repetition and vertical angles
7. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.
8. Determination of Tacheometric Constants.
9. Determination of Heights and distances by stadia Tacheometry.
10. Determination of Heights and distances by Tangential Tacheometry.
11. Traverse using Total station and Area of Traverse
12. Determination of distance and difference in elevation between two inaccessible points using Total station.
13. Study of DGPS and its applications.

	Text Books	References
Learning Resources	1. Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016. 2. T. P. Kanetkarand S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.	1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012. 2. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001. 3. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004. 4. S. K. Roy, Fundamentals of Surveying, Second Edition, Prenticeˆ Hall of India2010. 5. K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013. 6. C. Venkatramaiah, Textbook of Surveying, Universities Press, Second Edition, 2011.

Learning Assessment

Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	

* The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%

SEMESTER IV

Course Code	24CE401	Course Name	APPLIED HYDRAULICS ENGINEERING	Course Category	T	Professional Core Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Fluid Mechanics	Co- requisite Courses	Hydraulic Engineering Laboratory	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	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.	U	3	3	2	3	1	2	2	1	2	1	1	3	3	2	2
CO-2:	Analyse 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.	AN	3	3	2	3	1	2	2	1	2	1	1	3	3	2	2
CO-3:	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.	AP	3	3	2	3	1	2	2	1	2	1	1	3	3	2	2
CO-4:	Design turbines and explain the working principle	AP	3	3	3	3	1	2	2	1	2	1	1	3	3	2	3
CO-5:	Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.	U	3	3	3	3	1	2	2	1	2	1	1	3	3	2	3

Unit-1	**UNIFORM FLOW**	***12 Periods***
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-2	**VARIED FLOWS**	***12 Periods***
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-3	**RAPIDLY VARIED FLOWS**	***12 Periods***
Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation –Positive and Negative surges.		
Unit-4	**TURBINES**	***12 Periods***
Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine -Kaplan turbine – Impact of Jet - Draft tube - Cavitation - Performance of turbine - Specific speed - Runaway speed.		
Unit-5	**PUMPS**	***12 Periods***
Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitation's in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work done.		
	Total:	**60 Periods**

	Text Books	References
Learning Resources	1. Jain, A.K., "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016. 2. Modi, P.N., Seth,.S.M. "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2019. 3. Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017	1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009. 2. Mays L.W.,Water Resources Engineering, JohnWiley and Sons (WSE), New York, 2019 3. Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2019.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE402	Course Name	STRUCTURAL ANALYSIS I	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Engineering Mechanics, Strength of Materials	Co- requisite Courses	Nil	Progressive Courses	Structural Analysis II
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- To introduce the students to the basic theory and concepts of classical methods of structural analysis.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Analyse the continuous beams and rigid frames by slope deflection method.	AN	3	3	3	3	1	3	1	1	3	2	1	1	3	3	3
CO-2:	Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.	U	3	3	3	3	1	3	1	1	3	2	1	1	3	3	3
CO-3:	Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.	AN	3	3	3	3	1	3	1	1	3	2	1	1	3	3	3
CO-4:	Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed and rigid plane frames.	U	3	3	3	3	1	3	1	1	3	2	1	1	3	3	3
CO-5:	Analyze the pin-jointed plane frames and space trusses.	AN	3	3	3	3	1	3	1	1	3	2	1	1	3	3	3

Unit-1 **SLOPE DEFLECTION METHOD**	***9 Periods***
Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements - symmetric frames with symmetric and skew-symmetric loadings.	
Unit-2 **MOMENT DISTRIBUTION METHOD**	***9 Periods***
Stiffness - distribution and carry over factors –- Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.	
Unit-3 **FLEXIBILITY METHOD**	***9 Periods***
Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.	
Unit-4 **STIFFNESS METHOD**	***9 Periods***
Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.	
Unit-5 **ANALYSIS OF TRUSSES**	***9 Periods***
Determinate and indeterminate trusses - analysis of determinate trusses - method of joints - method of sections - Deflections of pin-jointed plane frames - lack of fit - change in temperature method of tension coefficient - Application to space trusses.	
Total:	**45 Periods**

	Text Books	References
Learning Resources	1. Bhavikatti, S.S., "Structural Analysis",Vol.1,& 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4,2015. 2. Vaidyanadhan, R. Perumal, P. "Comprehensive Structural Analysis", Vol. I, Laxmi Publications Pvt. Ltd., New Delhi, 2016. 3. Punmia. B.C., Ashok Kumar Jain & Arun Kumar Jain, "Theory of structures", Laxmi Publications, New Delhi, 2014.	1. William Weaver, Jr and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Second Edition, Delhi, 2004 2. Reddy .C.S, “Basic Structural Analysis”, Tata McGraw Hill Publishing Company, 2005. 3. Negi L.S. and Jangid R.S., Structural Analysis, Tata McGraw Hill Publishing. Co. Ltd. 2004.

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE403	Course Name	SOIL MECHANICS	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	4	5

Pre-requisite Courses	Engineering Geology	Co- requisite Courses	Nil	Progressive Courses	Foundation Engineering
Course Offering Department	Civil Engineering	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- 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.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems.	AP	2	3	2	2	3	1	1	1	2	1	2	3	3	3	2
CO-2:	Show the basic understanding of flow through soil medium and its impact of engineering solution	U	3	2	3	2	3	1	1	1	2	1	2	3	2	2	3
CO-3:	Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation.	U	3	3	2	2	2	2	1	1	2	1	2	3	2	2	3
CO-4:	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.	U	2	3	3	2	2	1	1	1	1	1	2	3	2	2	3
CO-5:	Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.	AP	3	3	2	2	2	1	1	1	1	1	1	3	2	3	2

Unit-1 SOIL CLASSIFICATION AND COMPACTION **9 Periods**

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-2 EFFECTIVE STRESS AND PERMEABILITY **9 Periods**

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-3 STRESS DISTRIBUTION AND SETTLEMENT **9 Periods**

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

Unit-4 SHEAR STRENGTH **9 Periods**

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-5 SLOPE STABILITY	9 Periods
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 Theory: 45 Periods

List of Experiments	Total Practical: 30 Periods
1. Determination of specific gravity of soil solids by grain size distribution using Sieve analysis method 2. Determination of specific gravity of soil solids by grain size distribution using Hydrometer analysis method. 3. Determination of Liquid limit and Plastic limit of soil solids. 4. Determination of Shrinkage limit and Differential free swell tests 5. Determination of in situ density of soil using field density Test (Sand replacement method) 6. Determination of moisture – density relationship using standard proctor compaction test. 7. Determination of Permeability by using constant head and falling head methods 8. Determination of coefficient of consolidation using One dimensional consolidation test. 9. Determination of shear strength using Direct shear test on cohesion less soil. 10. Determination of shear strength using Unconfined compression test in cohesive soil 11. Determination of shear strength using Laboratory vane shear test in cohesive soil 12. Determination of shear strength using Tri-axial compression test on cohesion less soil (Demonstration only) 13. Determination of California Bearing value using California Bearing Ratio Test 14. Determination of tensile strength and interfacial friction angle.(Demonstration only) 15. Determination of apparent opening sizes and permeability.(Demonstration only)	

	Text Books	References
Learning Resources	1. Punmia, B.C., "Soil Mechanics and Foundations", 16th Edition, Laxmi Publications Pvt. Ltd. New Delhi, 2017. 2. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2017. 3. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.	1. Arora, K.R., "Soil Mechanics and Foundation Engineering", 7th Edition, Standard Publishers and Distributors, New Delhi, 2018. 2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations": Basic Geotechnics Prentice-Hall, 2015. 3. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2011. 4. Venkatramaiah, C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017.

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				End Semester Examination (50% weightage)
Theory (25% weightage)		Practical (25% weightage)		
Average of Internal Test (15%)	Critical Thinking Assessment (10%)	Evaluation of Laboratory Observation, Record (15%)	Model Lab Exam (10%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24CE404	Course Name	ENVIRONMENTAL ENGINEERING	Course Category	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

- 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.
- Provide knowledge on Solid waste, Air and Noise pollution and its effects.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand various components of water resource estimation, demand prediction, water impurities, water quality analysis, waterborne diseases, potable water standards, and the operation of intake, storage, and distribution systems.	U	3	3	3	2		2	2	1	1		2		3	3	2
CO-2:	Understand the principles, functions, and design considerations of water treatment unit operations and processes.	U	3	3	3	2		2	2	1	1		2		3	3	2
CO-3:	Understand the characteristics and estimation of sewage and storm runoff, and the principles of sanitary sewer and storm drain design.	U	3	3	3	2		2	2	1	1		2		3	3	2
CO-4:	Demonstrate understanding of the principles, functions, and selection of various wastewater treatment methods like activated sludge, trickling filters, and ponds.	AP	3	3	3	2		2	2	1	1		2		3	3	2
CO-5:	Acquire knowledge on Solid waste management, Air and Noise pollution and its effects.	U	3	3	2	2		3	3	2	2		2		3	2	3

Unit-1 WATER SUPPLY, STORAGE AND DISTRIBUTION **9 Periods**

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

Unit-2 WATER TREATMENT **9 Periods**

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator - Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects

Unit-3 PLANNING AND DESIGN OF SEWERAGE SYSTEM **9 Periods**

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Prevention and control – Sewage pumping-drainage in buildings - Plumbing systems for drainage

Unit-4 WASTE WATER TREATMENT AND DISPOSAL **9 Periods**

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

Unit-5	WASTE MANAGEMENT, AIR & NOISE CONTROL	9 Periods
Source and types of solid waste - Rate of Generation - Sample Characterisation – Storage - Waste Segregation – Reduction Reuse – Recycling - Public participation- Air Pollution - Health effects – Dispersion – Stacks - Control systems - Concepts of Noise Pollution.		
		Total Theory: 45 Periods

List of Experiments	**Total Practical: 30 Periods**
1. Sampling and preservation methods for water and wastewater (Demonstration only). 2. Measurement of Electrical conductivity and turbidity. 3. Determination of fluoride in water by spectrophotometric method /ISE. 4. Determination of iron in water (Demo). 5. Determination of Sulphate in water. 6. Determination of Optimum Coagulant Dosage by Jar test apparatus. 7. Determination of available Chlorine in Bleaching powder and residual chlorine in water. 8. Estimation of suspended, volatile and fixed solids. 9. Determination of Sludge Volume Index in waste water. 10. Determination of Dissolved Oxygen. 11. Estimation of B.O.D. 12. Estimation of C.O.D. 13. Determination of TKN and Ammonia Nitrogen in wastewater. 14. Determination of total and faecal coliform (Demonstration only).	

	Text Books	**References**
Learning Resources	1. Garg, S. K., "Environmental Engineering", Vol.IKhanna Publishers, New Delhi, 2018. 2. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015. 3. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016. 4. Modi, P.N., "Sewage Treatment Disposal & Wastewater Engineering", Standard Book House, 17th Edition, New Delhi, 2020.	1. Punmia, B.C., Ashok Jain and Arun Jain, "Water Supply Engineering", Laxmi Publications, (P) Ltd., New Delhi, 2014. 2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999. 3. 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. 4. Metcalf and Eddy – Waste water Engineering – Treatment and Reuse, Tata Mc. Graw – Hill Company, New Delhi, 2010. 5. Syed R.Qasim “Waste water Treatment Plants”, CRCPress, Washington D.C., 2010

Learning Assessment				
Continuous Learning Assessment (CLA) (50% weightage)				**End Semester Examination (50% weightage)**
Theory (25% weightage)		**Practical (25% weightage)**		
Average of Internal Test (15%)	**Critical Thinking Assessment (10%)**	**Evaluation of Laboratory Observation, Record (15%)**	**Model Lab Exam (10%)**	
* The expected levels for Bloom’s Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24CE405	Course Name	CONCRETE TECHNOLOGY	Course Category	T	Professional Core Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Construction Materials and Technology	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	IS 10262		

Course Objective: ***The purpose of learning this course is to:***

- 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 importance and applications of special concretes.

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		**BL**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Understand the requirements of cement, aggregates and water for concrete	U	3	1	1	2		3	2					2	3	2	3
CO-2:	Select suitable admixtures for enhancing the properties of concrete	U	3	1	1	1		3	2	1	2	2		2	3	2	3
CO-3:	Design concrete mixes as per IS method of mix design	AP	3	2	3	3		3	2	1	2	2		3	3	2	3
CO-4:	Determine the properties of concrete at fresh and hardened state	U	3	1	1	1		3	2		2	2		1	3	2	3
CO-5:	Know the importance of special concretes for specific requirements.	U	3	1	1	1		3	2	1	2	2		2	3	3	3

Unit-1 **CONSTITUENT MATERIALS** ***9 Periods***

Cement-Different types-Chemical composition and Properties -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-2 **CHEMICAL AND MINERAL ADMIXTURES** ***9 Periods***

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

Unit-3 **PROPORTIONING OF CONCRETE MIX** ***9 Periods***

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-4 **FRESH AND HARDENED PROPERTIES OF CONCRETE** ***9 Periods***

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-5 **SPECIAL CONCRETES** ***9 Periods***

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

Total: 45 Periods

	Text Books	References
Learning Resources	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	1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995 2. Gambhir.M.L.Concrete Technology,Fifth Edition, McGraw Hill Education,2017. 3. Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015. 4. IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi

Learning Assessment		
Continuous Learning Assessment (CLA) (40% weightage)		**End Semester Examination (60% weightage)**
Average of Internal Test (20%)	***Critical Thinking Assessment (20%)***	
***** The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24CE411	Course Name	HYDRAULIC ENGINEERING LABORATORY	Course Category	P	Professional Core Courses	L	T	P	C
							0	0	4	2

Pre-requisite Courses	Fluid Mechanics	Co- requisite Courses	Applied Hydraulics Engineering	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes / Standards	Nil		

Course Objective: ***The purpose of learning this course is to:***

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

			Program Outcomes (PO)												Program Specific Outcome (PSO)		
Course Outcomes (CO): ***At the end of this course, learners will be able to:***		***BL***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1:	Apply Bernoulli equation for calibration of flow measuring devices	AP	2	2	1	3	1	2	2	1	2	1	1	2	2	1	1
CO-2:	Measure friction factor in pipes and compare with Moody diagram	AP	3	2	1	3	1	2	2	1	2	1	1	2	3	1	1
CO-3:	Determine the performance characteristics of roto dynamic pumps.	AP	3	3	2	3	1	2	2	1	3	1	1	2	3	2	1
CO-4:	Determine the performance characteristics of positive displacement pumps	AP	3	3	2	3	1	2	2	1	3	1	1	2	3	2	1
CO-5:	Determine the performance characteristics of turbines.	AP	3	3	2	3	1	2	2	1	3	1	1	2	3	2	1

List of Experiments **45 Periods**

1. Calibration of Rotometer
2. Flow through Orifice meter/mouthpiece, Venturimeter and Notches
3. Bernoulli's Experiment
4. Determination of friction factor in pipes
5. Determination of minor losses
6. Characteristics of Centrifugal pumps
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump
10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine
12. Determination of metacentric height of floating bodies.
13. Study on pipe flow using relevant software's.

Learning Assessment

Continuous Learning Assessment (CLA) (60% weightage)		End Semester Examination (40% weightage)
Evaluation of Laboratory Observation, Record (45%)	**Model Lab Exam (15%)**	

* The expected levels for Bloom's Taxonomy should be:
- Lower-order thinking skills: not more than 40%
- Higher-order thinking skills: not less than 60%