MRK INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

KATTUMANNARKOIL- 608 301, CUDDALORE DISTRICT, TAMILNADU, INDIA

CHOICE BASED CREDIT SYSTEM

Programme: B.E., Civil Engineering **Regulations:** 2026

Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)	**L** – Laboratory Course
BS – Basic Science (Mathematics, Physics, Chemistry)	**T** – Theory
ES –Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**) & Emerging Technology (**ET**))	**LIT** – Laboratory Integrated Theory
SD – Skill Development	**PW** – Project Work
SL – Self Learning	**IPW** – Internship cum Project Work
CDP – Capstone Design Project	**DIC–** Department Introductory Course
OE – Open Elective	**TCP –** Total Contact Period(s)

PROGRAM OUTCOMES

1. **Engineering Knowledge**: Apply math, science, and engineering fundamentals to complex problems.
2. **Problem Analysis**: Identify and analyze complex problems using research and sustainability principles.
3. **Design Solutions**: Design systems and processes considering health, safety, cost, culture, and environment.
4. **Investigations**: Use experiments, modelling, and data analysis to reach valid conclusions.

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5. **Engineering Tools**: Apply modern tools for modelling and problem-solving, recognizing their limits.
6. **Society & Environment**: Assess societal, legal, and environmental impacts of engineering solutions.
7. **Ethics**: Commit to ethics, human values, diversity, and legal compliance.
8. **Teamwork**: Work effectively as an individual and in multidisciplinary teams.
9. **Communication**: Communicate clearly in reports, presentations and documentation across diverse groups.
10. **Management & Finance**: Apply management and economic principles in projects and teamwork.
11. **Lifelong Learning**: Engage in continuous learning, adapt to new technologies, and think critically.

PROGRAM SPECIFIC OUTCOMES (PSOS)

B.E. Civil Engineering

1. To analyze, design, and execute civil engineering projects for real-time applications.
2. Utilize modern tools, software, and equipment for the development of safe, sustainable, and cost-effective civil engineering structures and systems.
3. To keep pace with rapid advancements in the field of Civil Engineering and demonstrate research aptitude, collaborate effectively in teams and uphold ethical practices.

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CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

Semester - I							
Sl.No	**Course Code**	**Course Title**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
3 Weeks Compulsory Induction Program							
1	26HSC01	தமிழர் மரபும் ததொழில் நுட்பமும் / Tamils Heritage and Technologies	T	1-0-0	1	1	HUM
2	26ENC01	English for Engineers	T	3-0-0	3	3	HUM
3	26MAC01	Applied Calculus and Matrices	T	3-1-0	4	4	BS
4	26PHC01	Engineering Physics	LIT	3-0-2	5	4	BS
5	26CYC01	Engineering Chemistry	LIT	3-0-2	5	4	BS
6	26MEC01	Engineering Graphics	T	3-1-0	4	4	ES(GE)
7	26CSC01	Programming Language: C	T	3-0-0	3	3	ES(PC)
8	26MEC02	Makers Space Laboratory	L	0-0-4	4	2	SD
9	26CSC02	Programming in C Laboratory	L	0-0-4	4	2	ES(PC)
10	26HSC02	Physical Education	---	---	---	---	HUM
			Total Credits		**33**	**27**	

Semester - II							
Sl.No	**Course Code**	**Course Title**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1	26MACO2	Linear Algebra	T	3-1-0	4	4	BS
2	26PHC04	Physics for Civil Engineers	T	3-0-0	3	3	BS
3	26GEC01	Environmental Science and Sustainability	T	2-0-0	2	2	ES(GE)
4	26EEC01	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES(PC)
5	26CE201	Introduction to Civil Engineering	T	3-0-0	3	2	ES(PC)
6	26CSCO3	Problem Solving using Python Programming	LIT	3-0-2	5	4	ES(PC)
7	26CE202	Building Planning and Drawing	L	0-0-4	4	2	ES(PC)
8	26ENC02	Communicative English Laboratory	L	0-0-4	4	2	HUM
9		NCC / NSS / NSO/ YRC #1	-	-	-	-	-
			Total Credits		**28**	**22**	

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

Semester - III							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26MAC05	Transforms, Partial Differential Equations and Numerical Methods	T	3-1-0	4	4	BS
2	26MEC03	Engineering Mechanics	T	3-1-0	4	4	ES(GE)
3	26CE301	Construction Materials and Technology	T	3-0-0	3	3	ES(PC)
4	26CE302	Fluid Mechanics	T	3-0-0	3	3	ES(PC)
5	26CE303	Surveying and Geomatics	T	3-0-0	3	3	ES(PC)
6	26ES301	Engineering Geology	T	3-0-0	3	2	ES
7	26CE304	Water Supply and Wastewater Engineering	LIT	3-0-2	5	4	ES(PC)
8	26CE305	Surveying Laboratory	L	0-0-3	3	2	ES(PC)
9	26SDC01	Foundation Aptitude & Verbal ability Skills	-	0-0-2	2	1	SD
10		Mandatory Course-I[&]	T	1-0-0	1	-	MC
				Total Credits	**31**	**26**	

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

Semester - IV							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE401	Strength of Materials	LIT	3-0-2	5	4	ES(PC)
2	26CE402	Concrete Technology	T	3-0-0	3	3	ES(PC)
3	26CE403	Soil Mechanics	T	3-0-0	3	3	ES(PC)
4	26CE404	Applied Hydraulic Engineering	T	3-0-0	3	3	ES(PC)
5	26CE405	Highway Engineering	T	3-0-0	3	3	ES(PC)
6	26CE406	Irrigation Engineering	T	3-0-0	3	3	ES(PC)
7	26CE407	Fluid Mechanics and Hydraulic Engineering Laboratory	L	0-0-4	4	2	ES(PC)
8	26CE408	Concrete and Highway Engineering Laboratory	L	0-0-4	4	2	ES(PC)
9	26SDC02	Professional and Corporate Communication Skills	-	0-0-2	2	1	SD
10		Mandatory Course-II[&]	T	1-0-0	1	-	MC
11		NCC / NSS / NSO/ YRC #2	-	-	-	-	-
				Total Credits	**31**	**24**	

[&]Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC)
#2 NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

Semester - V							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE501	Design of Reinforced Concrete Structural Elements	T	3-1-0	4	3	ES(PC)
2	26CE502	Structural Analysis I	T	3-1-0	4	3	ES(PC)
3	26CE503	Foundation Engineering	T	3-1-0	4	3	ES(PC)
4	26CE504	Railways, Airports and Harbour Engineering	T	3-0-0	3	3	ES(PC)
5		Programme Elective I	T	3-0-0	3	3	ES(PE)
6		Programme Elective II	T	3-0-0	3	3	ES(PE)
7		Open Elective-I[$]	T	3-0-0	3	2	ES(ET)
8	26CE505	Soil Mechanics Laboratory	L	0-0-3	3	2	ES(PC)
9	26CE506	Survey Camp (2 weeks)	L	0-0-0	0	1	SD
10		Mandatory Course-III[&]	T	1-0-0	1	-	MC
11	26IP501	Summer Internship*	-	-	-	1	IPW
12	26SDC03	Advanced Aptitude and Logical Reasoning Skills	-	0-0-2	2	1	SD
			Total Credits		**30**	**25**	

[$]Open Elective – I shall be chosen from the Emerging Technologies
[&] Mandatory Course-III is a Non-credit Course (Student shall select one course from the list given under MC)
***Two weeks Summer Internship carries one credit and it will be done during IV semester summer vacation and same will be evaluated in V semester.**

For Honours Degree							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – I	T	3-0-0	3	3	
2		Honours Elective – II	T	3-0-0	3	3	
For Minor Degree							
1		Minor Elective – I	T	3-0-0	3	3	
2		Minor Elective – II	T	3-0-0	3	3	

Semester - VI							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE601	Structural Analysis II	T	3-1-0	4	3	ES(PC)
2	26CE602	Design of Steel Structural Elements	T	3-1-0	4	3	ES(PC)
3		Programme Elective III	T	3-0-0	3	3	ES (PE)
4		Programme Elective IV	T	3-0-0	3	3	ES (PE)
5		Open Elective-II[$]	T	3-0-0	3	3	ES(ET)
6	26HSCO4	Project Management	T	3-0-0	3	3	HUM
7	26CE603	Building Structural Design and Drawing Laboratory	L	0-0-4	4	3	ES (PC)
8	26SDC04	Technical Interview and Advanced Competitive Examination Skills	-	0-0-2	2	1	SD
9		Mandatory Course-IV[&]	T	1-0-0	1	-	MC
10		Self-Learning Course	-	-	-	-	SL
11		NCC / NSS / NSO/ YRC #3	-	-	-	-	-
				Total Credits	**27**	**22**	

[$]Open Elective – II shall be chosen from the Emerging Technologies

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

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

For Honours Degree							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – III	T	3-0-0	3	3	
2		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1		Minor Elective – III	T	3-0-0	3	3	
2		Minor Elective – IV	T	3-0-0	3	3	

Semester - VII							
Sl.No	**Course Code**	**Course Title**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1	26CE701	Estimation, Costing and Valuation Engineering	T	3-1-0	4	3	ES(PC)
2	26CE702	Prestressed Concrete Structures	T	3-1-0	4	3	ES(PC)
3		Programme Elective-V	T	3-0-0	3	3	ES(PE)
4		Open Elective-II	T	3-0-0	3	2	ES (OE)
5	26HSCO3	Engineering Entrepreneurship Development	T	3-0-0	3	3	HUM
6	26HSC05	Professional Ethics and Human Values	T	2-0-0	2	2	HUM
7	26CE703	Irrigation Engineering and Drawings	T	2-1-0	3	3	ES(PC)
8	26CE704	Design Project	PW	0-0-4	4	2	SD
9	26SDC05	Professional Employability and Technical Communication Skills	-	0-0-2	2	1	SD
10		Mandatory Course-V[&]	T	1-0-0	1	-	MC
11	26IP701	Summer Internship*	-	-	-	1	IPW
				Total Credits	**29**	**23**	

[&]Mandatory Course-V is a Non-credit Course (Student shall select one course from the list given under MC)
***Two weeks Summer Internship carries one credit and it will be done during VI semester summer vacation and same will be evaluated in VII semester.**

For Honours Degree							
Sl.No	**Course Code**	**Course Title**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – V	T	3-0-0	3	3	
2		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1		Minor Elective – V	T	3-0-0	3	3	
2		Minor Elective – VI	T	3-0-0	3	3	

Semester - VIII							
Sl.No	**Course Code**	**Course Title**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1	26CE801	Project Work/Internship	PW	0-0-16	16	8	SD
				Total Credits	**16**	**8**	

Total Creditss – 177

PROGRAMME ELECTIVE COURSES: STREAMS

VERTICAL I	VERTICAL II	VERTICAL III	VERTICAL IV	VERTICAL V	VERTICAL VI
Structures and Construction Management	**Geotechnical Engineering**	**Transportation**	**Environment**	**Water Resources & GIS**	**Infrastructure**
Prefabricated Structures	Ground Improvement Techniques	Traffic Engineering and Management	Solid and hazardous waste management	Hydrology and Water Resources Engineering	Artificial Intelligence in Civil Engineering
Dynamics and Earthquake Resistant Structures	Soil Dynamics	Urban Planning and Development	Industrial wastewater management	Groundwater Engineering	Design of Bridges
Maintenance, Repair and Rehabilitation of Structures	Earth Retaining Structures	Intelligent Transportati on Systems	Air and noise pollution	Integrated Water Resources Management	Dam Engineering
Energy Efficient Buildings	Rock Mechanics	Pavement Engineering	Environmental Impact Assessment	Remote Sensing and GIS	Underground structures
Construction Management and Safety	Geo-Environmental Engineering	Geomatics for Transportation	Environmental Health and Safety	Geomatics for Hydrology and Water Resources	Formwork Engineering
Introduction to Finite Element Method	Pile Foundation	Smart Cities	Climate Change Adaptation and Mitigation	Water Resources Systems Engineering	Offshore structures
Construction Equipment and Machinery	Tunneling Engineering	Transportation Planning Process	Environmental Policy and Legislations	Watershed Conservation and Management	Coastal Engineering
Sustainable Construction And Lean Construction	Total Station and GPS Surveying	Transport and Environment	Environmental Quality Monitoring	Urban Water Infrastructure	Coastal Hazards and Mitigation
Energy Efficient Buildings	Satellite Image Processing	Transportation Infrasturture Engineering	Rainwater Harvesting	Water Quality and Management	Coastal Zone Management and Remote Sensing
Industrial Structures	Geoinformatics Applications for Civil Engineers	Urban Infrastructure and Smart Mobility	Disaster Management	ParticipatoryWater Resources Managemen	Bridge Engineering

PROGRAMME ELECTIVE COURSES : VERTICALS

VERTICAL I: STRUCTURES AND CONSTRUCTION MANAGEMENT

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE001	Prefabricated Structures	T	3-0-0	0	3	ES(PE)
2	26CE002	Dynamics and Earthquake Resistant Structures	T	3-0-0	0	3	ES(PE)
3	26CE003	Maintenance, Repair and Rehabilitation	T	3-0-0	0	3	ES(PE)
4	26CE004	Energy Efficient Buildings	T	3-0-0	0	3	ES(PE)
5	26CE005	Construction Management and Safety	T	3-0-0	0	3	ES(PE)
6	26CE006	Introduction to Finite Element Method	T	3-0-0	0	3	ES(PE)
7	26CE007	Construction Equipment and Machinery	T	3-0-0	0	3	ES(PE)
8	26CE008	Sustainable Construction And Lean Construction	T	3-0-0	0	3	ES(PE)
9	26CE009	Energy Efficient Buildings	T	3-0-0	0	3	ES(PE)
10	26CE010	Industrial Structures	T	3-0-0	0	3	ES(PE)

VERTICAL II: GEOTECHNICAL ENGINEERING

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE011	Ground Improvement Techniques	T	3-0-0	0	3	ES(PE)
2	26CE012	Soil Dynamics	T	3-0-0	0	3	ES(PE)
3	26CE013	Earth Retaining Structures	T	3-0-0	0	3	ES(PE)
4	26CE014	Rock Mechanics	T	3-0-0	0	3	ES(PE)
5	26CE015	Geo-Environmental Engineering	T	3-0-0	0	3	ES(PE)
6	26CE016	Pile Foundation	T	3-0-0	0	3	ES(PE)
7	26CE017	Tunneling Engineering	T	3-0-0	0	3	ES(PE)
8	26CE018	Total Station and GPS Surveying	T	3-0-0	0	3	ES(PE)
9	26CE019	Satellite Image Processing	T	3-0-0	0	3	ES(PE)
10	26CE020	Geoinformatics Applications for Civil Engineers	T	3-0-0	0	3	ES(PE)

VERTICAL III: TRANSPORTATION

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE021	Traffic Engineering and Management	T	3-0-0	0	3	ES(PE)
2	26CE022	Urban Planning and Development	T	3-0-0	0	3	ES(PE)
3	26CE023	Intelligent Transportation Systems	T	3-0-0	0	3	ES(PE)
4	26CE024	Pavement Engineering	T	3-0-0	0	3	ES(PE)
5	26CE025	Geomatics for Transportation	T	3-0-0	0	3	ES(PE)
6	26CE026	Smart Cities	T	3-0-0	0	3	ES(PE)
7	26CE027	Transportation Planning Process	T	3-0-0	0	3	ES(PE)
8	26CE028	Transport and Environment	T	3-0-0	0	3	ES(PE)
9	26CE029	Transportation Infrasturture Engineering	T	3-0-0	0	3	ES(PE)
10	26CE030	Urban Infrastructure and Smart Mobility	T	3-0-0	0	3	ES(PE)

VERTICAL IV: ENVIRONMENT

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE031	Solid and hazardous waste management	T	3-0-0	0	3	ES(PE)
2	26CE032	Industrial wastewater management	T	3-0-0	0	3	ES(PE)
3	26CE033	Air and noise pollution	T	3-0-0	0	3	ES(PE)
4	26CE034	Environmental Impact Assessment	T	3-0-0	0	3	ES(PE)
5	26CE035	Environmental Health and Safety	T	3-0-0	0	3	ES(PE)
6	26CE036	Climate Change Adaptation and Mitigation	T	3-0-0	0	3	ES(PE)
7	26CE037	Environmental Policy and Legislations	T	3-0-0	0	3	ES(PE)
8	26CE038	Environmental Quality Monitoring	T	3-0-0	0	3	ES(PE)
9	26CE039	Rainwater Harvesting	T	3-0-0	0	3	ES(PE)
10	26CE040	Disaster Management	T	3-0-0	0	3	ES(PE)

VERTICAL V: WATER RESOURCES & GIS

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE041	Hydrology and Water Resources Engineering	T	3-0-0	0	3	ES(PE)
2	26CE042	Groundwater Engineering	T	3-0-0	0	3	ES(PE)
3	26CE043	Integrated Water Resources Management	T	3-0-0	0	3	ES(PE)
4	26CE044	Remote Sensing and GIS	T	3-0-0	0	3	ES(PE)
5	26CE045	Geomatics for Hydrology and Water Resources	T	3-0-0	0	3	ES(PE)
6	26CE046	Water Resources Systems Engineering	T	3-0-0	0	3	ES(PE)
7	26CE047	Watershed Conservation and Management	T	3-0-0	0	3	ES(PE)
8	26CE048	Urban Water Infrastructure	T	3-0-0	0	3	ES(PE)
9	26CE049	Water Quality and Management	T	3-0-0	0	3	ES(PE)
10	26CE050	ParticipatoryWater Resources Managemen	T	3-0-0	0	3	ES(PE)

VERTICAL VI: INFRASTRUCTURE

Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26CE051	Artificial Intelligence in Civil Engineering	T	3-0-0	0	3	ES(PE)
2	26CE052	Design of Bridges	T	3-0-0	0	3	ES(PE)
3	26CE053	Dam Engineering	T	3-0-0	0	3	ES(PE)
4	26CE054	Underground structures	T	3-0-0	0	3	ES(PE)
5	26CE055	Formwork Engineering	T	3-0-0	0	3	ES(PE)
6	26CE056	Offshore structures	T	3-0-0	0	3	ES(PE)
7	26CE057	Coastal Engineering	T	3-0-0	0	3	ES(PE)
8	26CE058	Coastal Hazards and Mitigation	T	3-0-0	0	3	ES(PE)
9	26CE059	Coastal Zone Management and Remote Sensing	T	3-0-0	0	3	ES(PE)
10	26CE060	Bridge Engineering	T	3-0-0	0	3	ES(PE)

Open Electives (EMERGING TECHNOLOGIES)							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26OE901	AI-Driven Decision Support Systems	T	3-0-0	3	3	OE
2	26OE902	Emerging Technologies for Digital Transformation	T	3-0-0	3	3	OE
3	26OE903	Future Technologies for Intelligent Industries	T	3-0-0	3	3	OE
4	26OE904	Climate Change and Infrastructure Resilience	T	3-0-0	3	3	OE
5	26OE905	Environmental Sustainability and Resource Management	T	3-0-0	3	3	OE
6	26OE906	Green Building Technologies	T	3-0-0	3	3	OE
7	26OE907	Battery Technologies and Management Systems	T	3-0-0	3	3	OE
8	26OE908	Energy Management and Conservation	T	3-0-0	3	3	OE
9	26OE909	Renewable Energy Technologies	T	3-0-0	3	3	OE
10	26OE910	Smart Grid Technologies	T	3-0-0	3	3	OE
11	26OE911	IoT-Enabled Healthcare Technologies	T	3-0-0	3	3	OE
12	26OE912	Wearable Health Technologies	T	3-0-0	3	3	OE
13	26OE913	Biomedical Signal & Image Processing	T	3-0-0	3	3	OE
14	26OE914	Mobile Communication	T	3-0-0	3	3	OE
15	26OE915	Systems on Chip with IoT applications	T	3-0-0	3	3	OE
16	26OE916	Opto Nano Electronics	T	3-0-0	3	3	OE
17	26OE917	Mechatronics and Smart Systems	T	3-0-0	3	3	OE
18	26OE918	Finite Element Analysis for Engineers	T	3-0-0	3	3	OE
19	26OE919	Energy Audit and Energy Management	T	3-0-0	3	3	OE
20	26OE920	Industrial Safety	T	3-0-0	3	3	OE

Mandatory Courses (MC)							
Sl.No	Course Code	Course Title	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1	26MCC01	Disaster Management and Safety Awareness	T	1-0-0	1	-	MC
2	26MCC02	Gender Sensitization and Inclusive Society	T	1-0-0	1	-	MC
3	26MCC03	Constitution of India	T	1-0-0	1	-	MC
4	26MCC04	Digital Literacy and Cyber Awareness	T	1-0-0	1	-	MC
5	26MCC05	Research Methodology and Intellectual Property Rights	T	1-0-0	1	-	MC

Semester wise Credit Distribution

Course Category	Code	I	II	III	IV	V	VI	VII	VIII	Total Credits	% Share
Basic Science	BS	12	7	4	-	-	-	-	-	23	12.99
Humanities	HUM	4	2	-	-	-	2	5	-	13	7.34
Engineering Science (General)	ES (G E)	4	2	6	-	-	-	-	-	12	6.78
Programme Core	PC	5	11	15	23	14	9	9	-	86	48.58
Programme Elective	PE	-	-	-	-	6	6	3	-	15	8.47
Emerging Technology	ET	-	-	-	-	3	3	-	-	6	3.39
Skill Development	SD	2	-	1	1	2	2	3	8	19	10.73
Internship cum Project Work	IPW	-	-	-	-	-	1	2	-	3	1.69
Self-Learning / Industry Oriented Course	IPW	-	-	-	-	-	-	-	-	-	-
Total Credits	-	27	22	26	24	24	22	24	8	177	100


MRK Institute of Technology
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Semester – I

26HSC01	தமிழர் மரபும் ததொழில் நுட்பமும் / Tamils Heritage and Technologies	L	T	P	C
		1	0	0	1

Course Objectives:

- தமிழ்மமொழி, திரொவிட மமொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பொட்டு மரபுகளள அறிந்F விளக்குதல்.
- தமிழர்களின் நொட்டுப்புறக் களலகள், விளளயொட்டுகள், மதய்வ வழிபொடு மற்றும் ளகவிளன மரபுகளள அறிந்F அவற்றின் முக்கியத்Fவத்ளத விளக்குதல்.
- தமிழர்களின் பொரம்பரிய கட்டிடக்களல, சிற்பக்களல மற்றும் கட்டுமொனத் மதொழில்நுட்பங்களள அறிந்F அவற்றின் சிறப்புகளள விளக்குதல்.
- பண்ளடய தமிழர்களின் கப்பல் கட்டுதல், உலலொகத் மதொழில்நுட்பம், மணிகள் தயொரித்தல் மற்றும் வொணிபத் மதொழில்நுட்பங்களள அறிந்F விளக்குதல்.
- தமிழர்களின் லவளொண்ளம, நீர்ப்பொசன முளறகள், கொல்நளடப் பரொமரிப்பு மற்றும் கடல்சொர் அறிவியல் மதொழில்நுட்பங்களள அறிந்F அவற்றின் முக்கியத்Fவத்ளத விளக்குதல்.

அலகு I	**தமொழி மற்றும் இலக்கிய மரபுகள்**	**3**

இந்திய மமொழிக் குடும்பங்கள், திரொவிட மமொழி வளகக்ள், முச்சங்க வரலொறு, சங்க இலக்கியத்தில் அறச்சிந்தளனகள், சங்க இலக்கியமும் பண்பொட்டு மரபுகளும், தமிழ் ஒரு மசம்மமொழி, திருக்குறளில் லமலொண்ளமக் கருத்Fகள், சங்ககொலத்தில் கல்வி, சங்ககொல நகரங்களும் Fளறமுகங்களும், மபரியபுரொணம், நொயன்மமொர்கள் மற்றும் ஆழ்வொர்களின் பக்திமநறி

அலகு II	**நொட்டுப்புறக் கலலகளின் மரபுகள்**	**3**

நொட்டுப்புறக் களலயின் லதொற்றம் மற்றும் வளர்ச்சி, மதருக்கூத்F, கரகொட்டம், வில்லுப்பொட்டு, கணியொன் கூத்F, ஓயிலொட்டம், லதொல்பொளவக் கூத்F, சிலம்பொட்டம், புலியொட்டம், தமிழர்களின் விளளயொட்டுகள், நொட்டுப்புறத் மதய்வங்களின் வளகக்ள், சிற்பக்களல, நடுகல் வழிபொடு, ளகவிளனப் மபொருட்கள், இளசக்கருவிகளின் வளகக்ள்.

அலகு III	**தமிழர்களின் கட்டிடத் ததொழில்நுட்பம்**	**3**

சங்க கொலத்தில் மநசவு மற்றும் பொளனத் மதொழில்நுட்பம், சங்ககொலத்தில் கட்டுமொனங்கள், வீட்டு மபொருட்களின் வடிவளமப்பு, சங்ககொலத்தில் கட்டுமொன மபொருட்கள், சிலப்பதிகொரத்தில் லமளட அளமப்பு, மமொமல்லபுரம் சிற்பங்களும் லகொவில்களும் லசொழர் கொல மபருங்லகொயில்கள், வழிபொட்டுத்தலங்கள்,மீனொட்சி அம்மன் ஆலயம்,மசட்டிநொட்டு கட்டிடக் களல, திருமளல நொயக்கர் மஹொல்.

அலகு IV	**உற்பத்தித் ததொழில்நுட்பம்**	**3**

கப்பல் கட்டுமம் களல, இருமம்பு மதொழிற்சொளல, மசமம்பு மற்றுமம் தங்க நொணயங்கள் அச்சடித்தல், கண்ணொடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள் , கல்மணிகள் சிலப்பதிகொரத்தில் மணிகளின் வளககள், ,மதொல்லியல் சொன்றுகள்,சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி.		
அலகு V	**வேளொண்லம மற்றும் நீர்ப்பொசனத் ததொழில்நுட்பம்**	**3**
அளண ஏரி குளங்கள் மதகு அளமப்பு லசொழர் கொல குமுழி தூமம்பின் முக்கியத்Fவமம், கொல்நளட பரொமரிப்பு, லவளொண்ளம சொர்ந்த மசயல்பொடுகள், மபருங்கடல் குறித்த பண்ளடய அறிவு , முத்Fக்குளித்தல், அறிவுசொர் சமூகமம், கடல் கடந்த நாடுகளில் சசாழர்களின் வெற்றி. அறிவியல் தமிழின் ெளர்ச்சி, கணித்தமிழ் ெளர்ச்சி.		
TOTAL : 15 PERIODS		

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. மெொ. இரொசமெொணிக்கனொர், தமிழர் நொகரிகமுமம் பண்பொடுமம், ளசவசித்தொந்த நூற்பதிப்புக் கழகமம், மசன்ளன.
2. லக. லக. பிள்ளள, தமிழக வரலொறு – மக்களுமம் பண்பொடுமம், உலகத் தமிழொரொய்ச்சி நிறுவனமம், மசன்ளன.

References:

1. ந. சுப்பிரமணியன், தமிழக வரலொறு, தமிழ்நொட்டுப் பொடநூல் மற்றுமம் கல்வியியல் பணிகள் கழகமம், மசன்ளன.
2. இரொ. நொகசொமி, தமிழகத் மதொல்லியல், தமிழ்நொடு அரசு மதொல்லியல் Fளற, மசன்ளன.
3. குடவொயில் பொலசுப்ரமணியன், தமிழர் கட்டிடக்களல, தமிழ்ப் பல்களலக்கழகமம், தஞ்சொவூர்.
4. கொ. சிவத்தமம்பி, தமிழின் சமூக வரலொறு, நியூ மசஞ்சுரி புக் ஹவுஸ், மசன்ளன.
5. தமிழ்ப் பல்களலக்கழகமம், தமிழர் மதொழில்நுட்பமம், தமிழ்ப் பல்களலக்கழகமம், தஞ்சொவூர்.

E-resources:

1. https://www.tamilvu.org/
2. https://www.projectmadurai.org/
3. https://www.tnarch.gov.in/

CO	CO Description	PO	PSO
CO1	தமிழ்மமொழி, திரொவிட மமொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பொட்டு மரபுகளள அறிந்F விளக்குதல்.	PO1(2) PO2(2)	PSO3(2)
CO2	தமிழர்களின் நொட்டுப்புறக் களலகள், விளளயொட்டுகள், மதய்வ வழிபொடு மற்றும் ளகவிளன மரபுகளள அறிந்F அவற்றின் முக்கியத்Fவத்ளத விளக்குதல்.	PO1 (2), PO7 (3), PO8 (3)	PSO1(1), PSO3 (2)
CO3	தமிழர்களின் பொரம்பரிய கட்டிடக்களல, சிற்பக்களல மற்றும் கட்டுமொனத் மதொழில்நுட்பங்களள அறிந்F அவற்றின் சிறப்புகளள விளக்குதல்.	PO1 (3), PO2 (3)	PSO2 (2), PSO3 (2)
CO4	பண்ளடய தமிழர்களின் கப்பல் கட்டுதல், உலலொகத் மதொழில்நுட்பம், மணிகள் தயொரித்தல் மற்றும் வொணிபத் மதொழில்நுட்பங்களள அறிந்F விளக்குதல்.	PO1 (2), PO2 (2), PO3 (2), PO7 (3)	PSO2 (2), PSO3 (2)
CO5	தமிழர்களின் லவளொண்ளம, நீர்ப்பொசன முளறகள், கொல்நளடப் பரொமரிப்பு மற்றும் கடல்சொர் அறிவியல் மதொழில்நுட்பங்களள அறிந்F அவற்றின் முக்கியத்Fவத்ளத விளக்குதல்.	PO2 (3), PO5 (3), PO6 (3)	PSO1 (2), PSO2 (2), PSO3 (3)

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

26HSC01	Tamil Heritage and Technologies	L	T	P	C
		1	0	0	1

Course Objectives:

- Identify and explain the Tamil language, Dravidian languages, Sangam literature, and cultural heritage of the Tamils.
- Identify and explain the importance of folk arts, traditional games, folk deities, and handicraft traditions of the Tamils.
- Study and explain the significance of traditional architecture, sculpture, and construction technologies of the Tamils.
- Explain the shipbuilding, metallurgical, bead-making, and trade technologies practiced by the ancient Tamils.
- Explain the importance of agriculture, irrigation systems, animal husbandry, and maritime knowledge and technologies of the Tamils.

Unit I	Language and Literary Heritage	3

Indian language families, varieties of Dravidian languages, history of Muthamizh, ethical thoughts in Sangam literature, Sangam literature and cultural traditions, Tamil as a classical language, management concepts in Thirukkural, education during the Sangam period, Sangam-age cities and ports, Periyapuranam, and the devotional traditions of Nayanmars and Alvars.

Unit II	Traditions of Folk Arts	3

Origin and development of folk arts, Therukoothu, Karagattam, Villupattu, Kaniyan Koothu,Oyilattam, Tholpavai Koothu, Silambattam, Puliyattam, traditional games of the Tamils, types of folk deities, sculpture, hero-stone worship, handicrafts, and types of musical instruments.

Unit III	Architectural Technology of the Tamils	3

Weaving and pottery technology during the Sangam period, construction practices during the Sangam period, design of household articles, construction materials used during the Sangam period, stage arrangement described in Silappathikaram, sculptures and temples of Mamallapuram, great temples of the Chola period, places of worship, Meenakshi Amman Temple, Chettinad architecture, and Thirumalai Nayak Palace.

Unit IV	Manufacturing Technology	3

Shipbuilding technology, iron industry, production and minting of copper and gold coins, glass beads, terracotta beads, conch-shell beads, stone beads, varieties of beads mentioned in Silappathikaram, archaeological evidences, and export and import during the Sangam period.

Unit V	Agriculture and Irrigation Technology	3

Dams, lakes and ponds, sluice structures, significance of the Kumizhi Thoompu during the Chola period, animal husbandry, agriculture-related activities, ancient knowledge of the ocean, pearl diving, knowledge-based society, achievements of the Cholas in overseas countries, development of scientific Tamil, and development of computational Tamil.

TOTAL : 15 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. K. K. Pillay, A Social History of the Tamils, University of Madras, Chennai.
2. R. Nagaswamy, Tamil Nadu: An Archaeological Perspective, Tamil Nadu State Department of

Archaeology, Chennai.
References:
1. K. A. Nilakanta Sastri, A History of South India: From Prehistoric Times to the Fall of Vijayanagar, Oxford University Press, New Delhi. 4th Edition, 2015. 2. N. Subrahmanian, Social and Cultural History of Tamilnadu, Koodal Publishers, Madurai. 3. S. R. Balasubrahmanyam, Early Chola Art, Asia Publishing House, Bombay. 4. C. Sivaramamurti, South Indian Bronzes, Lalit Kala Akademi, New Delhi. 5. Noboru Karashima, A Concise History of South India: Issues and Interpretations, Oxford University Press, New Delhi. 1st Edition, 2014
E-resources:
1. https://www.tamilvu.org/ 2. https://www.projectmadurai.org/ **3.** https://www.tnarch.gov.in/

CO	CO Description	PO	PSO
CO1	Identify and explain the Tamil language, Dravidian languages, Sangam literature, and cultural heritage of the Tamils.	PO1 (2) PO2 (2)	PSO3 (2)
CO2	Identify and explain the importance of folk arts, traditional games, folk deities, and handicraft traditions of the Tamils.	PO1 (2), PO7 (3), PO8 (3)	PSO1 (1), PSO3 (2)
CO3	Study and explain the significance of traditional architecture, sculpture, and construction technologies of the Tamils.	PO1 (3), PO2 (3)	PSO2 (2), PSO3 (2)
CO4	Explain the shipbuilding, metallurgical, bead-making, and trade technologies practiced by the ancient Tamils.	PO1 (2), PO2 (2), PO3 (2), PO7 (3)	PSO2 (2), PSO3 (2)
CO5	Explain the importance of agriculture, irrigation systems, animal husbandry, and maritime knowledge and technologies of the Tamils.	PO2 (3), PO5 (3), PO6 (3)	PSO1 (2), PSO2 (2), PSO3 (3)

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

26ENC01	English for Engineers	L	T	P	C
		3	0	0	3

Course Objectives:

- Develop vocabulary and grammatical competence by strengthening students' knowledge and appropriate usage in different contexts.
- Facilitate reading and comprehension skills through the effective use in academic and professional texts.
- Improve oral communication and presentation skills to strengthen content and context
- Enhance effective listening skills by familiarizing students with different accents, dialects, varieties of English
- Enable students to write professional correspondence and ethical writing practices.

Unit I	Vocabulary and Grammar	9

Academic Word List (AWL) - Foreign Words - Semantics - synonyms, antonyms, one-word substitution - Phrasal verbs - Phrases and idioms - Misspelt words; Parts of Speech - Subject-verb agreement - Tenses - Articles - Voices - Reported speech – Modals- Sentence structure

Suggested Activities: Gap fills exercises, Cloze Test, Error Detection and Spell Bee.

Unit II	Reading and Comprehension	9

4 Types of Reading Techniques - Scanning, Skimming, Intensive reading, Extensive reading - Fiction and Non-fiction texts - Difference, features, strategies, comprehension - Strategies for reading general and professional content - Identifying transitions in a text - Note making - Interpreting charts and data; Academic reading - PQRST, SQ3R - Critical reading - Effective use of resources - Index, table of contents and glossary

Suggested Activities: Reading - newspaper and digital articles, Reading comprehension, note making and summarizing.

Unit III	Speaking	9

Importance of oral communication - Phonetics - Pronunciation, Stress and Intonation; Speaking in different contexts - verbal and non-verbal behavior; Presentation Skills - Types of Presentations - informative, persuasive, business - effective slide presentation - delivering a presentation; Classroom participation – Group Discussions, Debates, Group activities

Suggested Activities: Just a Minute (JAM) Video recording, Situational role plays, Usage of Apps.

Unit IV	Listening	9

Listening - Types - Purpose - Barriers - Strategies for effective listening in various contexts - Note-taking as a tool for effective listening - Dialects, accents, and slang - Dialectical Varieties - English in India,

Suggested Activities: Listening and Repeating, Note-taking

Unit V	Writing	9

Importance of written communication - Letter writing and e-mail - Reporting/Reports - Introduction to abstracts and articles - Difference between abstract and executive summary; Summarizing - Paraphrasing - Synthesizing - Editing and Proofreading - Plagiarism - Referencing online and offline resources.

Suggested Activities: Picture and poster description, Brainstorming and Mind Mapping.

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:
1. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, New Delhi, 2022. 2. M. Ashraf Rizvi, Effective Technical Communication, 2nd Edition, McGraw Hill Education, New Delhi, 2018.
References:
1. Department of Humanities and Social Sciences, Anna University, *English for Engineers and Technologists* (Combined edition, Vol. 1 and 2), Orient Blackswan, Chennai, 2006. 2. Nitin Bhatnagar and Mamta Bhatnagar, *Communicative English for Engineers and Professionals*, 3. Pearson Education, 2010. Board of Editors, *Vibrant English*, Orient Blackswan, Chennai, 2013. 4. William Strunk Jr. & E.B. White, *The Elements of Style*, 4th Edition, Pearson, 1999. 5. David F. Beer and David McMurrey, *Guide to Writing as an Engineer*, 5th Edition, John Wiley, New York, 2021.
E-resources:
1. https://learnenglish.britishcouncil.org/ 2. https://www.bbc.co.uk/learningenglish 3. https://learnenglish.britishcouncil.org/skills/speaking

CO	CO Description	PO	PSO
CO1	Apply appropriate vocabulary and grammatical structures accurately and effectively in academic, professional, and everyday communication.	PO7(2) PO9(3)	PSO2(1) PSO3(2)
CO2	Employ suitable reading strategies **to** comprehend, analyze, interpret, and critically evaluate general, academic, and professional texts.	PO2(3) PO9(3)	PSO2(1) PSO3(2)
CO3	Demonstrate effective speaking and presentation skills with appropriate pronunciation, stress intonation in individual and group settings.	PO8(3)	PSO1 (1) PSO2(1) PSO3(3)
CO4	Demonstrate effective listening skills by identifying key information, understanding different accents and varieties of English.	PO2(2) PO6(1)	PSO2(1) PSO3(2)
CO5	Produce clear, coherent, and professionally appropriate written documents**.**	PO10(2) PO11(3)	PSO1(1) PSO2(1) PSO3(2)

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

26MAC01	Applied Calculus and Matrices	L	T	P	C
		3	1	0	4

Course Objectives:

- To provide technical competence of modelling engineering problems using calculus.
- To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.

Unit I	Differential Calculus	12

Functions, graph of functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem.

Suggested Activities: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Unit II	Functions of Several Variables	12

Partial derivatives, Total derivative, Taylor's series formula for functions of two variables, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers.

Suggested Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Unit III	Integral Calculus	12

Fundamental theorem of Calculus, Indefinite integrals and Improper integrals, Evaluation of double integrals, Change of order of integration, Evaluation of triple integrals.

Suggested Activities: Definite and Indefinite Integrals, Determination of double and triple integrals, Solving of Competitive Examination questions (Ex. GATE).

Unit IV	Matrices	12

Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigen vectors (without proof) Cayley–Hamilton Theorem, Applications of Cayley–Hamilton Theorem.

Suggested Activities: Compute Eigen values and Eigen vectors, verify the Cayley–Hamilton theorem, and perform matrix computations using open-source software..

Unit V	Orthogonal Transformations and Quadratic Forms	12

Diagonalization of matrices by orthogonal transformation – Quadratic forms – Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

Suggested Activities: Perform orthogonal diagonalization, reduce quadratic forms to canonical form, determine the nature of quadratic forms, and visualize quadratic forms using open-source software

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. Grewal, B. S. (2025). Higher Engineering Mathematics (45th Ed.). Khanna Publishers, New Delhi. .

2. Ramana, B. V. (2024). Higher Engineering Mathematics. McGraw Hill Education (India) Private Limited.

References:

1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons.
2. Waner, S., & Costenoble, S. (2024). Applied Calculus (8th ed.). Cengage Learning..
3. Stroud, K. A., & Booth, D. J. (2020). Engineering Mathematics (8th ed.). Red Globe Press..
4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2022). Thomas' Calculus: Early Transcendentals (15th Ed.). Pearson.
5. Anton, H., Rorres, C., & Kaul, A. (2021). Elementary Linear Algebra: Applications Version (12th ed.). John Wiley & Sons.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc17_hs04
2. https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus_Early_Transcendentals_(Stewart)/
3. https://openstax.org/books/calculus-volume-1/

CO	CO Description	PO	PSO
CO1	Apply the concepts of limits, continuity and derivatives to analyze functions and solve optimization problems.	PO1(3) PO2(2)	PSO1(2) PSO2(1)
CO2	Analyze functions of several variables using partial derivatives, Taylor's formula and optimization techniques.	PO1(3) PO2(3)	PSO1(2) PSO2(2)
CO3	Apply integration techniques to evaluate single, double and triple integrals.	PO1(3) PO2(2)	PSO1(2) PSO2(1)
CO4	Determine eigenvalues and eigenvectors of matrices and apply the Cayley–Hamilton theorem to solve matrix problems.	PO1(3) PO2(2)	PSO1(2) PSO2(2)
CO5	Analyze matrices and quadratic forms using orthogonal transformations and determine the nature of quadratic forms.	PO1(3) PO2(3) PO5(2)	PSO1(2) PSO2(2) PSO3(1)

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

26PHC01	Engineering Physics	L	T	P	C
		3	0	2	4

Course Objectives:

- To impart essential physics concepts and demonstrate their relevance to diverse engineering applications.

Unit I	Fundamental & Properties of Matter	9

Concept – Force, Mass & Weight, Velocity & Acceleration, Momentum & Impulse, Elasticity – Cantilever-Young's modulus (non-uniform bending), Viscosity- Stokes method - Surface tension - Drop weight method –bimetallic Strip-Thermal Stress-Expansion joints and examples

Suggested Activities: Virtual demonstration of thermal stress.

Unit II	Thermodynamics	9

Thermal conductivity – Modes of heat transfer- Conductivity of bad conductor Lee's disc method – Conductivity of good conductor Forbes' Method. Conductivity of semiconductor- laws of Thermodynamics – Entropy- Carnot's cycle as heat engine and refrigerator.

Suggested Activities: Virtual demonstration of four-stroke engine

Unit III	Optics	9

Fiber Optics: Structure of fiber, fiber optics, communication fiber sensor, Displacement sensor, and pressure sensor & temperature sensor- Interference: constructive and destructive interference -Air Wedge-Determination of thin wire. Michelson's Interferometer - Determination of thin film

Suggested Activities: Demonstration of optical fiber communication and study of fiber optic sensors

Unit IV	Quantum Physics	9

Concept – DE Broglie wave equation – Dual nature of matter waves - Properties of matter waves, Schrodinger Time dependent wave equation and Time independent wave equation, Particle in one dimensional box, Photo electric effect - Experimental verification of photo electric effect.

Suggested Activities: Demonstration and analysis of the photoelectric effect and quantum phenomena

Unit V	Laser and its Application	9

Properties- Einstein Co-Efficient A and B, Ratio of stimulated and spontaneous emission construction, working. Solid laser (Nd-YAG Laser), Gas laser (**CO_2**), Dye laser, Diode laser (hetero junction and homo junction laser) Advantage industrial and medical application.

Suggested Activities: Demonstration of laser characteristics and study of industrial and medical applications of lasers.

TOTAL (Theory): 45 PERIODS

List of Experiments:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia
2. Non-uniform bending - Determination of Young's modulus
3. Uniform bending –Determination of young's modulus
4. Determination of band gap of semiconductor using post office box
5. Air wedge - Determination of thickness of a thin sheet/wire
6. Photoelectric effect-verification of electron flow

7. Laser- Determination of the wavelength of the laser using grating

TOTAL (Lab.): 30 PERIODS

TOTAL: 75 PERIODS

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.

Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).

Text Books:

1. M. N. Avadhanulu and P. G. Kshirsagar, A Textbook of Engineering Physics, S. Chand Publishing, New Delhi.
2. R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications, New Delhi.

References:

1. A. K. Sawhney and Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, Dhanpat Rai & Co., New Delhi. 14th Edition, 2017; Revised Edition 2020.
2. A. Ghatak and K. Thyagarajan, Optical Electronics and Fibre Optics, Cambridge University Press, Cambridge.
3. Arthur Beiser, Concepts of Modern Physics, 6th Edition, 2006, McGraw-Hill Education, New Delhi.
4. S. O. Pillai, Solid State Physics, 10th Edition, New Age International Publishers, New Delhi.
5. K. R. Nambiar, Lasers: Principles, Types and Applications, New Age International Publishers, New Delhi. 1st Edition, 2004/2006 catalogue records.

E-resources:

1. Barrier penetration problem and Quantum tunnelling: https://archive.nptel.ac.in/courses/115/104/115104096/
2. EM waves and wireless channelling: https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. Bimetallic Strips _ https://www.youtube.com/watch?v=WZQ8lvxdzDk

CO	CO Description	PO	PSO
CO1	Explain the fundamental principles of mechanics and the physical properties of materials**.**	PO1(3), PO2(2), PO3(1).	PSO1 (3)
CO2	Describe the basic concepts of thermodynamics, thermal conductivity and the Carnot cycle.	PO1(3), PO2(2), PO3(2)	PSO1 (3)
CO3	Apply the concepts of fiber optics and optical sensors in engineering applications and analyze interference phenomena.	PO1(3), PO2(3), PO4(2)	PSO1 (3)
CO4	Understand the basic principles of quantum mechanics and relate them to modern technological applications.	PO1(3), PO2(3), PO3(2)	PSO1 (3)
CO5	Analyze the operating principles of lasers and identify their applications in science and engineering.	PO1(3), PO2(2),	PSO1 (3)

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

26CYC01	Engineering Chemistry	L	T	P	C
		3	0	2	4

Course Objectives:

- Understand the fundamental principles and technological requirements of water treatment.
- Acquire knowledge of the basics of polymers, including their preparation, properties, and applications.
- Gain familiarity with renewable and non-renewable energy resources and various energy storage devices used in engineering applications.
- Understand the mechanisms of metal corrosion and the methods used for its prevention and protection in engineering applications.
- Develop an understanding of nanomaterials, their properties, and their applications.

Unit I	Water Technology	9

Introduction-sources and impurities in water-soft and hard water- water quality parameters.Types of hardness. Determination of hardness by EDTA method. Domestic water treatment. Boiler feed water –requisites, scale and sludge formation in boilers-caustic embrittlement- boiler corrosion-treatment of boiler feed water. Internal conditioning (carbonate, phosphate, and calgon conditioning), external conditioning – ion exchange process, zeolite process Brackish water – water purification by reverse osmosis.

Suggested Activities: Coagulation of water sample using Alum.

Unit II	Polymer Chemistry	9

Introduction - occurrence, definitions – functionality - degree of polymerization-, molecular weight - number and weight average method. Types of polymerizations - addition, condensation and copolymerization. Mechanism of polymerization (Free radical). Preparation, properties and applications of nylon 66, Poly Urethane, poly isoprene and Vulcanization of rubber, TEFLON, PET.

Suggested Activities: Preparation of Biodegradable Polymer/Polymer Demonstration.

Unit III	Energy Resources and Storage Devices	9

Nonrenewable energy - nuclear energy, nuclear reaction and its types; Nuclear power plant and its working (light water nuclear power plant & breeder reactor).Renewable energy and its sources - photo voltaic cells-working of photovoltaic cell, recent advances in solar cell materials; Geothermal Energy and Different type of geothermal power plants Batteries and fuel cells: types of batteries - lead storage battery, lithium battery, fuel cell - H_2-O_2 fuel cell-applications.

Suggested Activities: Performance Study of a Solar Cell.

Unit IV	Corrosion and its Control	9

Introduction, types of corrosion - chemical and electrochemical corrosion, mechanism, pilling - bedworth rule, types of electrochemical corrosion – galvanic corrosion, pitting corrosion, crevice corrosion, corrosion on wire fence and pipeline corrosion, factors influencing rate of corrosion. Corrosion control methods – sacrificial anode and impressed cathodic current. Protective coatings – paints: constituents and functions.

Suggested Activities: Demonstration of Corrosion and Its Prevention

Unit V	Nano Chemistry	9

Basics- distinction between molecules, nanoparticles and bulk materials; size dependent properties. Nanoparticles: nanocluster, nanorod, nanotube (CNT) and nanowires. Synthesis: Top down process- chemical vapour deposition, electro deposition. Electro spinning method. Bottom up process- precipitation, sol-gel, solvothermal - properties and applications of nanomaterials in various fields.

Suggested Activities: Synthesis/Demonstration of Nanomaterials

TOTAL (Theory) : 45 PERIODS

List of Experiments:

1. Determination of Total, Temporary and Permanent hardness of water by EDTA Method.

2. Estimation of Alkalinity in water sample.
3. Determination of HCl using NaOH by pH metry
4. Estimation of Ferrous iron by Potentiometric titration.
5. Estimation of HCl using NaOH by Conductometric titration
6. Estimation of Dissolved Oxygen content in water by Winkler's method
7. Determination of Chloride in water by Argentometric method
8. Estimation of copper content of the given solution by Iodometry.
9. Estimation of TDS of a water sample by gravimetry.
10. Determination of strength of acids in a mixture of acids using conductivity meter.

TOTAL (Lab.): 30 PERIODS

TOTAL: 75 PERIODS

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.

Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).

Text Books:

1. Dr.S.Mageswari, Dr.K.Balachandran, Dr.G.Vijayakumar, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., First Edition-2024.
2. O.G.Palanna, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., Second Edition -2017

References:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Text book of Quantitative Chemical Analysis, 6th Edition (2000).
2. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., 2025.
3. Arun Bahl, B.S. Bahl, G.D. Tuli, "Essentials of Physical Chemistry" Published by S. Chand & Company Ltd., 2014
4. Sashi Chawla, Dhanpat Rai & Co. Pvt. Ltd., "Engineering Chemistry" Fifth Edition - 2017.
5. Dr.S.Vairam, Dr.Suba Ramesh, "Engineering Chemistry" First Edition, Wiley Publication, Reprint-2016.

E-resources:

1. https://nptel.ac.in/courses/
2. https://swayam.gov.in/
3. https://www.chemguide.co.uk/

CO	CO Description	PO	PSO
CO1	Explain the principles of water technology, water treatment methods, and boiler feed water conditioning for industrial applications.	PO3(3)	PSO1(2)
CO2	Apply the concepts of polymer chemistry to classify polymers and relate their preparation, properties, and engineering applications.	PO3(3), PO6(2)	PSO2(3)
CO3	Analyze renewable and non-renewable energy resources, energy storage devices, and fuel cells for sustainable energy applications.	PO6(3)	PSO1(3)
CO4	Analyze the mechanisms of corrosion and recommend suitable corrosion prevention and protective coating techniques for engineering systems.	PO2(2), PO3(2), PO6(2)	PSO2(3)
CO5	Evaluate the synthesis methods, properties, and applications of nanomaterials in medical and electronic devices.	PO2(3)	PSO1(3) PSO2(2)

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

26MEC01	Engineering Graphics	L	T	P	C
		3	1	0	4

Course Objectives:

- The learning objectives of this course is to develop in students, the engineering graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Unit I **Plane Curves** **12**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

Suggested Activities: Virtual Demonstration of Conics and Cycloids.

Unit II **Projection of Points, Lines and Plane Surface** **12**

Orthographic projection- 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.

Suggested Activities: Virtual Demonstration of lines and Planes.

Unit III **Projection of Solids and Freehand Sketching** **12**

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to both the principal planes by rotating object method.

Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three-Dimensional objects — Layout of views-Freehand sketching of multiple views from pictorial views of objects.

Suggested Activities: Development of models of various solids and virtual demonstration of sectioning, CAD modelling of 2D objects.

Unit IV **Projection of Sectioned Solids and Development of Surfaces** **12**

Sectioning of simple solids like prisms, pyramids, cylinder, and cone in 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. Development of lateral surfaces of solids with cut-outs and holes.

Suggested Activities: Virtual Demonstration of Sectioned Solid Objects and Development of Surface.

Unit V **Isometric and Perspective Projections** **12**

Principles of isometric projections — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids, cone and cylinders by visual ray method.

Suggested Activities: Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects.

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

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

2. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International Publishers, New Delhi, 2018.

References:

1. K. B. Yogeshwaran, Dr. V. Ramasamy, Dr. K. Anandavelu, B. Veluchamy and Dr. C. K. Dhinakarraj, Engineering Graphics, Vishnu Prints Media, Edition 2022
2. Natarajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.
4. BasantAgarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2 nd Edition, 2019.
5. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.

E-resources:

1. https://nptel.ac.in/courses/105104148

CO	CO Description	PO	PSO
CO1	Draw Conic curves, Cycloids and Involutes	PO(1), PO(2), PO(3),	PSO1, PSO3
CO2	Draw orthographic projections of Points, Lines and Planes	PO(1), PO(2),	PSO1, PSO3
CO3	Draw orthographic projections and free hand sketches of Solids	PO(1), PO(2), PO(3),	PSO1 PSO2 PSO3
CO4	Draw sectional views of the objects and development of Surfaces	PO(1), PO(2),	PSO1 PSO2 PSO3
CO5	Draw isometric and perspective views of simple solids	PO(1), PO(2),	PSO1 PSO2

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

26CSC01	Programming Language: C	L	T	P	C
		3	0	0	3

Course Objectives:

- To equip engineering students with the foundational knowledge and practical skills in 'C' programming to analyses and solve computational problems effectively.
- To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.

Unit I	Introduction to C& Problem Solving	9

Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudo code, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Operators, Input/output Functions, Built-in Functions.

Suggested Activities:

Solve GATE-style MCQs on algorithms, flowcharts, pseudocode, Interactive and Script mode, Comments, Indentation.

Unit II	Control Structures & Functions	9

If, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements. Function Declaration, Definition and Calling, Function Parameters and Return Types, Call by Value and Call by Reference, Recursive Functions, Scope and Lifetime of Variables, Header files and Modular Programming.

Suggested Activities:

Solve GATE-style MCQs on if, if-else, nested if, switch-case, loops, nested loops, and jump statements with output prediction.

Unit III	Arrays, Strings & Pointers	9

One-dimensional and Multi-dimensional Arrays, Array operations and traversals, String Handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and Arrays, Pointers to function, Dynamic memory allocation.

Suggested Activities:

Solve GATE-style MCQs on one-dimensional and multi-dimensional arrays, array operations, traversals, and string handling with output prediction.

Unit IV	Structures & Unions	9

Defining and using structures, Array of structures, Sorting an array of structures, Difference between structures and unions, Pointers to structures, Unions and their uses, Unions with pointers, Enumerations.

Suggested Activities:

Analyze GATE-style MCQs on structures, arrays of structures, sorting, and pointers to structures.

Unit V	File operations & Standard Libraries	9

Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations .Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.

Suggested Activities:

Interpret GATE-style MCQs on file operations, text and binary files, file pointers, and error handling.

TOTAL (Theory) : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).
Text Books:
1. Thareja, R. (2021). Programming in C . Oxford University Press. 2. Balagurusamy, E. (2024). Programming in ANSI C (9th ed.). Tata McGraw Hill.
References:
1. Kanetkar, Y. (2020). Let us C. BPB Publications. 2. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress. 3. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C (4th ed.). Cengage. 4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013. 5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
E-resources:
1. Learn-C.org - https://www.learn-c.org/ 2. Geeks for Geeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/ 3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/"Introduction to C Programming", Swayam MOOC Course,

CO	CO Description	PO	PSO
CO1	Develop algorithms, flowcharts, and basic C programs for problem solving.	PO1 (3) PO2 (2)	PSO1 (3)
CO2	Implement control structures, functions, and modular programming in C.	PO2 (3) PO5 (2)	PSO1 (3)
CO3	Apply arrays, strings, pointers, and dynamic memory allocation in C programming.	PO2 (2) PO3 (3) PO5 (2)	PSO1 (3) PSO2 (2)
CO4	Construct C programs using structures and unions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop C applications using file handling techniques, standard libraries, user-defined libraries and mini projects.	PO3 (3) PO5 (3) PO9 (2)	PSO1 (3) PSO2 (3)

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

26MEC02	Makerspace Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

- To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques.
- To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators.

List of Suggested Activities:

(A). Dis-assembly & Assembly Practices

i. Tools and its handling techniques.
ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.
iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.
iv. Dis-assembly and assembly of a Bicycle.

(B). Welding Practices

i. Welding Procedure, Selection & Safety Measures.
ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.
iii. Hands-on session of preparing base material & Joint groove for welding.
iv. Hands-on session of MAW, GMAW, GTAW on Carbon Steel & Stainless Steel plates /pipes for fabrication of a simple part.

(C). Electrical Wiring Practices

i. Electrical Installation tools, equipment & safety measures.
ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box.
iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells.
iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D). Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.
ii. Dis-assembly and assembly of Computers.
iii. Hands-on session of Soldering Practices in a Printed Circuit Board.
iv. Hands-on session of Bridge Rectifier, Op-Amp and Trans impedance amplifier.
v. Hands-on session of integration of sensors and actuators with a Microcontroller.
vi. Demonstration of Programmable Logic Control Circuit.

(E). Contemporary Systems

i. Demonstration of Solid Modelling of components.
ii. Demonstration of Assembly Modelling of components.
iii. Fabrication of simple components / parts using 3D Printers.
iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)
Text Books:
1. S. K. Hajra Choudhury, A. K. Hajra Choudhury and S. K. Bhattacharya, Elements of Workshop Technology – Volume I: Manufacturing Processes, Media Promoters & Publishers, Mumbai. 2. R. S. Khurmi and J. K. Gupta, A Textbook of Workshop Technology – Manufacturing Processes, S. Chand Publishing, New Delhi.
References:
1. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, 4th Edition, 2017, McGraw Hill Education, New Delhi. 2. S. Kalpakjian and S. R. Schmid, Manufacturing Engineering and Technology, 9th Edition, 2025, Pearson Education, New Delhi. 3. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology – Volume I, S. Chand Publishing, New Delhi. 2024 Edition. 4. David P. Leach, Electrical and Electronic Technology, McGraw Hill Education, New Delhi. 5. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 7th Edition, 2019, Wiley, New Delhi.

CO	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of tools and perform disassembly and assembly of mechanical systems, home appliances and bicycles.	PO1(3), PO5(3), PO8(2)	PSO1(3)
CO2	Perform welding and fabrication of simple components using suitable welding processes, materials, tools and safety practices.	PO1(3), PO3(3), PO5(3), PO7(3)	PSO1(3), PSO2(3)
CO3	Carry out basic electrical wiring and connections for domestic and industrial applications using appropriate electrical equipment and safety procedures.	PO1(3), PO5(3), PO7(3),	PSO2(2), PSO3(2)
CO4	Demonstrate electronic assembly, soldering, circuit implementation and integration of sensors, actuators and microcontrollers for practical applications.	PO1(3), PO2(3), PO5(3), PO8(3), PO11(3)	PSO2(3), PSO3(3)
CO5	Apply contemporary engineering tools for solid and assembly modelling, 3D printing and laser cutting to develop simple components.	PO3(3), PO5(3), PO11(3)	PSO1(3), PSO2(3), PSO3(2)

26CSC02	Programming in C Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

- To familiarize with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. Create Problem Analysis Charts, Flowcharts and Pseudo code for simple C programs
2. I/O statements, operators, expressions.
3. Decision-making constructs: if-else, go to, switch-case, break-continue.
4. Loops: for, while, do-while.
5. Arrays: 1D and 2D, Multi-dimensional arrays, traversal.
6. Strings: operations.
7. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
8. Recursion.
9. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
10. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
11. Files: reading and writing data in text and binary files, File pointers, file operations, random access and processor directives.
12. Use of standard and user-defined libraries in solving problems.

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.

Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall.
2. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill Education, New Delhi.

References:

1. Thareja, R. (2021). Programming in C . Oxford University Press.
2. Balagurusamy, E. (2019). Programming in ANSI C. McGraw Hill Education.
3. Kanetkar, Y. (2020). Let us C. BPB Publications.
4. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress.
5. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C (4th ed.). Cengage.

E-resources:

1. Learn-C.org - https://www.learn-c.org/
2. Geeks for Geeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/
3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/

CO	CO Description	PO	PSO
CO1	Develop algorithms, flowcharts, and basic C programs for problem solving.	PO1 (3) PO2 (2)	PSO1 (3)
CO2	Implement control structures, functions, and modular programming in C.	PO2 (3) PO5 (2)	PSO1 (3)
CO3	Apply arrays, strings, pointers, and dynamic memory allocation in C programming.	PO2 (2) PO3 (3) PO5 (2)	PSO1 (3) PSO2 (2)
CO4	Construct C programs using structures and unions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop C applications using file handling techniques, standard libraries, user-defined libraries and mini projects.	PO3 (3) PO5 (3) PO9 (2)	PSO1 (3) PSO2 (3)

26HSC02	Physical Education	L	T	P	C
		-	-	-	-

Course Objectives:

- To impart the fundamentals of physical education for the development of students' physical, mental, and social well-being.
- To instil a lifelong appreciation for physical activity, develop a positive attitude, and foster the values of teamwork and sportsmanship.

Introduction to physical education: Exercise for good posture – conditioning and calisthenics before starting physical activities – jogging, bending, twisting, standing, sitting, and relaxation exercises – training in basic first-aid practices.

Participation of athletic events: Rules and regulations of important athletic events – sprints, jumps, throws, and hurdles.

Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.

Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.

TOTAL: 30 PERIODS

References:

1. Ajmer Singh, Essentials of physical education. Kalyani Publishers, 7th Revised Edition, 2025.
2. Kamlesh,M.L.(2006).Psychology in physical education and sport(3rded.). Metropolitan Book Co.
3. S.K. Mangal & Shubhra Mangal: Sports Psychology: Concepts and Applications, 1st Ed., "Psychology of Sports Performance" 2024, Routledge India.

E-Resources:

1. https://www.who.int/health-topics/physical-activity

CO	CO Description	PO	PSO
CO1	Demonstrate appropriate physical exercises, conditioning, calisthenics, posture, relaxation techniques and basic first-aid practices for maintaining physical fitness and safety.	PO1(2), PO4(2), PO7(3)	PSO3(2)
CO2	Demonstrate knowledge of rules and regulations and apply fundamental skills in athletic events including sprints, jumps, throws and hurdles.	PO7(2), PO8(3)	PSO3(2)
CO3	Develop and demonstrate fundamental skills, techniques and game strategies in a selected outdoor game through regular practice and teamwork.	PO2(2), PO3(2), PO5(2), PO7(2), PO8(3)	PSO3(3)
CO4	Develop and demonstrate fundamental skills, techniques and strategies in a selected indoor game with emphasis on concentration, discipline and fair play.	PO2(2) PO7(3), PO9(2)	PSO3(2)
CO5	Apply physical fitness, sports skills, teamwork, discipline, ethical values and safety practices to promote a healthy and active lifestyle.	PO6(3), PO7(3), PO8(3) PO11(3)	PSO3(3)


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Semester – II

26MAC02	Linear Algebra	L	T	P	C
		3	1	0	4

Course Objectives:

- To impart foundational knowledge in linear algebra essential for analyzing and solving problems in engineering applications.
- The Objectives of the course are to equip students with the ability to formulate and solve various types of Ordinary Differential Equations for solving differential equations encountered in engineering problems.

Unit I	Vector Spaces	12

Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension.

Suggested Activities: Open-Source software, exercises to test linear dependence and independence using rank, solving Competitive Examination questions

Unit II	Inner Product Spaces	12

Inner product, Norms, Cauchy, Schwarz inequality, Gram Schmidt orthogonalization, Simple problems (up to $\boldsymbol{R^3}$).

Suggested Activities: Open-Source software, exercises to compute inner products and vector norms, solving Competitive Examination questions.

Unit III	Matrix Decomposition	12

QR decomposition (Gram- Schmidt method and House holder method), Singular Value Decomposition (SVD), Least squares solutions, simple problems (up to 3×3 $matrices$).

Suggested Activities: Open-Source software, exercises to check if a matrix is positive definite, solving Competitive Examination questions.

Unit IV	First order Ordinary Differential Equations	12

Basic concepts of ordinary differential equations, Formation of first order differential equations from physical problems, First order and first-degree ODE: Variables separable, Exact equations, Leibnitz's equation, Bernoulli's equation.

Suggested Activities: Application and Visualization of the first order ODE using open-source software and solving Competitive Examination questions.

Unit V	Higher order Ordinary Differential Equations	12

Formation of second order differential equations from physical problems Linear equations of second and higher order with constant coefficients, Euler's linear equations, Method of variation of parameters.

Suggested Activities: Solving ordinary differential equations using open-source software and solving of Competitive Examination questions.

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). Linear algebra. Pearson.
2. Boyce, W. E., DiPrima, R. C., & Meade, D. B. (2022). Elementary differential equations and boundary value problems (12th ed.). Wiley.

References:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2026.
2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). Linear algebra and its applications with MATLAB. Pearson.
3. Bronson, R., Costa, G. B., Saccoman, J. T., & Gross. D (2023). Linear algebra: Algorithms, applications, and techniques (4th ed).

4. Lay, D. C., Lay, S. R., & McDonald, J. J. (2021). Linear algebra and its applications (6th ed.). Pearson
5. Kreyszig, E. (2025). Advanced engineering mathematics (11th ed.). Wiley.

E-resources:

1. https://math.libretexts.org/Bookshelves/Linear_Algebra/Book%3A_Linear_Algebra_(Schilling_Nachtergaele_and_Lankham)/09%3A_Inner_product_spaces
2. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/
3. https://archive.nptel.ac.in/content/syllabus_pdf/111107063.pdf

CO	CO Description	PO	PSO
CO1	Explain the fundamental concepts of Linear Algebra.	PO1(3)	PSO1(2)
CO2	Compute inner products and vector norms, validate the Cauchy-Schwarz inequality	PO1(3)	PSO1(2)
CO3	Factorize matrices using QR decomposition to solve physical least-squares approximation problems.	PO1 (3)	PSO1(1)
CO4	Explain first and higher-order ODEs using appropriate analytical and numerical techniques.	PO1 (2) PO2 (2)	PSO3(1)
CO5	Solve higher-order ODEs using classical and finite Difference methods.	PO1(3) PO5(3)	PSO1(2)

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

26PHC02	Physics for Civil Engineering	L	T	P	C
		3	0	0	3

Course Objective:

- To provide a comprehensive understanding of fundamental physics concepts and their applications in Civil Engineering.

Unit I	Acoustics	9

Sound absorbing material- method of sound absorbing- Reverberation-Echo-Sabine formula--noise and its measurement-impact of noise in multi stored building - sound insulation-measurement, properties and application.

Suggested Activities: Measurement of reverberation time and study of sound absorbing materials.

Unit II	Refrigeration &Ventilation	9

Refrigeration –Types- window type air conditioner, packaged air conditioner and chilled water plant, protection against fire to be caused by A.C system. Natural ventilation- principles of natural ventilation- designing of natural ventilation.

Suggested Activities: Demonstration of window air conditioner.

Unit III	Thermal Application & Mechanics	9

Principles of heat transfer-conduction through compound media series and parallel-conductivity of rubber tube and powder Method-Mechanics – Types of supports and loads - Equilibrium of rigid bodies – Types of structures: Beams, frames, trusses – Analysis.

Suggested Activities: Study of heat transfer through materials and equilibrium of rigid bodies.

Unit IV	Lighting Design	9

Glare -type of glare-colors- day light calculation –day light design of window- measurement of day light –LED designing and application- artificial skies, principle of artificial lighting, supplementary artificial lighting.

Suggested Activities: Study of light intensity using a lux meter.

Unit V	New Material	9

Composite-fiber reinforced plastics (FRP), Fiber reinforced metal (FRM) Metallic glass-quenching process, application, Shape memory alloy (SMA)-Process of application-crystalline and non- crystalline material – Ceramics-properties -isostatic pressing methods-applications.

Suggested Activities: Demonstration of shape recovery in SMA and identification of composite materials

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text book:

1. W.R. Stevens (2018). Building Physics: Lighting. Pergamon Press.
2. Hugo Hens (2016). Applied Building Physics: Ambient Conditions – Building Performance and Material Properties. Wiley.
3. K.G. Budinski & M.K. Budinski (2016). Engineering Materials: Properties and Selection. Pearson Education.

References:
1. Peter A. Claisse (2016). Civil Engineering Materials. Elsevier. 2. Marko Pinterić (2017). Building Physics. Springer. 3. D.S. Mathur (2019). Elements of Properties of Matter. S. Chand & Company, New Delhi.
E-resources:
1. Sound Insulation: https://youtu.be/nhE2a4GEOtA 2. Daylighting and lighting design: https://youtu.be/vZO09qL-vZs 3. Metallic glass:https://www.youtube.com/watch?v=jt97BUImQfE

CO	CO Description	PO	PSO
CO1	Understand acoustics principles and sound insulation in building	PO1(3), PO2(2) PO4(1)	PSO1(2)
CO2	Explain refrigeration, air conditioning and ventilation system	PO1(3), PO2(2), PO5(1)	PSO1(2)
CO3	Apply thermal mechanics concepts in heat transfer and structural equilibrium	PO1(3), PO2(2) PO3(1)	PSO1(3)
CO4	Understand lighting design and artificial lighting techniques	PO1(3), PO2(2) PO5(1)	PSO1(2)
CO5	Describe new material and their engineering application	PO1(3), PO3(2) PO5(1)	PSO1(3)

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

26GEC01	Environmental Science and Sustainability	L	T	P	C
		2	0	0	2

Course Objectives:

- To understand environment, ecosystems, biodiversity, and conservation.
- To understand sustainability, SDGs, and environmental issues.
- To learn sustainable practices, circular economy, and green engineering.
- To understand pollution, prevention, control, and waste management.
- To learn energy conservation and renewable energy sources

Unit I	Environment and Biodiversity	6

Nature and scope of environmental education, natural resources, Ecosystem Structure, characteristics and functions of ecosystem. Biodiversity, definition, conservation of biodiversity (in-situ and Ex-situ).

Suggested Activities: Know Your Campus Biodiversity & Campus Biodiversity Survey.

Unit II	Social Issues and Sustainability	6

Sustainability, Definition, Sustainable development Goals, Environmental issues - global warming and Ozone depletion ,Climate change, Acid rain, Carbon foot print-Possible solutions to Environmental issues.

Suggested Activities: Sustainability Action Challenge & Sustainability Action Plan.

Unit III	Sustainability Practices	6

Zero waste and R-concept-circular economy, material life cycle assessment, Sustainable habitat - Sustainable transports, Sustainable urbanization, Green Engineering, Green buildings, Green materials- GRIHA- IGBC Green & Net Zero Buildings Rating System.

Suggested Activities: Unsustainable Campus Challenge – "From Waste to Resource Green Campus" solution.

Unit IV	Environmental Pollution and Its Control	6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts.

Suggested Activities: Environmental Pollution Audit and Control Plan, Prepare a Pollution Control Chart.

Unit V	Renewable Sources of Energy	6

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

Suggested Activities: Comparative Study of Renewable Energy Sources, Design a Renewable Energy Syllabus.

TOTAL : 30 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. G. Tyler Miller and Scott E. Spoolman, Environmental Science, 15th Edition, Cengage Learning, Boston.

References:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 3rd Edition, Pearson Education, 2023.
3. P. Meenakshi – Elements of Environmental Science and Engineering, 2nd Edition, latest print 2023, PHI Learning

4. Jay H. Withgott & Matthew Laposata – Essential Environment: The Science Behind the Stories, 7th Edition, Pearson.
5. Cunnighum and cooper-"Environmental Science, Jaico", The current Cunningham environmental-science text is 16th Edition, 2026, McGraw Hill

E-resources:

1. https://nptel.ac.in/courses/103107215
2. 1. https://nptel.ac.in/courses/103107216
3. 1. https://nptel.ac.in/courses/103107218

CO	CO Description	PO	PSO
CO1	Explain environmental concepts, ecosystems, biodiversity, and conservation.	PO6(3)	PSO3(3)
CO2	Describe sustainability, SDGs, environmental issues, and solutions.	PO7(3)	PSO2(3)
CO3	Apply sustainable practices, circular economy, green engineering, and green buildings.	PO6(3), PO7(3)	PSO1(3)
CO4	Identify pollution causes, effects, control measures, and waste management practices.	PO3(3), PO6(3)	PSO2(3)
CO5	Explain energy conservation and emerging renewable energy sources.	PO6(3)	PSO1(3) PSO2(2)

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

26EEC01	Basic Electrical and Electronics Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

- To impart foundational knowledge in principles and applications of electrical and electronics engineering.

Unit I	DC Fundamentals	9

Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Series parallel combination of R, L and C components, Voltage Divider and Current Divider Rules.

Suggested Activities: Virtual Demonstration of electrical laws & circuits, Hands-on Bread boarding, Solving GATE questions.

Unit II	AC Fundamentals	9

Faraday's Laws of Electro-magnetic Induction, Definition of Self and Mutual Inductances, Generation of sinusoidal voltage, Instantaneous & RMS values of sinusoidal signals, Introduction to 3-phase systems, Electrical Safety, Fuses and Earthing.

Suggested Activities: Virtual Demonstration of electromagnetic induction, Measurement of instantaneous and RMS values of AC signals, Solving GATE questions.

Unit III	Electric Machines	9

DC Machines, Transformers, Star and delta Connections, Three phase Induction motors, Synchronous Generators, Single Phase Induction Motors, Stepper Motor, Universal Motor and BLDC motor.

Suggested Activities: Virtual demonstration of step-up and step-down transformers, Virtual working models of Universal and BLDC motors, Solving GATE questions.

Unit IV	Analog and Digital Electronics	9

Semiconductor Devices: PN junction diodes, Zener Diode, Voltage regulator, BJT & FET Transistors, Timers, Operational Amplifiers.

Digital Electronics: Boolean algebra, Basic and Universal Gates, adders, multiplexers, demultiplexers and flip -flops.

Suggested Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Online logic gate simulators, Solving GATE questions.

Unit V	Microcontrollers	9

Microcontrollers: Introduction, Architecture, Memory organization, I/O ports, timer, Serial port, Interrupt, Comparison of family 8051, Potential Applications.

Suggested Activities: Physical demonstration of a microcontroller and online simulation of microcontroller.

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).

Text Books:

1. A textbook of electrical technology, Theraja, B. L., S.Chand & Company,24th edition,2024.
2. Basic Electrical and Electronics Engineering ,D.P. Kothari and I.J. Nagrath, Tata McGraw Hill Education, 2nd edition, 2020.

References:
1. A Textbook of Applied Electronics ,R.S. Sedha, S. Chand & Co. 3 rd edition,2008. 2. Thomas L. Floyd ,Digital Fundamentals , Pearson Education,11 th edition,2025. 3. The 8051 Microcontroller and Embedded Systems ,Muhammad Ali Mazidi, 2 nd edition,2007 4. Basic Electrical and Electronics Engineering by S.K. Bhattacharya published by Pearson India Second Edition published in July 2017. 5. Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku is published by McGraw-Hill Education in 2021
E-resources:
1. https://archive.nptel.ac.in/courses/108/106/108106172/ 2. Circuit Simulator – https://www.falstad.com/circuit/

CO	CO Description	PO	PSO
CO1	Learnt the fundamentals of DC Circuits	PO1(3)	--
CO2	Apply basic and AC circuits calculations in electrical systems.	PO1(3)	PSO1(3)
CO3	Understand the concepts of electrical machines.	PO1(3)	PSO2(1)
CO4	Explain the basic electronics engineering concepts.	PO1(3)	PSO1(2)
CO5	Understand the underlying mechanisms behind the microcontrollers	PO1(3)	PSO2(3)

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

26CE201	Introduction to Civil Engineering	L	T	P	C
		3	0	0	2

Course Objectives:

- To impart the significance of the Civil Engineering and provide insight to the essentials of components of infrastructure.

Unit I	Overview of Civil Engineering	9

Role of civil engineers in society, Ethics in Civil Engineering Practice, outstanding accomplishments of the profession, future trends Types of projects, stages of projects, specification and scope.

Suggested Activities: Identify and discuss civil engineering structures around the college.

Unit II	Fields of Civil Engineering	9

Overview of Structural, Construction, Geotechnical, Environmental, Transportation, Water Resources and Environmental Engineering – Introduction to Engineering Geology and seismology.

Suggested Activities: Identify different fields of civil engineering through real-life examples.

Unit III	Civil Engineering Materials	9

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber, Glass - Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building components.

Suggested Activities: Identify and classify common civil engineering materials from samples.

Unit IV	Building Components	9

Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering- NBC.

Suggested Activities: Identify building components from a simple building plan or nearby building.

Unit V	Civil Engineering Infrastructure	9

Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management system- Introduction to Highways and Railways - Introduction to Green Buildings.

Suggested Activities: Visit a nearby civil engineering infrastructure project and identify its major components.

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%,
Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Ramamrutham, S. (2026). Basic Civil Engineering & Engineering Mechanics. Dhanpat Rai Publishing Co. (P) Ltd., New Delhi.
2. Shanmugam, G., Palanichamy, M.S. & Ravindran, S. (2025). Basic Civil and Mechanical Engineering. 2nd Edition, McGraw Hill Education (India).
3. Rangwala, S.C. (2025). Building Construction. 35th Edition, Charotar Publishing House Pvt. Ltd.

References:

1. Seetharaman, S. (2019). Basic Civil Engineering. Anuradha Agencies, Chennai.
2. Kumar, S. (2020). Building Construction. Standard Publishers, New Delhi.
3. Varghese, P.C. (2020). Building Materials. PHI Learning Pvt. Ltd., New Delhi.
4. Punmia, B.C., Jain, A.K. & Jain, A.K. (2021). Basic Civil Engineering. Laxmi Publications, New Delhi.
5. Sushil Kumar, (2019). Building Construction. Standard Publishers Distributors, New Delhi.

E-resources:

1. Green Building and Sustainable Construction – IGBC: https://igbc.in/
2. National Building Code of India and Building Standards: https://www.bis.gov.in/
3. Indian Roads Congress – Standards and Publications: https://www.irc.nic.in/

CO	Description of CO	PO	PSO
CO1	Explain the role, significance, professional ethics and emerging trends of Civil Engineering.	PO6 (2) PO7 (3)	PSO1 (1) PSO2 (1) PSO3 (2)
CO2	Describe the major fields of Civil Engineering and their applications in infrastructure development.	PO1 (3) PO6 (2)-	PSO1 (2) PSO2 (1) PSO3 (2)
CO3	Identify and explain the properties and applications of conventional, modern and sustainable civil engineering materials.	PO1 (3) PO2 (2) PO7 (2)	PSO1 (2) PSO2 (3) PSO3 (2)
CO4	Explain the basic components, planning and construction practices of buildings.	PO1 (3) PO3 (2) PO5 (2)	PSO1 (3) PSO2 (3) PSO3 (2)
CO5	Describe major civil engineering infrastructure systems and sustainable infrastructure practices.	PO3 (2) PO6 (3) PO7 (2)	PSO1 (3) PSO2 (3) PSO3 (3)

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

26CSC03	Problem Solving using Python Programming	L	T	P	C
		3	0	2	4

Course Objectives:

- To equip engineering students with the foundational knowledge and practical skills in Python programming to analyse and solve computational problems effectively.
- To faster problem-solving, critical thinking, and modular programming skills essential for engineering domains.

Unit I	Introduction to Python Programming	9

Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error Messages, Variables, Reserved Words, Data Types, Arithmetic Operators and Expressions, Built-in Functions, Importing from Packages.

Suggested Activities:

Interpret GATE-style MCQs on pseudocode, interactive/script mode, indentation, comments, errors, variables, reserved words, and data types.

Unit II	Control Structures and Functions	9

If, if-else, Nested if, Multi-way if-elif Statements, while Loop, for Loop, Nested Loops, pass Statements. Functions: Hiding Redundancy and Complexity, Parameters, Arguments and Return Values, Formal and Actual Arguments, Named Arguments, Recursive Functions, Lambda Functions.

Suggested Activities:

Practice GATE-style MCQs on Control Statements, while, for, nested loops, and pass statements.

Unit III	Strings and Collections	9

String Comparison, Formatting, Slicing, Splitting, Stripping. Collections: Lists, Tuples, Sets and Dictionaries, Basic List Operators, Searching and Sorting Lists, Dictionary Literals, Adding and Removing Keys, Accessing and Replacing Values.

Suggested Activities:

Evaluate GATE-style MCQs on string comparison, formatting, slicing, splitting, stripping, lists, tuples, sets, and dictionaries.

Unit IV	File Operations and Data Processing	9

Creating, Opening, Reading, Writing, Appending and Closing Files, Manipulating Directories, OS and Sys Modules, Reading and Writing Text and Numbers, Creating and Reading Formatted Files such as CSV and Tab-Separated Files.

Suggested Activities:

Examine GATE-style MCQs on creating, opening, reading, writing, appending, closing files, directories, and OS/Sys modules.

Unit V	Python Modules, Packages and Project	9

Packages: Built-in Modules, User-Defined Modules, NumPy, SciPy, Pandas and Scikit-learn.

Suggested Activities:

Assess GATE-style MCQs on built-in modules, user-defined modules, and their applications.

TOTAL (Theory) : 45 PERIODS

List of Experiments:

1. Problem Analysis Chart, Flowchart and Pseudocode Practices. (Minimum Three)
2. Usage of Conditional Logics in Programs. (Minimum Three)
3. Usage of Functions in Programs. (Minimum Three)
4. String Manipulation and Operations on Lists, Tuples, Sets and Dictionaries. (Minimum Three)
5. Opening, Closing, Reading and Writing Formatted Files and Sorting Data. (Minimum Three)
6. Usage of Modules and Packages to Solve Engineering Problems. (Minimum Three)
7. Project: Development of Python-based applications using appropriate programming concepts, modules and packages. (Minimum Two Projects)

TOTAL (Lab.): 30 PERIODS

TOTAL: 75 PERIODS

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (10%), Assignment (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%)

Text Books:

1. Thareja, R. (2023). Python Programming: Using Problem Solving Approach (2nd ed.). Oxford University Press.
2. Liang, Y. D. (2017). Introduction to Programming Using Python (1st ed.). Pearson Education.

References:

1. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming (2nd ed.). No Starch Press.
2. Brown, M. C. (2018). Python: The complete reference (4th ed.). McGraw Hill Publishers.
3. Guttag, J. V. (2016). Introduction to computation and programming using Python: With applications to understanding data (2nd ed.). MIT Press.
4. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython. Shroff/O'Reilly.
5. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2016.

E-resources:

1. Official Python Documentation – https://docs.python.org/3/
2. Python Tutorials – https://www.w3schools.com/python/
3. NumPy – https://numpy.org/doc/

CO	CO Description	PO	PSO
CO1	Apply problem-solving techniques, algorithms, flowcharts, and Python programming fundamentals to develop simple programs.	PO1 (3), PO2 (3)	PSO1 (3), PSO2 (2)
CO2	Implement conditional, looping, and function construct to develop modular Python programs.	PO1 (3), PO2 (3), PO5 (2)	PSO1 (3), PSO2 (3), PSO3 (2)
CO3	Develop Python programs using strings, lists, tuples, sets, and dictionaries for data manipulation.	PO1 (3), PO2 (3), PO3 (2), PO5 (2)	PSO1 (3), PSO2 (3), PSO3 (2)
CO4	Implement file and directory operations to store, retrieve, process, and organize data in formatted files.	PO2 (3), PO5 (3)	PSO1 (2), PSO2 (3), PSO3 (2)
CO5	Develop problem-solving applications using Python modules and packages such as NumPy, SciPy, Pandas, and Scikit-learn.	PO2 (3), PO3 (3), PO5 (3), PO11 (2)	PSO1 (3), PSO2 (3), PSO3 (3)

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

26CE202	Building Planning and Drawing	L	T	P	C
		0	0	4	2

Course Objective:

- To impart knowledge and skill relevant to Building is drawing and Detailing lab using computer software.

List of Experiments:

1. Principles of planning and orientation
2. Load-bearing building with RCC roof – Plan, section and elevation
3. Building with sloping/pitched roof – Plan, section and elevation
4. RCC framed building – Plan, section and elevation
5. Industrial building – North-light roof, roof truss and purlin
6. BIM-based building modelling and documentation
7. RCC reinforcement detailing – Slab, beam, column and footings
8. Steel structural detailing – Beam-column and beam-beam connections, bolted and welded connections

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Observation and Record - 20%, Practical - 30%, Internal Examinations-50%.

Text book:

1. V.B. Sikka (2020). A Course in Civil Engineering Drawing. S.K. Kataria & Sons Publishers, New Delhi.
2. D.N. Ghose (2018). Civil Engineering Drawing and Design. CBS Publishers & Distributors Pvt. Ltd., New Delhi.

References:

1. National Building Code of India (NBC 2016). Bureau of Indian Standards (BIS), New Delhi, 2016.
2. Pillai, S.U. & Menon, D. (2023). Reinforced Concrete Design. 4th Edition, McGraw Hill Education, New Delhi.
3. Subramanian, N. (2024). Design of Steel Structures. 2nd Edition, Oxford University Press, New Delhi.
4. Varghese, P.C. (2022). Limit State Design of Reinforced Concrete. 3rd Edition, PHI Learning Pvt. Ltd., New Delhi.
5. Duggal, S.K. (2020). Limit State Design of Steel Structures. 2nd Edition, McGraw Hill Education, New Delhi.

E-resources:

1. Bureau of Indian Standards – National Building Code – https://www.bis.gov.in/standards/national-building-code/
2. Ministry of Road Transport and Highways – https://www.morth.gov.in/

CO	CO Description	PO	PSO
CO1	Apply the principles of building planning, orientation and development control rules in preparing building drawings.	PO1(3), PO3(3), PO5(2)	PSO1(3), PSO2(2)
CO2	Prepare plan, section and elevation drawings of load-bearing buildings and buildings with flat and sloping roofs.	PO1(3), PO3(3), PO5(3)	PSO1(3), PSO2(2), PSO3(2)
CO3	Prepare drawings of RCC framed and industrial buildings including North-light roof structures, trusses and purlins.	PO1(3), PO3(3), PO5(3)	PSO1(3), PSO2(2), PSO3(2)
CO4	Prepare reinforcement detailing drawings for RCC slabs, beams, columns and different types of foundations.	PO1(3), PO3(3), PO5(3)	PSO1(3), PSO2(2), PSO3(2)
CO5	Prepare steel structural connection details and develop building models and documentation using Building Information Modelling (BIM) and computer-aided drafting techniques.	PO1(3), PO3(3), PO5(3), PO11(2)	PSO1(3), PSO2(2), PSO3(2)

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

26ENC02	Communicative English Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

- To make students proficient and confident communicators in English across a variety of contexts.
- To enable learners to comprehend both spoken English in diverse settings.
- To develop students' ability in the nuances Reading English.
- To enhance the ability of different formal and technical writings.
- To prepare learners to tackle situations and seek employment with assurance in the modern globalized world.

List of Suggested Activities

Listening Skill

a) Listening Comprehension
b) Listening Native Speakers and Repeat
c) Listening to Pod casts
d) Experiencing Listening Technical Reports
e) Listening Barriers

Speaking Skill

a) Phonetics
b) Pronunciation
c) Accent
d) Intonation
e) Stress
f) Pause
g) Nuances

Reading skill

a) General and Technical Comprehension
b) Experiencing Intensive reading,
c) Extensive reading
d) Skimming and Scanning
e) Practice on Terminologies
f) Synonyms and Antonyms from technical subjects

Writing Skill

a) Common Errors
b) Paragraphs and Essays
c) Writing Technical Reports
d) Business Letters, Emails, Notices
e) Agenda and Minutes of Meeting

Personality Development

a) SWOT Analysis
b) Digital Presentation
c) Role Play
d) Dialogue and Conversation
e) TED Talks –Extempore

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.

Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)
Text Books:
1. Dutt, Kiranmai, et al. A Course in Communication Skills. Cambridge University Press, 2008. 2. Green, David. Contemporary English Grammar: Structures & Composition. Trinity Press, 2018.
References:
1. Narayanaswami, V. R. Strengthen Your Writing. Orient Blackswan, 2009. 2. Nicholls, Anne. Mastering Public Speaking. Jaico Publication, 1999. 3. Raman, Meenakshi. Principles and Practice in Technical Communication. Oxford University Thomson, 3rd Edition, 2022 4. A.J. and A.V. Martinet. A Practical English Grammar. Oxford University Press. 5. Murphy, Raymond. Essential English Grammar. 2nd ed., Cambridge University Press, 2022.
E-resources:
1. https://www.shortform.com/summaries 2. https://www.skillsyouneed.com/rhubarb.html 3. Sway am-NPTEL Business English Communication Portal

CO	CO Description	PO	PSO
CO1	Demonstrate effective interpersonal and intrapersonal communication skills in all the contexts.	PO7(2) PO8(3) PO9(3)	PSO3(3)
CO2	Apply appropriate listening and speaking strategies to comprehend technical information.	PO8(2) PO9(3) PO10(2) PO11(2)	PSO2(2) PSO3(2)
CO3	Employ reading strategies to comprehend and interpret general and technical texts and acquire relevant technical vocabulary.	PO2(2) PO9(3) PO11(2)	PSO2(2) PSO3(2)
CO4	Produce clear and accurate written communication to use in appropriate grammar and professional conventions.	PO2(1) PO8(2) PO9(3)	PSO2(2) PSO3(3)
CO5	Develop personality and professional competencies for career development.	PO3(1) PO7(3) PO8(3)	PSO2(2) PSO3(3)

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


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Semester – III

26MAC05	Transforms, Partial Differential Equations and Numerical Methods	L	T	P	C
		3	1	0	4

Course Objectives:

- The course aims to provide students with a comprehensive understanding of advanced mathematical and numerical techniques and their applications in engineering and scientific problems. The course objectives are:
- Understand the basic concepts and applications of partial differential equations.
- Apply Fourier series for representing and analysing periodic functions.
- Use Z-transforms and difference equations to solve discrete problems.
- Apply numerical methods to solve algebraic and linear system equations.
- Use numerical techniques for differentiation, integration, and differential equations.

Unit I	Partial Differential Equations	12

Formation of partial differential equations, Lagrange's linear equation. Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

Suggested Activities: Application and Visualization of the first order PDE using open-source software and solving Competitive Examination questions.

Unit II	Fourier Series	12

Dirichlets conditions, General Fourier series, Odd and even functions, Half range sine series, Half range cosine series, Harmonic analysis.

Suggested Activities: solving Fourier coefficients. Using open-source software and solving of Competitive Examination questions and solving Competitive Examination questions.

Unit III	Z-Transforms and Difference Equations	12

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

Suggested Activities: Students are given different numerical sequences. They find their Z-transforms and inverse Z-transforms then use them to solve simple difference equations and solving Competitive Examination questions.

Unit IV	Solution of Equations and Eigenvalue Problems	12

Solution of algebraic and transcendental equations, Fixed point iteration method, Newton Raphson method, Solution of linear system of equations, Gauss elimination method Iterative methods of Gauss Jacobi and Gauss Seidel.

Suggested Activities: Students solve the same nonlinear equation using Fixed Point Iteration and Newton–Raphson Method. They record the number of iterations and compare accuracy and solving Competitive Examination questions.

Unit V	Numerical Differentiation and Integration	12

Approximation of derivatives using interpolation polynomials, Numerical integration using Trapezoidal, Simpsons 1/3 rule, Single step methods, Taylors series method ,Euler's method, Modified Euler's.

Suggested Activities: Students evaluate a definite integral using the Trapezoidal Rule and Simpson's 1/3 Rule. They compare the results with the exact value and calculate the error and solving Competitive Examination questions.

TOTAL: 60 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).
Text Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, (11th ed.), John Wiley & Sons, USA, 2025. 2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45thEdition, 2026.
References:
1. Steven C. Chapra and Raymond P. Canale. Numerical Methods for Engineers (8th ed.). McGraw- Hill Education, 2021. 2. William E. Boyce and Richard C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", Wiley, 11th Edition, 2017. 3. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hill Education, New Delhi, 4th Edition, 2017. 4. Amiya K. Jana, Numerical Methods: Theory and Engineering Applications. Cambridge University Press, 1st edition, 2024. 5. Lindfield, George, and John Penny. Numerical Methods Using MATLAB. 5th ed. Elsevier, 2025.
E-resources:
1. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/ 2. https://archive.nptel.ac.in/content/syllabus_pdf/111107063.pdf 3. https://github.com/patrickwalls/mathematicalpython Description of CO PO

CO	CO Description	PO	PSO
CO1	Apply the concepts of partial differential equations to formulate and solve first-order PDE	PO1(3), PO2(3), PO4(2)	PSO1(3) PSO2(2)
CO2	Understand the basic concepts and properties of Fourier series.	PO1(3) PO3(2) PO4(2)	PSO1(3) PSO2(2)
CO3	Understand the basic concepts, properties, and applications of Z-transforms.	PO1(3) PO4(2) PO5(2)	PSO1(3)
CO4	Understand the fundamental concepts and numerical techniques for solving algebraic and transcendental equations.	PO1(3) PO4(2) PO5(2)	PSO1(3)
CO5	Understand the basic concepts and principles of numerical differentiation and integration.	PO1(3) PO2(3) PO4(2)	PSO1(3)

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

26MEC03	Engineering Mechanics	L	T	P	C
		3	1	0	4

Course Objectives:

- Understand modern methods of force and equilibrium analysis.
- Apply vector and computational techniques to analyze engineering systems.
- Analyze distributed loads, friction, and contact forces in engineering applications.
- Understand and apply the principles of dynamics, momentum, work, and energy.
- Use CAE (Computer-Aided Engineering) and simulation tools to solve engineering mechanics problems.

Unit I	Force Systems and Engineering Statics	12

Fundamentals of engineering mechanics and units-Force systems, vector representation and resultants-Force resolution using rectangular components and unit vectors-Free-body diagrams and equilibrium of particles-2D and 3D force analysis using computational tools

Suggested Activities: Assignments and Quiz on resultant forces, Solving of GATE questions.

Unit II	Rigid Body Equilibrium and Mechanical Systems	12

Moments, couples and equivalent force systems-Vector and scalar products in force analysis-Equilibrium of rigid bodies in 2D and 3D-Support reactions and connections-Force–couple systems in mechanical and structural applications

Suggested Activities: Virtual demonstration of rigid bodies, Solving of GATE questions.

Unit III	Distributed Loads and Section Properties	12

Centroids and centre of gravity of engineering components-Composite and irregular sections-Distributed loading on beams and structural members-Area and mass moments of inertia-Parallel-axis theorem and radius of gyration-Application to structural and machine-component design

Suggested Activities: Virtual Simulation of Moment of Inertia, Principal Axes Determination, Solving of GATE questions.

Unit IV	Friction and Contact Mechanics	12

Dry friction and friction coefficients-Wedge, ladder and wheel friction-Rolling resistance and contact forces-Friction in machine elements and mechanisms-Engineering applications in robotics, automation and mobility systems.

Suggested Activities: Virtual Demonstration of Friction in belts and pulleys, Solving of GATE questions.

Unit V	Particle Dynamics and Energy Methods	12

Rectilinear and curvilinear motion-Newton's laws and equations of motion-Work–energy and impulse–momentum methods-Kinetic energy and impact analysis-Applications to machines, vehicles, robotics and dynamic systems.

Suggested Activities: Assignments using programming tools to calculate the motion parameters of particles and present the results in graphical form.

TOTAL : 60 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz - 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education, 11th Edition, 2017.
2. Vela Murali, *Engineering Mechanics: Statics and Dynamics*, Oxford University Press, 1st Edition, 2018.
3. Abhijit Chanda and Debabrata Nag, *Engineering Mechanics*, Wiley India, 2018.
4. F. P. Beer, E. R. Johnston, D. Mazurek, P. J. Cornwell and B. Self, *Vector Mechanics for Engineers: Statics and Dynamics*, McGraw Hill Education, 12th Edition, 2018.
5. R. C. Hibbeler, *Engineering Mechanics: Statics and Dynamics*, Pearson, 14th Edition, 2019/2020.

References:

1. S.S.Bhavikatti and K.G.Rajashekarappa, Engineering Mechanics, New Age International Publishers, New Delhi, 10th Edition 2026.
2. Arshad Noor Siddiquee, Zahid A. Khan and Pankul Goel, *Engineering Mechanics*, Cambridge University Press, 2018/2019.
3. Vikrant Sharma, Atul Kumar, N. S. Baruaole and Mukesh Kumar, *Engineering Mechanics: Statics*, Narosa Publishing House, 2018.
4. F. P. Beer et al., *Vector Mechanics for Engineers: Statics and Dynamics*, McGraw Hill, 12th Edition, 2018.
5. R. C. Hibbeler, *Engineering Mechanics: Statics*, Pearson, 14th Edition, 2019/2020.

E-resources:

1. https://nptel.ac.in/courses/112106286
2. https://nptel.ac.in/courses/112106290
3. https://www.iitg.ac.in/rkbc/me101/Presentation/L01-03.pdf

CO	CO Description	PO	PSO
CO1	Utilize computational and vector-based methods for force analysis of statically determinate and modern structural systems.	PO1(3) PO2(2)	-
CO2	Apply principles of rigid-body equilibrium and mechanical simulation to solve engineering problems using contemporary CAE tools.	PO1 (2) PO2 (2)	PSO1 (2) PSO2 (2)
CO3	Analyze complex distributed and dynamic loading conditions in beams and structural components using analytical and numerical methods	PO1 (2) PO2 (2) PO4 (2)	PSO1 (3) PSO2 (2)
CO4	Evaluate friction, contact mechanics, and tribological effects in modern mechanical, robotic, and automated systems.	PO2 (2) PO3 (2) PO4 (2)	PSO1 (2) PSO2 (2)
CO5	Apply Newtonian dynamics, momentum, work-energy principles, and computational simulation to model and evaluate contemporary engineering systems.	PO1 (2) PO2 (2)	PSO1 (2) PSO2 (2)

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

26CE301	Construction Materials and Technology	L	T	P	C
		3	0	0	3

Course Objectives:

- To impart fundamental knowledge of traditional and modern building materials used in construction.
- To introduce methods of construction such as masonry, formwork, scaffolding, plastering, and joints.

Unit I	Stones, Bricks and Concrete Blocks	9

Stone as building material, Criteria for selection, Tests on stones, Deterioration and preservation of stonework. Bricks, Classification, Manufacturing of clay bricks, Tests on bricks, Compressive strength, Water absorption, Efflorescence, Bricks for special uses, Refractory bricks. Concrete blocks, Types, Hollow and solid blocks, Lightweight concrete blocks, Applications.

Suggested Activities: Visit to brick/block manufacturing plant.

Unit II	Lime, Cement, Aggregates and Mortar	9

Types, Preparation of lime mortar, Applications. Cement, Ingredients, Manufacturing process, Types and grades, Properties: hydration, compressive and tensile strength, soundness, consistency, setting time. Fine aggregates, River sand, crushed stone sand (M and P-Sand), Properties. Coarse aggregates, Crushing strength, impact strength, flakiness and elongation index, abrasion resistance, Grading. Mortar, Cement and lime mortars, Uses and proportions.

Suggested Activities: Virtual Demonstration of Cement Manufacturing.

Unit III	Timber, Metals and Other Materials:	9

Timber, Market forms, Industrial timber, Plywood, Laminated panels. Metals, Steel, Aluminum, Composition, properties, Market forms, Mechanical treatment, Aluminum composite panels. Surface finishes, Paints, Varnishes Distempers, Bituminous products. Sealants for joints, Insulating materials, Acoustic and thermal Insulation, Fire protection, Damp proofing, Ventilation, Air conditioning.

Suggested Activities:

Unit IV	Construction Technology and Construction Practices	9

Masonry construction, Brick and stone masonry. Formwork, Centering, shuttering, Scaffolding, Shoring, Underpinning. Construction joints, Contraction, construction and expansion joints. Plastering, Pointing, Cavity and diaphragm walls.

Suggested Activities: Virtual Demonstration of different types of masonry works.

Unit V	Advanced Construction Materials, Equipment and Planning	9

Advanced materials, Glass, Solar Panels - Ceramics, Clay products, Refractories, Fibre reinforced plastics, Fibre textiles, Geomembranes, Geotextiles. Composite materials, Types, Laminar composites, Applications in construction, Construction equipment, Selection for earthwork, concreting, material handling, dewatering and pumping. Construction planning.

Suggested Activities: Visit to Construction sites, virtual demonstration of FRP, Case Study in Concrete Mixing Plan.

TOTAL:45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Varghese, P.C. (2015). Building Materials, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi.
2. Arora, S.P. & Bindra, S.P. (2018). A Textbook of Building Construction, 5th Revised Edition,
3. Dhanpat Rai Publications, New Delhi.

4. Punmia, B.C., Jain, Ashok Kumar & Jain, Arun Kumar (2023). Building Construction: An Elementary as well as Advanced Course for Engineering Students, 12th Edition, Laxmi Publications Pvt. Ltd., New Delhi. ISBN: 978-81-318-0428-5.

References :

1. Arora, S.P. & Bindra, S.P. (2018). A Textbook of Building Construction, 5th Revised Edition, Dhanpat Rai Publications, New Delhi.
2. Peurifoy, R. L., Schexnayder, C. J., Schmitt, R., Shapira, A., & Cohen, A. (2024). Construction Planning, Equipment, and Methods, 10th Edition, McGraw Hill, New York.
3. Rangwala, S. C. (2024). Engineering Materials, 44th Edition, Charotar Publishing House Pvt. Ltd.,Gahlot, P. S. & Dhir, B. M. (2018). Construction Planning and Management, 2nd Edition, New Age International Publishers, New Delhi.
4. Punmia, B. C. & Khandelwal, K. K. (2016). Project Planning and Control with PERT and CPM, 5th Edition, Laxmi Publications, New Delhi.
5. Srivastava, U. K. (2016). Construction Planning and Management, 3rd Edition, Galgotia Publications, New Delhi

E-resources:

1. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/
2. https://archive.nptel.ac.in/content/syllabus_pdf/111107063.pdf
3. https://github.com/patrickwalls/mathematicalpython Description of CO PO

CO	CO Description	PO	PSO
CO1	Explain the properties, classifications, and applications of stones, bricks, concrete blocks, and other conventional building materials.	PO1 (3)	PSO2 (2)
CO2	Evaluate the quality and suitability of lime, cement, aggregates, and mortar using standard tests and specifications.	PO1 (3)	PSO1 (3) PSO2 (2)
CO3	Apply knowledge of timber, metals, paints, sealants, insulating materials, and other building materials in construction works.	PO2 (2)	PSO1 (2) PSO3 (1)
CO4	Apply construction practices such as masonry, formwork, scaffolding, shoring, joints, plastering, and wall construction in building projects.	PO3 (2) PO5 (2)	PSO2 (3)
CO5	Explain the applications of advanced construction materials and select appropriate construction equipment and planning techniques for effective project execution.	PO2 (3) PO3 (2)	PSO2 (3) PSO3 (2)

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

26CE302	Fluid Mechanics	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the fundamental properties and concepts of fluids and fluid flow.
- Apply the principles of fluid statics to determine pressure forces, buoyancy, and stability.
- Analyze fluid flow using the continuity equation, Bernoulli's equation, and momentum equation.
- Classify different types of fluid flow and understand flow patterns and flow lines.
- Evaluate energy losses in pipe flow and apply relevant equations for practical problems.
- Determine discharge and flow characteristics using orifices, mouthpieces, Venturimeter, and flow meters.
- Understand the fundamentals of boundary layer, dimensional analysis, and similitude.

Unit I	Properties Of Fluids And Hydrostatics	9

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

Suggested Activities: Solid vs. fluid behavior, Capillarity, surface tension and buoyancy.

Unit II	Fluid Kinematics And Dynamics	9

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

Suggested Activities: Observe streamlines using dye or suitable flow-tracing methods**.**

Unit III	Flow Through Pipes	9

Reynolds experiment, Reynolds number, laminar flow through circular pipes, Hagen–Poiseuille equation Darcy–Weisbach equation, friction factor, Moody diagram, major and minor losses, entrance and exit losses, bends and fittings Pipes in series, pipes in parallel, siphon pipes and transmission of power through pipes.

Suggested Activities: Calculate Reynolds number and friction factor for given pipe-flow conditions.

Unit IV	Dimensional Analysis And Model Studies	9

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

Suggested Activities: Prepare a chart showing fundamental dimensions and derived dimensions**.**

Unit V	Boundary Layer	9

Boundary layer– definition- boundary layer on a flat plate– thickness and classification displacement , energy and momentum thickness– Boundary layer separation and control– drag in flat plate– drag and lift coefficients.

Suggested Activities: Study practical applications of boundary-layer control in aircraft, automobiles and other fluid-flow systems.

TOTAL (Theory) : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Dr. P.N. Modi and Dr. S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, Revised Standard Edition released in January 2019.
2. R.K. Bansal, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Laxmi Publications, Revised with major edition reprints including January 2019 and November 2023.
3. Frank M. White and Henry Xue, *Fluid Mechanics*, 9th Edition, McGraw Hill, 2022.
4. Yunus A. Çengel and John M. Cimbala, *Fluid Mechanics: Fundamentals and Applications*, 2024 Release, McGraw Hill, 2024.

References:

1. Fluid Mechanics (8th Edition) by Frank M. White, Publication Year: 2016 / 2017 (Global Edition)
2. R.W. Fox, A.T. McDonald, P.J. Pritchard & J.W. Mitchell, *Fluid Mechanics*, 9th Edition, 2018, Wiley.
3. B.R. Munson et al., *Fundamentals of Fluid Mechanics*, 7th Edition, 2017, Wiley.
4. K. Subramanya, *Flow in Open Channels*, 5th Edition, 2019, McGraw Hill.
5. Yunus A. Çengel and John M. Cimbala, *Fluid Mechanics: Fundamentals and Applications*, 24th Edition published in 2018.

E-resources:

1. NPTEL Course: Fluid Mechanics https://nptel.ac.in/courses/112/105/112105093/
2. NPTEL Course: Hydraulic Machines- https://nptel.ac.in/courses/112/106/112106121/
3. Interactive Tools: Fluid Flow Demo (Sim Scale/Flow Lab) – https://www.simscale.com/

CO	CO Description	PO	PSO
CO1	Explain the fundamental properties of fluids and analyze fluid statics, pressure measurement, forces on plane surfaces, centre of pressure, buoyancy and floatation	PO1(3) PO2(2) PO3(2)	PSO1(3)
CO2	Apply continuity, Euler, Bernoulli and momentum equations to analyze fluid kinematics and dynamics, including flow-measuring devices and pipe-bend applications.	PO1(3) PO2(3) PO3(3) PO5(2)	PSO1(3) PSO2(2)
CO3	Analyze laminar and turbulent flow through pipes and determine friction factors, major and minor losses, and flow characteristics in series, parallel and siphon pipes.	PO1(3) PO2(3) PO3(3) PO4(2) PO5(2)	PSO1(3) PSO2(2)
CO4	Apply dimensional analysis, Rayleigh's method, Buckingham π theorem, dimensionless parameters and similitude principles to solve fluid-mechanics and model-study problems.	PO1(3) PO2(3) PO4(3)	PSO1(2) PSO2(3)
CO5	Analyze boundary-layer development and evaluate boundary-layer thickness, separation, drag, lift and separation-control techniques for engineering applications.	PO1(3) PO2(3) PO3(2) PO4(2) PO6(2)	PSO1(3) PSO2(2)

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

26CE303	Surveying and Geomatics	L	T	P	C
		3	0	0	3

Course objective:

- Understand the basic principles and methods of surveying and use common surveying instruments. Perform chain surveying, ranging, traversing, plotting, levelling, plane table surveying, and contouring**.**
- Measure horizontal and vertical angles using theodolite and apply trigonometric levelling and tachometric methods.
- Use modern surveying instruments and technologies such as Total Station, GPS, drones, LiDAR, and bathymetry.
- Understand **s**urvey control, coordinate computation, errors, and adjustment of observations for accurate surveying.

Unit I	Fundamentals of Surveying	9

Definition- Classifications - Basic Principles- -units of measurements – objectives of chain Surveying-types of Chains-Survey Stations - Instruments and Accessories for surveying and ranging.- Methods of ranging - well conditioned triangles – Errors in linear measurement and their Corrections

Suggested Activities: The Backyard Baseline and Chain Survey Lab

Unit II	Plane Table Surveying and Levelling	9

Plane table and its accessories Radiation - Intersection - Resection – Traversing- sources of errors – applications. Levelling**:** Datum, benchmarks, temporary and permanent adjustments–levelling methods booking and reduction– contouring

Suggested Activities: Review of Competitive Exam Questions related to surveying.

Unit III	Theodolite Surveying	9

Horizontal and vertical angle measurements-Temporary and permanent adjustments-Trigonometric levelling - Single and double plane methods – Stadia tacheometry - Subtense method- Tangential tacheometry.

Suggested Activities: : Seminar on control Single and double plane methods

Unit IV	Modern Surveying	9

Total station - components, working, errors, applications; Bathymetry, GPS - components, data acquisition, errors, applications; Introduction to drone surveying and LiDAR.

Suggested Activities: Case study report on GPS applications.

Unit V	Control Surveying, Adjustment	9

Horizontal and vertical control, triangulation, traversing, trilateration, coordinate computation; errors, weights, and adjustment of observations

Suggested Activities: Seminar on control surveying.

TOTAL :45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. S.K. Duggal, *Surveying – Vol. I*, 5th Edition, McGraw Hill, 2019/2020.
2. S.K. Duggal, *Surveying – Vol. II*, 5th Edition, McGraw Hill, 2019.

3. Charles D. Ghilani, *Elementary Surveying: An Introduction to Geomatics*, 16th Edition, Pearson, 2021.

References:

1. Jerry A. Nathanson, Michael Lanzafama and Philip Kissam, *Surveying Fundamentals and Practices*, 7th Edition, Pearson, 2017/2018.
2. John Walker and Joseph L. Awange, *Surveying for Civil and Mine Engineers: Theory, Workshops, and Practicals*, Springer, 2017/2018.
3. B. Bhatta, *Remote Sensing and GIS*, 3rd Edition, Oxford University Press, 2020.
4. P.K. Garg, *Principles of Geoinformatics*, Khanna Publishers, 2019.
5. Kang-Tsung Chang, *Introduction to Geographic Information Systems*, Indian Edition, McGraw Hill, 2017.

E-resources:

1. https://nptel.ac.in/courses/105104101?utm_source=chatgpt.com
2. https://archive.nptel.ac.in/content/storage2/courses/105107122/
3. https://www.nptel.ac.in/courses/105103176?utm_source=chatgpt.com

CO	CO Description	PO	PSO
CO1	Apply fundamental surveying principles, chain surveying, ranging, traversing, plotting, and error corrections for basic surveying tasks.	PO1(3) PO2(3) PO3(2) PO4(2)	PSO1(3) PSO2(2) PSO3(1)
CO2	Perform plane table surveying, levelling, and contouring to determine positions and elevations for engineering applications.	PO1(3) PO2(3) PO3(3) PO4(2)	PSO1(3) PSO2(2) PSO3(2)
CO3	Measure horizontal and vertical angles and apply theodolite, trigonometric levelling, and tacheometric methods for surveying.	PO1(3) PO2(3) PO3(3) PO4(2)	PSO1(3) PSO2(3) PSO3(1)
CO4	Apply modern surveying technologies such as Total Station, GPS, drone surveying, LiDAR, and bathymetry for engineering surveys.	PO1(3) PO2(3) PO3(3) PO4(3) PO5(3)	PSO1(3) PSO2(3) PSO3(1)
CO5	Establish survey control networks and perform coordinate computations and adjustment of observations considering errors and weights.	PO1(3) PO2(3) PO3(3) PO4(3)	PSO1(3) PSO2(3) PSO3(1)

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

26ES301	Engineering Geology	L	T	P	C
		3	0	0	2

Course objective:

- To impart knowledge on Earth's structure, minerals, and rocks; geological processes; geophysical investigations; and landslide mitigation.
- To identify various rock-forming minerals and classify igneous, sedimentary, and metamorphic rocks based on their engineering properties.
- To analyze geological structures such as folds, faults, and joints, and apply geophysical investigation methods for subsurface exploration.
- To evaluate geological conditions critical for the construction of dams, reservoirs, and tunnels, and apply remote sensing techniques for hazard mitigation.

Unit I	General Geology	9

Importance of Geology in Civil Engineering – Branches of geology – Earth structures and composition - Earth processes – Weathering – work of rivers, wind and their Engineering importance. Groundwater: Mode of occurrence - Importance in Civil Engineering– Earthquake – causes - zones in India

Suggested Activities : Geological and Stratigraphic Logging

Unit II	Mineralogy	9

Elementary knowledge on symmetry elements of crystallographic systems (normal class) – Physical properties of minerals – Study of the rock forming minerals – Quartz family - Feldspar family – Pyroxene family minerals - Mica – Fundamentals of ore mineral formation.

Suggested Activities : Physical Property Testing of Minerals

Unit III	Petrology	9

Rocks - Rock cycle – Classification and Distinction of rocks - Igneous rocks: Granite, Syenite, Basalt and Dolerite - Sedimentary rocks: Conglomerate, Breccia, Sandstone, Shale and Limestone - Metamorphic rocks: Gneiss, Schist, Quartzite and Marble.

Suggested Activities : Sort and test everyday stones using simple household items to discover how rock properties dictate civil engineering uses.

Unit IV	Structural Geology And Geophysical Investigations	9

Dip and Strike – Outcrops – Folds - Faults and joints: causes and types – bearing on engineering construction - Electrical survey for civil engineering investigations.

Suggested Activities : Modeling Dip and Strike

Unit V	Geological Investigations In Civil Engineering	9

Applications of remote sensing technique – Interpretation for civil engineering projects – Geological considerations for construction of dam, reservoir and Tunnels – Landslides – causes and preventions.

Suggested Activities : Analyze satellite imagery, topographic maps, and geological data to select optimal locations for a dam and tunnel, and design engineering countermeasures for a high-risk landslide zone.

TOTAL :45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz - 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. N. Chenna Kesavulu, *Textbook of Engineering Geology*, Trinity Press, 2nd Edition, 2017.
2. D. Venkat Reddy, *Engineering Geology*, Vikas Publishing House, 2nd Edition, 2017.

References

1. Vinay Kumar Pandey & Ajai Mishra, *Handbook of Engineering Geology*, CBS Publishers, 2017.
2. Peter T. Bobrowsky & Brian Marker (Eds.), *Encyclopedia of Engineering Geology*, Springer, 2018.
3. Krynine & Judd, *Principles of Engineering Geology & Geotechnics*, 2018 edition/reprint.
4. K. V. G. K. Gokhale, *Principles of Engineering Geology*, B.S. Publications, 2019.
5. A. Parthasarathy, V. Panchapakesan & R. Nagarajan, *Engineering Geology – As per AICTE*, Wiley India, 2019.

E-resources:

1. NPTEL Course: Geology for Engineers.
2. https://nptel.ac.in/courses/113/101/113101053/
3. Virtual Rock Lab: Rock Identification Guide –https://geology.com/rocks/

CO	CO Description	PO	PSO
CO1	Explain fundamental geological processes, landforms, and plate tectonics with relevance to civil Engineering.	PO1(3)	PSO2(2)
CO2	Identify minerals and rock and evaluate their engineering properties.	PO1(3) PO2(2)	PSO1(3) PSO2(2)
CO3	Study about origin, classification and distinction of rocks	PO1(2) PO2(3)	PSO1(2) PSO2(3)
CO4	Analyze geological structures and apply geophysical methods for Subsurface investigation.	PO1(2) PO2(3)	PSO1(3) PSO2(1) PSO3 (1)
CO5	Apply geological knowledge in the design of civil engineering projects and mitigation of natural hazards.	PO1(2) PO2(3)	PSO1(3) PSO2(1) PSO3 (1)

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

26CE304	Water Supply and Wastewater Engineering	L	T	P	C
		3	0	2	4

Course objective:

- To introduce students to various components and design of water supply scheme, water treatment methods, water storage distribution system, sewage treatment and disposal and deign of intake structures and sewerage system.

Unit I	Water Supply	9

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.

Suggested Activities: Poster on water sources and quality comparison for a town.

Unit II	Water Treatment	9

Plane table and its accessories Radiation - Intersection - Resection – Traversing- sources of errors – applications. Levelling**:** Datum, benchmarks, temporary and permanent adjustments–leveling methods booking and reduction– contouring

Suggested Activities: Site Visit to a municipal water treatment plan.

Unit III	Water Storage and Distribution	9

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.

Suggested Activities: Case-based exercise on building water supply design.

Unit IV	Planning And Design of Sewerage System	9

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

Suggested Activities: Ask students to draw a simple sewer network connecting houses → branch sewer → main sewer → treatment plant and mark the direction of flow.

Unit V	Sewage Treatment and Disposal	9

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

Suggested Activities: Divide the class into groups and ask each group to draw a simple flow diagram of one sewage-treatment process and explain it in 2–3 minutes.

TOTAL:45 PERIODS

List of Experiments:

Tests on water:

1. Determination of pH of water and wastewater.
2. Determination of turbidity and electrical conductivity of water.
3. Determination of total solids, dissolved solids and suspended solids.

4. Determination of alkalinity and acidity of water.
5. Determination of chloride content in water.

Tests on wastewater:

6. Determination of dissolved oxygen (DO) in water/wastewater.
7. Determination of Biochemical Oxygen Demand (BOD) of wastewater. (Demo)
8. Determination of Chemical Oxygen Demand (COD) of wastewater.
9. Determination of optimum coagulant dose using Jar Test.
10. Determination of sludge volume index (SVI).

TOTAL (LAB):30 PERIODS

TOTAL (T+L):75 PERIODS

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Assignments - 10%, Quiz- 10%, Competitive Examinations - 10%, Flipped Class - 10%, Practical - 20%, Internal Examinations - 40%.

Text Books:

1. Goel, Sudha, *Water and Wastewater Engineering*, 1st Edition, Cambridge University Press, 2019.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.
3. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015.
4. Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
5. Garg, S.K., *Environmental Engineering – Volume I & II*, Khanna Publishers, 2017–2018 editions.

References:

1. Punmia, B.C., Jain, A.K. and Jain, A.K., Water Supply Engineering, Laxmi Publications, 2nd Edition, 2016 .
2. Goel, S., Water and Wastewater Engineering, Cambridge University Press, 1st Edition, 2019.
3. Rangwala, S.C., Water Supply and Sanitary Engineering, Charotar Publishing House, 29th Edition, 2022 .
4. Gupta, A.K., Uddameri, V., Majumder, A. and Nimbhorkar, S.K., Wastewater Engineering: Issues, Trends and Solutions, CRC Press/Taylor & Francis, 1st Edition, 2023 .
5. D. Lal and Upadhyay, Water Supply & Waste Water Engineering, S.K. Kataria & Sons, 3rd Edition, 2016 (reprint 2023.

E-resources:

1. https://youtu.be/aSTFFhk3tzM?si=st5TfHDmCrU1VM05
2. https://youtu.be/s8IVjQg7yno?si=DD3nK4PW9canQEir
3. https://www.linkedin.com/posts/upendra-kumar-837497144_waterstandards-infrastructure-sustainability-activity-7486459561181360128

CO	CO Description	PO	PSO
CO1	Explain the sources, characteristics, and requirements of water for domestic, industrial, and public uses. Estimate water demand and design water distribution systems, including pipes, pumps, reservoirs, and appurtenance.	PO1(2) PO2(3) PO4(2) PO8(1) PO9(1)	–
CO2	Analyze and evaluate various methods of water treatment, including coagulation, sedimentation, filtration, disinfection, and advanced treatment processes.	PO1(2) PO2(3) PO4(2) PO8(1) PO9(1)	–
CO3	Explain the types, location, functions, and capacity requirements of storage and balancing reservoirs. Identify and evaluate suitable distribution system layouts based on topography, population, and water demand.	PO1(3) PO2(3) PO3(3) PO6(3)	PSO2(2) PSO3(2)
CO4	Explain the characteristics and environmental impacts of wastewater and determine appropriate wastewater collection and disposal methods. Design and evaluate physical, biological, and chemical wastewater treatment processes such as primary sedimentation, activated sludge, trickling filters, and sludge treatment.	PO1(3) PO2(3) PO3(3) PO4(2) PO5(2)	PSO2(2) PSO3(2)
CO5	Apply relevant standards, design principles, and engineering practices for sustainable water and wastewater management. Analyze the reuse and recycling of treated wastewater and recommend appropriate solutions for pollution control and resource recovery.	PO1(3) PO2(3) PO3(3) PO4(2) PO5(2)	PSO2(2) PSO3(3)

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

26CE305	Surveying Laboratory	L	T	P	C
		0	0	3	2

Course objective:

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

List of Experiments:

1. **Levelling Operations:** Fly levelling ,check levelling,
2. **Contouring and Mapping:** Grid levelling, contour mapping,
3. **Plane table surveying:** Radiation - Intersection - Resection – Traversing
4. **Theodolite Surveying:** Measurement of horizontal angles by repetition and reiteration methods.
5. **Heights and distances** - Triangulation - Single plane method. And double plane method
6. **Total Station Surveying:** Angle, distance, coordinate measurement, orientation, and resection methods.
7. **Height and Distance Measurement:** Determination of height using REM/trigonometric methods.
8. **GPS Surveying:** Navigation and feature collection using handheld GPS.

Tasks:(Perform any 2tasks)

Task 1: Site Leveling and Earthwork Estimation: perform leveling and contour mapping to estimate cut and fill volumes for a construction site.

Task 2: Precision Survey and Layout: Measure horizontal angles using theodolite methods and apply them for setting out a simple structure.

Task 3: Total Station Mapping: Conduct a topographic survey using Total Station and prepare contour and feature maps for planning.

Task4:HeightandGPSSurvey: Determine heights using REM method and integrate GPS data form
applying infrastructure features.

TOTAL PERIODS : 45

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Observation and Record - 20%, Practical - 30%, Internal Examinations- 50%.

Text Books:

1. Punmia.B.C.,Ashok Kumar Jain and Arun Kumar Jain, Surveying Vol.I &II, Lakshmi Publications Pvt Ltd, New Delhi, 2016.
2. S.K. Duggal, Surveying, Vol. I & II, Tata McGraw-Hill.
3. K.R. Arora, Surveying, Vol. I & II, Standard Book House.

References:

1. George Murgel and Robert Hamilton, *Engineering Surveying Laboratory Manual*, 2nd Edition, Kendall Hunt, 2018.
2. N. Shanmuga sundaram and R. Priya, *Surveying Laboratory Manual*, VSRD Academic Publishing, 2020.
3. John Walker and Joseph L. Awange, *Surveying for Civil and Mine Engineers: Theory, Workshops, and Practicals*, Springer, 2017/2018.
4. Jerry A. Nathanson, Michael Lanzafame and Philip Kissam, *Surveying Fundamentals and*

Practices, 6th Edition, Pearson, 2017.
5. K.R. Arora, *Surveying*, Vol. I & II, 16th Edition, Standard Book House, 2022.

E-resources:

1. Surveying Virtual Lab-https://vlab.co.in
2. MIT Open Course Ware -https://ocw.mit.edu

CO	CO Description	PO	PSO
CO1	Perform fly levelling, check levelling, grid levelling, contouring, and mapping to determine elevations and prepare contour maps.	PO1(3), PO2(3), PO3(2), PO4(3), PO5(2), PO9,(1)	PSO1(3) PSO2(2) PSO3(2)
CO2	Perform plane table surveying using radiation, intersection, resection, and traversing methods for field mapping.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO9,(2)	PSO1(3) PSO2(2) PSO3(2)
CO3	Measure horizontal angles using a theodolite by repetition and reiteration methods and evaluate the accuracy of observations.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(2), PO9,(2)	PSO1(3) PSO2(3) PSO3(1)
CO4	Determine heights and distances using single-plane and double-plane triangulation and REM/trigonometric methods.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO9,(1)	PSO1(3) PSO2(2) PSO3(1)
CO5	Operate Total Station and handheld GPS for angle, distance, co ordinate, orientation, resection, navigation, and feature-collection surveys.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO9,(1)	PSO1(3) PSO2(3) PSO3(2)

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

26SDC01	Foundation Aptitude &Verbal Ability Skills	L	T	P	C
		0	0	2	1

Course Objectives:

- To solve quantitative aptitude problems through practical exercises.
- To Apply logical and analytical reasoning techniques.
- To improve grammar and vocabulary through practice-oriented activities.
- To demonstrate effective reading, listening and speaking skills.
- To demonstrate professional communication skills required for placement activities.

List of Activities:

1. Number System, Simplification, Percentage and Ratio
2. Average, Profit and Loss, Simple and Compound Interest
3. Time, Work, Speed, Distance and Data Interpretation
4. Number Series, Analogy, Coding-Decoding and Logical Patterns
5. Blood Relations, Direction Sense, Ranking, Syllogism and Data Sufficiency
6. Grammar, Sentence Correction and Error Spotting
7. Vocabulary, Synonyms, Antonyms, Idioms and Sentence Completion
8. Reading Comprehension, Para Jumbles and Listening Skills
9. Speaking Skills, Group Discussion and Presentation Skills
10. Resume Preparation, Interview Skills and Mock Placement Activities

TOTAL : 30 PERIODS

Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)

References:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing.
2. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publishing.
3. Wren & Martin, High School English Grammar and Composition, S. Chand Publishing.
4. Arun Sharma, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGraw Hill Education.

E-resources:

1. https://nptel.ac.in/courses/109104030

CO	CO Description	PO	PSO
CO1	Solve quantitative aptitude problems using appropriate numerical and arithmetic techniques.	PO1 (3) PO2 (2)	PSO2 (1)
CO2	Apply logical and analytical reasoning techniques to solve aptitude problems.	PO2 (3) PO4 (2)	PSO2 (2) PSO3 (1)
CO3	Apply grammar and vocabulary skills to solve verbal ability exercises.	PO1 (2) PO10 (3)	PSO3 (2)
CO4	Demonstrate effective reading, listening, speaking, group discussion and presentation skills.	PO8 (3) PO9 (3) PO10 (3)	PSO3 (3)
CO5	Demonstrate professional communication skills through resume preparation, interviews and mock placement activities.	PO6 (2) PO8 (3) PO9 (3)	PSO1 (1) PSO2 (2) PSO3 (3)

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

Semester – IV


MRK Institute of Technology
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26CE401	Strength of Materials	L	T	P	C
		3	0	2	4

Course objectives:

- To learn the fundamental concepts of Stress in simple and complex states.
- To know the mechanism of load transfer in beams and the induced stresses due to simple Bending.
- To know the method of finding slope and deflection of beams.
- To know the basic concept of analyzing indeterminate beams.
- Evaluate structural behavior using failure theories and advanced bending concepts in unsymmetrical members.
- To develop practical skills through laboratory experiments to evaluate mechanical properties of materials.

Unit I	Concept of Stress and Strain	9

Simple stresses and strains at a point -Normal and shear Stresses - Hooke's Law - Young's modulus

- Bars subjected to axial Forces - simple problems - Strain Energy due to axial force – Resilience, proof resilience and modulus of resilience – stresses due to gradual load, sudden load and impact load - Elastic constants - Relation between Elastic constants - Stress Strain Diagram for behavior of

materials - Composite Bars - Thermal Stresses.

Suggested Activities: To study stress–strain behavior, Hooke's law, Young's modulus, axial loading, strain energy, resilience, elastic constants, composite bars, and thermal stresses using practical engineering examples.

Unit II	Bending of Beams	9

Beams–types and transverse loading on beams– Shear force and bending moment for simply supported, cantilever and over-hanging beams-Theory of simple bending–Bending stress distribution–Shear stress distribution.

Suggested Activities: Review of competitive exam questions related to SFD and BMD.

Unit III	Deflection of Beams	9

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

Suggested Activities: Perform beam deflection experiments and numerical exercises using double integration, Macaulay's method, area-moment method, and conjugate beam method to determine slopes and deflections.

Unit IV	Indeterminate Beams	9

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.

Suggested Activities: Quiz on analysis methods and bending moment diagrams.

Unit V	Advanced Topics	9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections– Shear Centre - curved beams– Winkler Bach formula. Theories of failure: Maximum Principal stress theory– Maximum Principal strain theory– Maximum shear stress theory– Total Strain energy theory–

Maximum distortion energy theory– Application problems.

Suggested Activities: Model making to demonstrate bending and curved beam behavior. Poster presentation on failure theories and stress states.

TOTAL:45 PERIODS

List of experiments:

1. Tension test on mild steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam.
8. Compression test on helical spring (Open and Closed Coiled Helical Springs)

TOTAL (LAB):30 PERIODS

TOTAL (T+L):75 PERIODS

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Assignments - 10%, Quiz- 10%, Competitive Examinations - 10%, Flipped Class - 10%, Practical - 20%, Internal Examinations - 40%.

Text Books:

1. Rajput.R.K, Strength of Materials, S.Chand and Co, New Delhi, 2025.
2. Bansal.R.K, Strength of Materials, Laxmi Publications, New Delhi, 2024.

References

1. Punmia.B.C., AshokKumar Jain and ArunKumar Jain, SMTS–I Strength of materials, Laxmi publications. New Delhi, 2018.
2. Ramamrutham S and Narayanan R, Strength of Materials, New Revised and Enlarged Edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2025.
3. Singh.D.K. Strength of Materials, Ane Books Pvt. Ltd., New Delhi, 2021. KazimiS.M.A, Solid Mechanics, Tata Mc Graw-Hill Publishing Co., New Delhi, 2017.
4. IS 1608 (Part 1):2022: Metallic Materials – Tensile Testing – Method of Test at Room Temperature.
5. IS1586 (Part1):2018: Metallic Materials–Rockwell Hardness Test–Test Method.

E-resources:

1. NPTEL Course: Strength of Materials https://nptel.ac.in/courses/112/105/112105099/
2. NPTELmaterialhttps://archive.nptel.ac.in/courses/105/105/105105108/
3. YouTube Lectures: “Shear Force and Bending Moment Diagrams” – IIT/NPTEL playlists https://sm-nitk.vlabs.ac.in/

CO	CO Description	PO	PSO
CO1	Understand the concepts of stress and strain for material properties and elastic behavior of solids.	PO1 (3) PO2 (3) PO3 (3) PO11 (1)	PSO1 (3) PSO2 (3) PSO3 (3)
CO2	Analyze and construct Shear force and bending moment in beams and understand concept of theory of simple bending.	PO1 (3) PO2 (3) PO7 (1) PO11 (1)	PSO1 (3) PSO2 (3) PSO3 (3)
CO3	Compute the slope and deflection of determinate beams using different methods.	PO1 (3) PO2 (3) PO3 (3) PO11 (2)	PSO1 (3) PSO2 (3) PSO3 (3)
CO4	Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements	PO1 (3) PO4 (3) PO5 (2) PO6 (3)	PSO1 (3) PSO2 (3) PSO3 (3)
CO5	Determine the stress due to unsymmetrical bending of beams, locate the shear center, and study the various theories of failure.	PO1 (3) PO2 (3) PO3 (3)	PSO1 (3) PSO2 (3) PSO3 (3)

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

26CE402	Concrete Technology	L	T	P	C
		3	0	0	3

Course Objectives:

- Discuss the physical and chemical properties of cement and admixtures.
- Understand the workability of concrete, manufacturing processes of concrete and the behavior of the hardened concrete.
- Identify, formulate and solve problems in concrete mix design.
- Enrich the practical knowledge on mix design principles, concepts and methods.

Unit I	Constituent Materials	9

Cement: Types of cement – Special cements – Tests on cement – BIS and EN Specifications. Aggregates: Classification – Characteristics affecting Concrete Properties – Tests on aggregates – Natural Sand and crushed aggregate (M-sand & P-sand) – BIS specifications. Water: General requirements – Tolerable concentrations of impurities – Quality of water for use in concrete – Use of sea water and its effects.

Suggested Activities: Collect samples or labels of different cement types such as OPC, PPC, and PSC.

Unit II	Chemical and Mineral Admixtures	9

Chemical Admixtures: Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers – Mineral Admixtures: Fly Ash – Micro and Nano Silica – Ground Granulated Blast Furnace Slag and Metakaolin – Effects on concrete properties.

Suggested Activities: Flipped classroom on mineral admixtures.

Unit III	Proportioning of Concrete Mix	9

Mix Design: Principles of Mix Proportioning – Methods of concreting – Factors in the choice of mix Properties – Physical properties of materials required for Mix Design – Quality Control – Design Mix and Nominal Mix – BIS Method of Mix Design – Mix Design Examples – ACI Procedures – Durability consideration as per IS code.

Suggested Activities: Concrete mix proportioning and fresh concrete testing (IS 516).

Unit IV	Properties of Fresh and Hardened Concrete	9

Fresh Concrete: Workability – Factors affecting workability – Tests – Segregation and Bleeding. Hardened Concrete: Factors affecting Strength – Curing – Methods of curing – Tests – Compressive strength – Split tensile strength – Flexural strength – Modulus of elasticity – In situ strength determination – NDT. Durability of concrete – Water absorption – Permeability – Corrosion test – Acid resistance.

Suggested Activities: Demonstrate segregation and bleeding by preparing mixes with different water contents and aggregate gradations. Record and discuss the causes and preventive measures.

Unit V	Special and Advanced Concrete	9

Special Concrete: High strength concrete – High Performance concrete – Lightweight & Heavy weight concrete – Self-compacting concrete – Fiber reinforced concrete – Polymer concrete – Foam concrete – Ready mix concrete Hot & cold weather concreting – Precast concrete – Prestressed Concrete – SIFCON and Bacterial Concrete.

Suggested Activities: Poster presentation on special concretes.

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%,
Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Bhavikatti S S, "Concrete Technology", 2015, I.K.International Publishing House Pvt. Ltd, New Delhi.
2. R.P.Rethaliya, Concrete Technology, 2nd Revised Edition, Charotar Publishing House, 2018.

References :

1. Shetty, M.S. and Jain, A.K., Concrete Technology: Theory and Practice, 8th Edition, S. Chand Publishing, 2019.
2. Shetty, M. S, Concrete Technology, Chand.S and Company Ltd, New Delhi, 2026
3. Rethaliya, R.P., Concrete Technology, 2nd Revised Edition, Charotar Publishing House, 2018.
4. Krishnaraju, N., Design of Concrete Mixes, 5th Edition, CBS Publishers & Distributors, 2018.
5. Santhakumar, A.R., Concrete Technology, 2nd Edition, Oxford University Press, 2018.

E-Resources

1. NPETL-Concrete Technology https://nptel.ac.in/courses/105106186
2. Bureau of Indian Standards (BIS) – IS codes related to cement, aggregates, concrete and testing - https://www.bis.gov.in
3. https://ct-dei.vlabs.ac.in/

CO	CO Description	PO	PSO
CO1	Evaluate the properties of cement, aggregates, and water through standard laboratory tests as per relevant IS codes.	PO2 (2),PO4(3) PO5 (2),PO7 (3) PO8 (2)	PSO1(2) PSO2(2) PSO3(1)
CO2	Analyze the influence of chemical admixtures, mineral admixtures, and fibers on the fresh and hardened properties of concrete.	PO2 (2),PO4 (3) PO5 (2),PO8 (2)	PSO1(3) PSO2(2) PSO3(1)
CO3	Design and proportion concrete mixes using BIS methods and assess workability and quality control parameters.	PO1 (3),PO3 (3) PO7 (2),PO8 (2)	PSO1(3) PSO2(3) PSO3(2)
CO4	Determine the strength, durability, and performance of concrete,	PO1 (3),PO4 (3) PO5 (2),PO8 (3)	PSO1(3) PSO2(3) PSO3(1)
CO5	Special concretes, using standard and long-term durability metrics, chemical resistance, and permeability parameters for advanced infrastructure projects.	PO1 (3),PO4 (3) PO5 (2),PO8 (3)	PSO1(3) PSO2(3) PSO3(1)

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

26CE403	Soil Mechanics	L	T	P	C
		3	0	0	3

Course objectives:

- To enable the students to acquire the essential knowledge about the index and engineering properties of soils and their practical relevance.
- Enable students to apply Darcy's law, analyze effective stress, and evaluate groundwater flow and seepage using flow nets.
- Introduce elastic theories and equations alongside consolidation theories to predict soil settlement and deformation under structural loads.
- Develop the capability to determine shear parameters through laboratory testing and conduct stability
- Analyses for both infinite and finite slopes.

Unit I	Introduction and Soil Properties	9

Origin of soil- rock- soil structure and clay mineralogy - Basic definitions - phase diagram -relationships - index properties of soil - classification of soils.

Suggested Activities: Inspect soil samples to separate coarse-grained fractions (sands and gravels) from fine-grained fractions (silts and clays).

Unit II	Soil-Water And Seepage	9

Permeability: Soil water – capillary rise – suction- flow of water through soils – Darcy‘s law- permeability – Factors affecting permeability – coefficient of permeability – Effective stress concepts in soils – quick sand conditions - Seepage - seepage velocity- discharge velocity- Introduction to flow nets –properties and uses**.**

Suggested Activities : Capillary Rise and Soil Suction Demonstration

Unit III	Stress Distribution in Soil	9

Stress distribution in soil- assumptions in elastic theories- Boussinesq’s equation for point and line loads- Westergaard’s equation for point load- concept and use of pressure bulbs- principle and use of Newmark‘s influence chart, contact pressure- Equivalent point load – two point method – three point method.

Suggested Activities : The Layered Strata Stress Test (Westergaard's Principle)

Unit IV	Compaction and Consolidation	9

Compaction - Mechanism - factors affecting compaction - effects on soil properties- measurement of compaction. Consolidation - mechanism - components - basic definitions- Terzaghi’s theory of one dimensional consolidation - co efficient of consolidation - computation of rate of settlement- factors influencing compression behaviour of soils.

Suggested Activities : The Moisture and Sponge Densification Lab

Unit V	Shear Strength and Slope Stability	9

Introduction- Mohr – Coulomb Failure theories - measurement of shear parameters - direct shear test-triaxial shear test- unconfined compression test- Vane shear test- Factors influencing shear strength of soils. Slope failure mechanisms – Types: Infinite slopes - Finite slopes - Stability analysis for purely cohesive and cohesionless soils. Method of slices, Swedish circle method – stability number – slope protection measures.

Suggested Activities : The Sliding Book and Tilting Slope Lab

TOTAL:45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.
Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%
Text book:
1. Das, B.M. and Sobhan, K., Principles of Geotechnical Engineering, 9th Edition, Cengage Learning, 2018. 2. Knappett, J. and Craig, R.F., Craig's Soil Mechanics, 9th Edition, CRC Press, 2019.
References
1. Das, B.M. and Sobhan, K., "Principles of Geotechnical Engineering", 9th Edition, Cengage Learning, 2018. 2. Kaliakin, V., "Soil Mechanics: Calculations, Principles, and Methods", Elsevier, 2017. 3. Barnes, G., "Soil Mechanics", 4th Edition, Bloomsbury Academic, 2017. 4. Punmia, B.C., Jain, A.K. and Jain, A.K., "Soil Mechanics and Foundations", 17th Edition, Laxmi Publications, 2017. 5. Kim Huat, B.B., Prasad, A., Asadi, A. and Kazemian, S., "Soil Mechanics and Foundation Engineering", Cengage Learning, 201**6**
E-resources:
1. NPTEL web courses on Soil Mechanics - https://nptel.ac.in/courses/105101084 2. NPTEL web courses on Geotechnical Engineering https://archive.nptel.ac.in/courses/105/101/105101201/ 3. https://smfe-iiith.vlabs.ac.in/

CO	CO Description	PO	PSO
CO1	Explain soil properties, classification and compaction characteristics to assess their suitability for engineering applications.	-	-
CO2	Apply effective stress, permeability, and seepage concepts to analyze soil–water interaction and groundwater flow problems.	PO1 (3), PO2 (3)	PSO1(3) PSO2(2) PSO3 (1)
CO3	Analyze stress distribution and settlement of soils under various loading conditions.	PO1 (3), PO2 (3)	PSO1(3) PSO2(2)
CO4	Analyze stress compaction, consolidation and compression behaviour of soils.	PO1 (3), PO2 (3), PO3 (2)	PSO1(3) PSO2(2) PSO3 (2)
CO5	Evaluate shear strength and slope stability of soils using appropriate theories, laboratory parameters, and Analytical methods.	PO1 (3), PO2 (3), PO3 (2)	PSO1(3) PSO2(2) PSO3 (2)

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

26CE404	Applied Hydraulic Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

- To introduce the fundamental principles of fluid mechanics and hydraulic engineering and their applications in engineering systems.
- To develop an understanding of hydraulic turbines, pumps, and hydraulic machinery and their operating principles.
- To familiarize students with the construction, working, performance, and applications of hydraulic turbines.
- To provide knowledge of centrifugal and reciprocating pumps, including their characteristics, performance, and applications.

Unit I	Uniform Flow	9

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

Suggested Activities : Pipe flow vs Open channel, Open-channel parameters, and Normal-depth computation

Unit II	Gradually Varied Flow	9

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

Suggested Activities: Numerical Problem – GVF Profile, Change in Grades

Unit III	Rapidly Varied Flow	9

Application of the momentum equation for RVF- Hydraulic jumps- Types- Energy Dissipation Celerity– Rapidly varied unsteady flows (positive and negative surges.

Suggested Activities: Introduction to Rapidly Varied Flow (RVF), Energy Dissipation in Hydraulic Jump, Practical Applications of RVF

Unit IV	Turbines	9

Classification of Turbines– Pelton wheel– Francis turbine– Kaplan turbine- Specific speed– Draft tube – Cavitation - Performance of turbine - Runaway speed – Minimum Speed to start the pump

Suggested Activities: Performance of Turbines, Cavitation in Turbines, Draft Tube, Efficiency of Pelton Wheel, Work Done by Pelton

Unit V	Pumps	9

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

Suggested Activities: Centrifugal Pump – Construction and Working, Savings in Work Done

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%

Text Books:

1. Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi, 2018.
2. Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017

References:

1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2019.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 19th edition, 2017.
3. Mays L. W., Water Resources Engineering, John Wiley and Sons (WSE), New York, 2019.
4. Subramanya.K., " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2019.
5. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.

E-resources:

1. NPTEL Course: Hydraulic-Engineering
2. NPTEL/hydraulic engineering/?utm_source=chatgpt.com&v=13b5bfe96fe
3. NPTEL Course: Hydraulic Machines- https://nptel.ac.in/courses/112103249

CO	CO Description	PO	PSO
CO1	Analyze uniform flow in open channels using Chezy's and Manning's equations, hydraulic parameters, specific energy, specific force, critical depth and normal-depth computation	PO1(3) PO2(3) PO3(2)	PSO1(3)
CO2	Analyze gradually varied and spatially varied flows and determine water-surface profiles using direct-step, standard-step and graphical methods	PO1(3) PO2(3) PO4(2)	PSO1(3)
CO3	Analyze rapidly varied flow using the momentum equation and evaluate hydraulic jumps, energy dissipation, celerity and positive/negative surges.	PO1(3) PO2(3) PO4(2)	PSO1(3)
CO4	Analyze the performance of Pelton, Francis and Kaplan turbines with respect to efficiency, specific speed, draft tube, cavitation and operating conditions	PO1(3) PO2(3) PO3(2)	PSO2(3)
CO5	Analyze centrifugal, reciprocating and rotary pumps with respect to NPSH, cavitation, operating characteristics, air vessels and energy savings.	PO1(3) PO2(3) PO3(2) PO7(2)	PSO2(3)

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

26CE405	Highway Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the principles of highway classification, alignment, and geometric design to establish the foundation for efficient and safe roadway planning.
- Develop proficiency in testing and evaluating highway materials, such as aggregates, bitumen, and soil, to ensure their suitability for different pavement designs.
- Gain practical experience in pavement construction techniques and maintenance strategies to enhance the durability and performance of road infrastructure.

Unit I	Highway Planning and Alignment	9

Role of Transportation - Characteristics, merits and demerits of road transportation - Historical development of Road Construction - Highway development in India - Classification of roads - Road patterns - Highway alignment - Engineering surveys for Highway location.

Suggested Activities: Quiz on Highway Planning and Alignment.

Unit II	Geometric Design	9

Highway cross sectional elements - Typical cross sections of Urban and Rural roads - Sight distance - Design of Horizontal alignment - horizontal curves, camber, super elevation, widening of curves, transition curves, set-back distance - Design of Vertical alignment - gradients, grade compensation, vertical curves.

Suggested Activities: Poster presentation on geometric design of highways.

Unit III	Design of Pavements	9

Flexible Pavements: materials – tests (CBR) - mix design - design factors - flexible pavement design as per IRC. Rigid Pavements: design of rigid pavements - general design considerations - stresses in rigid pavements - design of joints, dowel bar, tie bar - IRC method of design of concrete pavements.

Suggested Activities: Construct small physical models of flexible and rigid pavements and compare their layer arrangement.

Unit IV	Highway Construction	9

Types - Standard construction practice for WBM and WMM, Bituminous concrete and Cement concrete roads - Construction of joints in cement concrete pavements - Materials and methods of construction - Fly ash embankments, Crumb rubber modified bitumen and geo-textiles.

Suggested Activities: Field visit to Visit an ongoing WBM/WMM, bituminous, or cement-concrete road project and observe the sequence of construction.

Unit V	Highway drainage and Maintenance	9

Highway drainage - Importance and requirements - Surface and sub-surface drainage - Highway maintenance - Pavement failures - Distress in flexible and rigid pavements - Causes and treatments - Pavement evaluation - Strengthening of existing pavements – overlays - Benkelman beam deflection studies - Pavement maintenance management system.

Suggested Activities: Visit a nearby highway and identify surface-drainage components such as side drains, catch-water drains, kerbs, gutters, and culverts. Students prepare a sketch showing the drainage arrangement.

TOTAL :45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.
Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations - 20%, Flipped Class - 10%, Internal Examinations - 40%
Text Books:
1. Kadiyali, L.R., Highway Engineering, 1st Edition, Khanna Publishing House, 2017. 2. Gogers, Martin and Enright, Bernard, Highway Engineering: An Indian Adaptation, 4th Edition, Wiley, 2025.
Reference :
1. Kadiyali, L.R., and Lal, N.B. Principles and Practice of Highway Engineering, Khanna Publishers, Reprint Edition, 2023. 2. Rogers, Martin and Enright, Bernard, Highway Engineering: An Indian Adaptation, 4th Edition, Wiley, 2025. 3. Martin Rogers and Bernard Enright, Highway Engineering: An Indian Adaptation, 4th Edition, Wiley, 2025. 4. IRC:67-2022- Code of Practice for Road Signs 5. IRC:44-2017- Guidelines for Cement Concrete Mix Design for Pavements
E-Resources
1. https://ts-nitk.vlabs.ac.in/ (Virtual labs) 2. National Highways Authority of India manuals and circulars : https://nhai.gov.in/ 3. Highway Alignment - https://www.slideshare.net/khaledalshami93/highway-geometric-design

CO	CO Description	PO	PSO
CO1	Apply basic principles of highway planning, classification, alignment, and engineering surveys to the selection and development of suitable road networks.	PO1 (3) PO2 (3) PO3 (3) PO5 (2) PO7 (2)	PSO1(2)
CO2	Apply principles of horizontal alignment in the design of horizontal curves. And also apply principles of vertical alignment by determining suitable gradients, grade compensation, and vertical curves.	PO1 (3) PO2 (3) PO3 (3) PO7 (2)	PSO2 (3)
CO3	Design flexible and rigid pavements using IRC guidelines based on material properties, traffic loading, and subgrade characteristics.	PO2 (2) PO3 (3) PO7 (3)	PSO1(3) PSO2(2) PSO3(1)
CO4	Evaluate highway materials and pavement performance through standard laboratory tests, field studies, and failure analysis.	PO2 (2) PO4 (3) PO5 (2) PO8 (2)	PSO(3) PSO(2)
CO5	Analyze highway construction, maintenance, and rehabilitation practices using modern materials, equipment, and technologies.	PO2 (2) PO4 (2) PO5 (3)	PSO1(3) PSO2(2) PSO3(2)

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

26CE406	Irrigation Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation.
- Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I	Crop Water Requirement	9

Need and classification of irrigation- historical development and merits and demerits of irrigationtypes of crops-crop season-duty, delta and base period- consumptive use of crops-estimation of Evapotranspiration using experimental and theoretical methods

Suggested Activity: Calculate duty, delta and base period for a selected crop - Estimate crop evapotranspiration using experimental/theoretical methods.

UNIT II	Irrigation Methods	9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

Suggested Activity: Conduct a field demonstration/model of drip and sprinkler irrigation - Prepare an irrigation scheduling chart and calculate irrigation efficiency.

UNIT III	Diversion and Impounding Structures	9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages.

Suggested Activity: Prepare working models of a gravity dam, earth dam and arch dam - Draw and explain the forces acting on a gravity dam - Prepare diagrams/models of weirs, barrages and diversion head works.

UNIT IV	Canal Irrigation	9

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory - Design of unlined canal

Suggested Activity: Draw the layout of a canal irrigation system - Prepare models/sketches of canal drops, outlets and cross-drainage works - Conduct a case study on canal lining and canal alignment.

UNIT V	Water Management In Irrigation	9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses-On form development works-Participatory irrigation management- Water resources associations Changing paradigms in water management-Performance evaluation - Economic aspects of Irrigation

Suggested Activity: Conduct a group discussion on Participatory Irrigation Management (PIM) - Prepare a water-use optimization plan for a selected irrigation command area - Evaluate the performance and economic aspects of an irrigation system.

TOTAL : 45 PERIODS

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

Assessment Methodology: Assignments - 20%, Quiz- 10%, Competitive Examinations -

20%, Flipped Class - 10%, Internal Examinations - 40%
Text Books:
1. Sharma, S.K., Irrigation Engineering and Hydraulic Structures, S. Chand Publishing, 2017. 2. Waller, P. and Yitayew, M., Irrigation and Drainage Engineering, Springer International Publishing, 2016.
Reference :
1. Punmia, B.C., Pande, B.B.L., Jain, A.K. and Jain, A.K., Irrigation and Water Power Engineering, 16th Edition, Laxmi Publications, 2016. 2. Garg, S.K., Irrigation Engineering and Hydraulic Structures: Water Resources Engineering, Vol. II, 32nd Edition, Khanna Publishers, 2016. 3. Sahasrabudhe, S.R., Irrigation Engineering and Hydraulic Structures, 3rd Edition, S.K. Kataria & Sons, 2016. 4. Rai, R.K. and Singh, V.P., Planning and Evaluation of Irrigation Projects, Elsevier, 2017. 5. Ukarande, S.K., Irrigation Engineering and Hydraulic Structures, Springer, 2023.
E-Resources 1 https://nptel.ac.in/courses/126105010?utm_source **2** https://nptel.ac.in/courses/105105110?utm_source

CO	CO Description	PO	PSO
CO1	Explain crop water requirements, duty, delta, base period, consumptive use and methods of estimating evapotranspiration.	PO1(3), PO2(2)	PSO1(2)
CO2	Explain and design different irrigation methods including surface, subsurface, sprinkler, drip, ridge and furrow irrigation, and determine irrigation scheduling and efficiency.	PO1(3), PO3(3), PO5(2)	PSO1(3), PSO2(2)
CO3	Analyze the principles and design considerations of impounding and diversion structures such as gravity dams, earth dams, arch dams, weirs and barrages.	PO1(3), PO2(3), PO3(3)	PSO1(3), PSO2(2)
CO4	Design and analyze canal irrigation systems including canal outlets, canal drops, cross-drainage works, canal lining and regime canals.	PO1(3), PO2(3), PO3(3), PO5(2)	PSO1(3), PSO2(2)
CO5	Apply water-management principles for optimization of water use, minimization of water losses, rehabilitation, modernization and performance evaluation of irrigation systems.	PO2(3),PO3(2), PO5(3),PO6(2), PO10(1),PO11(2)	PSO2(3), PSO3(3)

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

26CE407	Fluid Mechanics and Hydraulic Engineering Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

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

List of Experiments:

A. Flow Measurement

1. Calibration of Rotameter
2. Flow through Orifice meter/ Venturimeter
3. Bernoulli's Experiment

B. Losses in Pipes

4. Determination of friction factor in pipes.
5. Determination of minor losses

C. Pumps

6. Characteristics of Centrifugal pumps
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump

D. Turbines

10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine

E. Determination Of Metacentric Height

12. Determination of metacentric height of floating bodies.

Tasks: (Perform any 2 tasks)

Task 1: Compare discharge values obtained from different devices and analyze errors.

Task 2: Evaluate major and minor losses in the system and Compare experimental results with theoretical/Moody chart values.

Task 3: Plot performance curves and determine the specific speed of a centrifugal pump

Task 4: Plot characteristic curves (H–Q, η–Q) and determine efficiency of a reciprocating pump.

Task 5: Assess stability conditions and compare with theoretical values.

TOTAL: 60 PERIODS

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Observation and Record - 20%, Practical - 30%, Internal Examinations- 50%.

Text Books:

1. Modi, P. N. and Seth, S. M., Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House, New Delhi, 2017.
2. R. K. Rajput, A Textbook of Fluid Mechanics and Hydraulic Machines, S. Chand Publishing, New Delhi, 2015.

References:

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

2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi,2022.
3. Subramanya.K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd. 2019.

CO	Description of CO	PO	PSO
CO1	Determine and analyze flow characteristics and discharge using Rotameter, Orifice meter and Venturimeter, and verify Bernoulli's theorem through experiments.	PO1(3) PO2(3) PO5(2)	PSO1(3)
CO2	Determine friction factor and major/minor losses in pipe flow and interpret the experimental results for hydraulic systems.	PO1(3) PO2(3) PO4(2) PO5(2)	PSO1(3) PSO2(2)
CO3	Evaluate the performance and characteristics of centrifugal, gear, submersible and reciprocating pumps under different operating conditions.	PO1(3) PO2(3) PO4(3) PO5(2)	PSO1(3) PSO2(3)
CO4	Analyze the performance characteristics of Pelton wheel and Francis turbines and determine their hydraulic performance parameters.	PO1(3) PO2(3) PO4(3) PO5(2)	PSO1(3) PSO2(3)
CO5	Determine the metacentric height and stability of floating bodies through experimental investigation and interpret the results.	PO1(3) PO2(3) PO4(2)	PSO1(3)

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

26CE408	Concrete and Highway Engineering Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

- To develop skills to test various construction materials

List of Experiments:

Tests on Cement

1. Determination of Standard Consistency of Cement by Vicat Apparatus
2. Determination of Initial and Final Setting Time of Cement
3. Determination of Soundness of Cement by Le-Chatelier Method
4. Determination of Fineness of Cement by 90 µm Sieve

Tests on Coarse Aggregate

5. Determination of Aggregate impact value test.
6. Determination of Los Angeles abrasion test.
7. Determination of Aggregate crushing value test.
8. Determine the Flakiness index & Elongation index test.
9. Determination of Specific gravity and water absorption test on aggregate.

Tests on Concrete

10. Determination of slump of concrete
11. Determination of flow ability of self-compacting concrete (Demo only)

Tests on Bitumen

12. Determination of Penetration Test of Bitumen.
13. Determination of Viscosity Test of Bitumen.
14. Determination of Softening Point Test of Bitumen.
15. Determination of Ductility test on Bitumen.

TOTAL PERIODS:45

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Observation and Record - 20%, Practical - 30%, Internal Examinations- 50%.

Text Books:

1. Pant, M.K., Laboratory Manual for Civil Engineering Students, S.K. Kataria & Sons, 2016
2. Sood, H., Laboratory Manual on Concrete Technology, CBS Publishers & Distributors, 2016 edition.

Reference :

1. Thomas, J., Concrete Technology, Cengage Learning, 2015.
2. Venkatramaiah, C., Transportation Engineering – Volume I: Highway Engineering, Universities Press**,** 2016.
3. Concrete Technology Laboratory Manual" by M. S. Shetty
4. "Highway Engineering Laboratory Manual" by S. K. Khanna and C. E. G. S. Raju
5. "Laboratory Manual for Concrete and Highway Engineering" by R. Srinivasan

E-Resources

1. Science Direct (Elsevier)-https://www.sciencedirect.com/
2. ASCE Library (American Society of Civil Engineers)- https://ascelibrary.org/

CO	CO Description	PO	PSO1
CO1	Determine the mechanical properties of steel.	PO1(2) PO2(2) PO3(1)PO4(3) PO5(1)PO6(2) PO7(2)	PSO1(2) PSO2(2) PSO3(2)
CO2	Determine the physical properties of cement	PO1(3)PO2(2) PO3(1)PO4(3) PO5(1)PO6(2) PO7(2)	PSO1(3) PSO2(2) PSO3(2)
CO3	Determine the physical properties of fine and coarse aggregate.	PO1(3)PO2(3) PO3(2)PO4(3) PO5(1)PO6(2) PO7(2)	PSO1(3) PSO2(3) PSO3(2)
CO4	Determine the workability and compressive strength of concrete.	PO1(3)PO2(3) PO3(2)PO4(3) PO5(1)PO6(2) PO7(2)	PSO1(3) PSO2(2) PSO3(2)
CO5	Determine the strength of brick and wood.	PO1(3)PO2(3) PO3(2)PO4(3) PO5(2)PO6(2) PO7(2)	PSO1(3) PSO2(2) PSO3(2)

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

26SDC02	Professional and Corporate Communication Skills	L	T	P	C
		0	0	2	1

Course Objectives:

- To develop effective verbal and professional communication skills.
- To enhance grammar, vocabulary, reading and listening abilities.
- To demonstrate effective speaking, presentation and group discussion skills.
- To prepare students for corporate communication and workplace interactions.
- To develop professional skills required for interviews, placements and corporate environments.

List of Activities

1. Professional Communication Fundamentals and Workplace Etiquette
2. Verbal Ability, Grammar and Vocabulary Enhancement
3. Reading Comprehension and Critical Verbal Reasoning
4. Listening Skills and Effective Workplace Conversations
5. Professional Speaking, Pronunciation and Presentation Skills
6. Group Discussion, Team Communication and Negotiation Skills
7. Corporate Email, Business Writing and Digital Communication
8. Resume Writing, Self-Introduction and Personal Branding
9. Interview Skills, Corporate Etiquette and Workplace Interaction
10. Mock Corporate Communication, Presentation and Placement Simulation

TOTAL : 30 PERIODS

Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)

References:

1. Raman, Meenakshi and Sharma, Sangeeta, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, New Delhi, 2022.
2. Rizvi, M. Ashraf and Patnaik, Priyadarshi, Effective Technical Communication, 3rd Edition, McGraw Hill Education, New Delhi, 2024.
3. Pal, Rajendra and Korlahalli, H. S., Essentials of Business Communication, Sultan Chand & Sons, New Delhi, latest available edition.
4. John Seely – The Oxford Guide to Writing and Speaking, Oxford University Press.
5. Swan, Michael, Practical English Usage, 4th Edition, Oxford University Press, 2016.

E-resources:

1. https://nptel.ac.in/courses/112107291

CO	CO Description	PO	PSO
CO1	Apply verbal and professional communication techniques in workplace situations.	PO1 (3)	PSO1 (3)
CO2	Demonstrate effective reading, listening, speaking and presentation skills.	PO2 (1) PO3 (3)	PSO1 (3) PSO2 (2)
CO3	Construct professional emails, business documents and other forms of corporate communication.	PO1 (3) PO3 (3)	PSO1 (3) PSO2 (3)
CO4	Demonstrate effective participation in group discussions, interviews and professional interactions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop professional communication profiles through resume preparation, personal branding and placement-oriented activities.	PO1 (3) PO2 (2) PO3 (3)	PSO1 (3) PSO2 (3)

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


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MANDATORY COURSES

26MCC01	Disaster Management and Safety Awareness	L	T	P	C
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Course Objectives:

- To provide students with fundamental knowledge of natural and man-made disasters, disaster preparedness, risk reduction, emergency response, industrial safety and personal/community safety, enabling them to respond effectively during emergency situations

Unit I	Fundamentals of Disaster Management	3

Disaster, hazard, vulnerability and risk; types of disasters; disaster management cycle; prevention, mitigation, preparedness, response and recovery; disaster risk reduction and early warning systems.

Unit II	Natural Disasters	3

Earthquakes, tsunamis, floods, landslides, cyclones, thunderstorms, droughts and heat waves; causes and impacts; preparedness, mitigation, evacuation and emergency response.

Unit III	Industrial and Man-Made Disasters	3

Industrial hazards and accidents; fire and explosion; chemical leakage; electrical and machinery hazards; biological and transportation disasters; personal protective equipment; hazard identification and risk assessment.

Unit IV	Emergency Response and First Aid	3

Emergency action and evacuation plans; fire prevention and fire extinguishers; basic first aid; bleeding, burns, fractures, electric shock and heat-related emergencies; basic CPR awareness; emergency communication and rescue procedures.

Unit V	Safety and Community Resilience	3

Occupational, laboratory, workshop, road and electrical safety; disaster recovery and rehabilitation; community resilience; role of government agencies, NGOs and volunteers; disaster risk mapping, safety audit, emergency drills and institutional disaster management planning.

TOTAL : 15 PERIODS

Text Books:

1. R. B. Singh, Disaster Management, Rawat Publications, Jaipur, 2015
2. S. K. Singh, Disaster Management, A.K. Publications, New Delhi, 2017.

References:

1. M. M. S. Maheshwari, Disaster Management, Pointer Publishers, Jaipur, 2011.
2. B. K. Khanna, All You Wanted to Know About Disasters, New India Publishing Agency, New Delhi, 2005.
3. National Disaster Management Authority (NDMA), National Disaster Management Guidelines, Government of India.
4. Ministry of Home Affairs, National Disaster Management Plan, Government of India.
5. S. K. Sharma, Disaster Management and Preparedness, CBS Publishers & Distributors, New Delhi.

CO	CO Description	PO	PSO
CO1	Explain the concepts, types and phases of disaster management.	PO9 (2), PO11 (2)	PSO3 (3)
CO2	Identify disaster hazards, vulnerabilities and associated risks.	PO7 (3), PO9 (2)	PSO3 (3)
CO3	Apply appropriate preparedness and mitigation measures for different disasters.	PO9 (2), PO11 (2)	PSO3 (3)
CO4	Demonstrate basic emergency response, first aid, fire safety and evacuation procedures.	PO9 (3), PO10 (2)	PSO3 (3)
CO5	Develop awareness of industrial, occupational, environmental and community safety practices	PO9 (3), PO11 (3)	PSO3 (3)

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

26MCC02	Gender Sensitization and Inclusive Society	L	T	P	C
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Course Objectives:

- To create awareness about gender equality, equity, diversity and social inclusion.
- To understand gender roles, stereotypes, discrimination and constitutional values.
- To familiarize students with gender-based violence, safety measures and relevant legal provisions.
- To promote respectful behaviour, empathy and equal opportunities in educational and professional environments.

Unit I	Gender Concepts and Social Awareness	3

Gender, sex and gender identity; gender roles and stereotypes; gender equality and equity; socialization and discrimination; importance of gender sensitivity.

Unit II	Gender and Constitutional Values	3

Fundamental rights and duties; equality and non-discrimination; constitutional provisions for gender equality;

Unit III	Gender-Based Violence and Safety	3

Types of gender-based violence; domestic violence, sexual harassment and cyber harassment; prevention and

Unit IV	Inclusive Education and Workplace	3

Inclusive education; equal opportunities; diversity and inclusion; accessibility; respectful communication;

Unit V	Building an Inclusive Society	3

Role of students and professionals in promoting equality; empathy and responsible behaviour; gender-sensitive

TOTAL : 15 PERIODS

Text Books:

1.A. S. Altekar, The Position of Women in Hindu Civilization, Motilal Banarsidass, New Delhi.
2.B. R. Ambedkar, Annihilation of Caste, Navayana Publishing.

References:

1. United Nations, Gender Equality and Women's Empowerment, UN Publications.
2. Government of India, The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.
3. National Commission for Women, Handbook on Sexual Harassment of Women at Workplace, Government of India.
4. UGC, Policy on Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and
Students in Higher Educational Institutions.
5. UNESCO, Gender Equality and Education, UNESCO Publications.

CO	CO Description	PO	PSO
CO1	Explain the concepts of gender, gender equality, equity and social inclusion.	PO9(2), PO11(2)	PSO3(3)
CO2	Identify gender stereotypes, discrimination and inequalities in society.	PO7(3), PO9(2)	PSO3(3)
CO3	Understand constitutional provisions and legal mechanisms related to gender equality and safety.	PO9(2), PO11(2)	PSO3(3)
CO4	Demonstrate respectful and inclusive behaviour in academic and workplace environments.	PO9(3), PO10(2)	PSO3(3)
CO5	Promote gender-sensitive practices and contribute to building an equitable and inclusive society.	PO9(3), PO11(3)	PSO3(3)

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

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