



GOVERNMENT COLLEGE OF ENGINEERING, SALEM
(NAAC Accredited with A+, An Autonomous Institution, Affiliated to Anna University, Chennai)

UNDERGRADUATE CURRICULUM

(Applicable to the students admitted in B.E. Programme, from the Academic Year 2026-2027)

Programme: B.E. Civil Engineering (Full Time)

Regulations: 2026

Overview of Credits

Sem	BS	HM	ES(G)	ES(PC)	ES(PE)	OE	SD	MC	Total
I	7	3	8	3					21
II	12	3	8				2		25
III	3			16				3	22
IV		2		16			1	3	22
V				17	6		1		24
VI				8	9	3	3		23
VII				13	3				16
VIII							10		10
Total	22	8	16	73	18	3	17	6	163
% of Category	13.50	4.91	9.82	44.79	11.04	1.84	10.43	3.68	100

Abbreviations:

Course Type:

T - Theory
L - Laboratory
LIT - Laboratory Integrated Theory
CDP - Capstone Design Project
PW - Project Work
IOC – Industry Oriented Course

Category :

BS - Basic Science
HM- Humanities
ES - Engineering Science [General (**G**)
Programme Core (**PC**)
Programme Elective (**PE**)]
OE - Open Elective
SD - Skill Development
MC - Mandatory Course

Others :

L - Lecture
T - Tutorial
P - Practical
SL - Term work (TW) + Self Learning (SL)
TH - Total Number of Teaching – Learning Hours per Semester

Semester I													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26ENC02	Professional English	LIT	30	0	15	15	60	2	HM	50	50	100
2.	26HMC01	Heritage of Tamils / தமிழர் மரபு	T	15	0	0	15	30	1	HM	40	60	100
3.	26PHC02	Materials Science	T	45	0	0	45	90	3	BS	40	60	100
4.	26MAC01	Matrices and Calculus	T	45	15	0	60	120	4	BS	40	60	100
5.	26MEC01	Engineering Graphics	T	30	45	0	45	120	4	ES(G)	40	60	100
6.	26EEC01	Basic Electrical & Electronics Engineering	LIT	45	0	45	30	120	4	ES(G)	50	50	100
7.	26CE101	Construction Materials and Technology	T	45	0	0	45	90	3	ES(PC)	40	60	100
8.	26MCC01	Induction Programme	T	-	-	-	-	-	0	MC	-	-	-
Total								630	21				

Semester II													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26ENC01	Communicative English	T	45	0	0	15	60	2	HM	40	60	100
2.	26HMC02	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	T	15	0	0	15	30	1	HM	40	60	100
3.	26MAC02	Ordinary Differential Equations and Transform Techniques	T	45	15	0	60	120	4	BS	40	60	100
4.	26CEC01	Engineering Mechanics	T	45	15	0	60	120	4	ES(G)	40	60	100
5.	26CSC01	C Programming	LIT	45	0	30	45	120	4	ES(G)	50	50	100
6.	26CYC01	Applied Chemistry	LIT	45	0	45	30	120	4	BS	50	50	100
7.	26PHC01	Applied Physics	LIT	45	0	45	30	120	4	BS	50	50	100
8.	26MEC02	Engineering Practices Laboratory	L	0	0	45	15	60	2	SD	60	40	100
9.	26MCS01	Engineering Sprints	L	0	0	15	15	30	0	SD	100	-	100
10.	26NCC01	NCC Course - I*	T	30	0	0	30	60	2*	-	40	60	100
Total								840	25				

*< Only for NCC Students, it is not considered for CGPA Calculation >

Semester III													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26MAC04	Partial Differential Equations and Complex Variables	T	45	15	0	30	90	3	BS	40	60	100
2.	26CE301	Mechanics of Fluids	T	45	0	0	45	90	3	ES(PC)	40	60	100
3.	26CE302	Surveying	T	45	0	0	45	90	3	ES(PC)	40	60	100
4.	26CE303	Water Resources Engineering	T	45	0	0	45	90	3	ES(PC)	40	60	100
5.	26ES301	Mechanics of Solids	T	45	15	0	30	90	3	ES(PC)	40	60	100
6.	26CE304	Advanced Surveying and Basic GIS Practical	L	0	0	60	0	60	2	ES(PC)	60	40	100
7.	26CE305	Material Testing and Evaluation Laboratory	L	0	0	60	0	60	2	ES(PC)	60	40	100
8.	26MCC02	Environmental Science and Engineering	T	45	0	0	45	90	3	MC	40	60	100
9.	26MCS02	Innovation Sprints	L	0	0	15	15	30	0	SD	100	-	100
10.	26NCC02	NCC Course - II*	T	30	0	0	30	60	2*	-	40	60	100
Total								750	22				

*< Only for NCC Students, it is not considered for CGPA Calculation >

Semester IV													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE401	Strength of Materials	T	45	15	0	30	90	3	ES(PC)	40	60	100
2.	26CE402	Steel Structural Elements	T	45	15	0	30	90	3	ES(PC)	40	60	100
3.	26CE403	Mechanics of Soils	T	45	0	0	45	90	3	ES(PC)	40	60	100
4.	26CE404	Applied Hydraulics and Fluid Machinery	T	45	0	0	45	90	3	ES(PC)	40	60	100
5.	26CE405	Computer Aided Building Drawing	L	0	0	60	0	60	2	ES(PC)	60	40	100
6.	26CE406	Applied Hydraulics and Machinery Laboratory	L	0	0	60	0	60	2	ES(PC)	60	40	100
7.	26ENC03	Placement and Soft Skill Laboratory	L	0	0	45	15	60	2	HM	60	40	100
8.	26MCC03	Universal Human Values	T	45	0	0	45	90	3	MC	40	60	100
9.	26CEICXX	Industry Oriented Course - I	IOC	15	0	0	15	30	1	SD	100	-	100
10.	26MCS03	Design Sprints	L	0	0	15	15	30	0	SD	100	-	100
Total								690	22				

Semester V													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE501	Basic Structural Analysis	T	45	15	0	30	90	3	ES(PC)	40	60	100
2.	26CE502	Foundation Engineering	T	45	0	0	45	90	3	ES(PC)	40	60	100
3.	26CE503	Design of Reinforced Concrete Elements	T	45	0	0	45	90	3	ES(PC)	40	60	100
4.	26CE504	Water Supply Engineering	T	45	0	0	45	90	3	ES(PC)	40	60	100
5.	26CE505	Concrete Technology	T	45	0	0	45	90	3	ES(PC)	40	60	100
6.	26CEPEXX	Programme Elective - I	T	45	0	0	45	90	3	ES(PE)	40	60	100
7.	26CEPEXX	Programme Elective - II	T	45	0	0	45	90	3	ES(PE)	40	60	100
8.	26CE506	Geotechnical Engineering Laboratory	L	0	0	60	0	60	2	ES(PC)	60	40	100
9.	26CEICXX	Industry Oriented Course - II	IOC	15	0	0	15	30	1	SD	100	-	100
10.	26MCC04	Disaster Management and Preparedness	T	30	0	0	30	60	0	MC	100	-	100
11.	26MCC05	Indian Constitution	T	30	0	30	0	60	0	MC	100	-	100
12.	26MCS04	Ideation Sprints	L	0	0	15	15	30	0	SD	100	-	100
Total								870	24				

Semester V													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
For Honours Degree													
1.	26CED01	Capstone Design Project Level-I	CDP	0	0	90	90	180	6	SD	60	40	100
OR													
1.	26CEHXX	Honours Elective - I	T	45	0	0	45	90	3	ES(PE)	40	60	100
2.	26CEHXX	Honours Elective - II	T	45	0	0	45	90	3	ES(PE)	40	60	100
For Minor Degree													
1.	26CEMXX	Minor Elective - I	T	45	0	0	45	90	3	OE	40	60	100
2.	26CEMXX	Minor Elective - II	T	45	0	0	45	90	3	OE	40	60	100
Total								180	6				

Semester VI													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE601	WasteWater Engineering	T	45	0	0	45	90	3	ES(PC)	40	60	100
2.	26CE602	Transportation Engineering	T	45	0	0	45	90	3	ES(PC)	40	60	100
3.	26CEPEXX	Programme Elective - III	T	45	0	0	45	90	3	ES(PE)	40	60	100
4.	26CEPEXX	Programme Elective - IV	T	45	0	0	45	90	3	ES(PE)	40	60	100
5.	26CEPEXX	Programme Elective - V	T	45	0	0	45	90	3	ES(PE)	40	60	100
6.	26XXOEXX	Open Elective - I	T	45	0	0	45	90	3	OE	40	60	100
7.	26CE603	Environmental Quality Measurement Laboratory	L	0	0	60	0	60	2	ES(PC)	60	40	100
8.	26CE604	Mini Project	PW	0	0	45	45	90	3	SD	100	-	100
Total								690	23				

Semester VI													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
For Honours Degree													
1.	26CED02	Capstone Design Project Level-II	CDP	0	0	90	90	180	6	SD	60	40	100
OR													
1.	26CEHXX	Honours Elective - III	T	45	0	0	45	90	3	ES(PE)	40	60	100
2.	26CEHXX	Honours Elective - IV	T	45	0	0	45	90	3	ES(PE)	40	60	100
For Minor Degree													
1.	26CEMXX	Minor Elective - III	T	45	0	0	45	90	3	OE	40	60	100
2.	26CEMXX	Minor Elective - IV	T	45	0	0	45	90	3	OE	40	60	100
Total								180	6				

Semester VII													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE701	Advanced Structural Analysis	T	45	0	0	45	90	3	ES(PC)	40	60	100
2.	26CE702	Construction Management	T	45	0	0	45	90	3	ES(PC)	40	60	100
3.	26CE703	Estimation, Costing and Valuation	T	45	0	0	45	90	3	ES(PC)	40	60	100
4.	26CEPEXX	Programme Elective - VI	T	45	0	0	45	90	3	ES(PE)	40	60	100
5.	26CE704	Concrete Technology Laboratory	L	0	0	60	0	60	2	ES(PC)	60	40	100
6.	26CE705	Computer Aided Design and Drawing (Concrete & Steel)	L	0	0	60	0	60	2	ES(PC)	60	40	100
Total								480	16				

Semester VII													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
For Honours Degree													
1.	26CED03	Capstone Design Project Level-III	CDP	0	0	90	90	180	6	SD	60	40	100
OR													
1.	26CEHXX	Honours Elective - V	T	45	0	0	45	90	3	ES(PE)	40	60	100
2.	26CEHXX	Honours Elective - VI	T	45	0	0	45	90	3	ES(PE)	40	60	100
For Minor Degree													
1.	26CEMXX	Minor Elective - V	T	45	0	0	45	90	3	OE	40	60	100
2.	26CEMXX	Minor Elective - VI	T	45	0	0	45	90	3	OE	40	60	100
Total								180	6				

Semester VIII													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE801	Project Work	PW	0	0	225	75	300	10	SD	60	40	100
Total								300	10				
Total Credits of the Programmes									163				

Programme Electives

Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CEPE01	Advanced Steel Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
2.	26CEPE02	Dynamics and Earthquake Resistant Design of Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
3.	26CEPE03	Prestressed Concrete Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
4.	26CEPE04	Advanced Concrete Design	T	45	0	0	45	90	3	ES(PE)	40	60	100
5.	26CEPE05	Design of Composite Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
6.	26CEPE06	Air Pollution Control Engineering	T	45	0	0	45	90	3	ES(PE)	40	60	100
7.	26CEPE07	Solid Waste Management	T	45	0	0	45	90	3	ES(PE)	40	60	100
8.	26CEPE08	Watershed Management	T	45	0	0	45	90	3	ES(PE)	40	60	100
9.	26CEPE09	Hazardous Waste Management	T	45	0	0	45	90	3	ES(PE)	40	60	100
10.	26CEPE10	Marine pollution Monitoring and Control	T	45	0	0	45	90	3	ES(PE)	40	60	100
11.	26CEPE11	Subsurface Investigation and Instrumentation	T	45	0	0	45	90	3	ES(PE)	40	60	100
12.	26CEPE12	Rock Mechanics and Applications	T	45	0	0	45	90	3	ES(PE)	40	60	100
13.	26CEPE13	Soil Structure Interaction	T	45	0	0	45	90	3	ES(PE)	40	60	100
14.	26CEPE14	River Engineering	T	45	0	0	45	90	3	ES(PE)	40	60	100
15.	26CEPE15	Ground Improvement Techniques	T	45	0	0	45	90	3	ES(PE)	40	60	100
16.	26CEPE16	Building Information Modelling	T	45	0	0	45	90	3	ES(PE)	40	60	100

Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
17.	26CEPE17	High rise Buildings	T	45	0	0	45	90	3	ES(PE)	40	60	100
18.	26CEPE18	Coastal Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
19.	26CEPE19	Storage Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
20.	26CEPE20	Earth Retaining Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
21.	26CEPE21	Advanced Irrigation Engineering	T	45	0	0	45	90	3	ES(PE)	40	60	100
22.	26CEPE22	Hydrology	T	45	0	0	45	90	3	ES(PE)	40	60	100
23.	26CEPE23	Sustainable and Green Building Technology	T	45	0	0	45	90	3	ES(PE)	40	60	100
24.	26CEPE24	Formwork for Concrete Structures	T	45	0	0	45	90	3	ES(PE)	40	60	100
25.	26CEPE25	Ferrocement Technology	T	45	0	0	45	90	3	ES(PE)	40	60	100
26.	26CEPE26	Airports, Docks and Harbours Engineering	T	45	0	0	45	90	3	ES(PE)	40	60	100
27.	26CEPE27	Traffic Engineering and Management	T	45	0	0	45	90	3	ES(PE)	40	60	100
28.	26CEPE28	Advanced Surveying Techniques	T	45	0	0	45	90	3	ES(PE)	40	60	100
29.	26CEPE29	Railway Engineering	T	45	0	0	45	90	3	ES(PE)	40	60	100
30.	26CEPE30	Urban Planning & Development	T	45	0	0	45	90	3	ES(PE)	40	60	100
31.	26CEPE31	Sustainable Ground water Management	T	45	0	0	45	90	3	ES(PE)	40	60	100
32.	26CEPE32	Circular Economy in Construction	T	45	0	0	45	90	3	ES(PE)	40	60	100
33.	26CEPE33	Geotechnical Engineering for Metro	T	45	0	0	45	90	3	ES(PE)	40	60	100

Open Electives

Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
Courses Offered by the Department of Civil Engineering													
1.	26CEOE01	Environmental Management	T	45	0	0	45	90	3	OE	40	60	100
2.	26CEOE02	Repair and Rehabilitation of Building Elements	T	45	0	0	45	90	3	OE	40	60	100

3.	26CEOE03	Mechanics of Deformable Bodies	T	45	0	0	45	90	3	OE	40	60	100
Courses Offered by the Department of Computer Science and Engineering													
1.	26CSOE01	Object Oriented Programming Concepts	T	45	0	0	45	90	3	OE	40	60	100
2.	26CSOE02	Operating Systems Principles	T	45	0	0	45	90	3	OE	40	60	100
3.	26CSOE03	Python Programming	T	45	0	0	45	90	3	OE	40	60	100
4.	26CSOE04	Fundamentals of Java Programming	T	45	0	0	45	90	3	OE	40	60	100
5.	26CSOE05	Data Structures using C	T	45	0	0	45	90	3	OE	40	60	100
6.	26CSOE06	Introduction to Artificial Intelligence	T	45	0	0	45	90	3	OE	40	60	100
7.	26CSOE07	Cloud Computing Fundamentals	T	45	0	0	45	90	3	OE	40	60	100
Courses Offered by the Department of Electronics and Communication Engineering													
1.	26ECOEO1	Fundamentals of Electron Devices	T	45	0	0	45	90	3	OE	40	60	100
2.	26ECOEO2	Principles of Modern Communication Systems	T	45	0	0	45	90	3	OE	40	60	100
3.	26ECOEO3	Microcontrollers and Its Applications	T	45	0	0	45	90	3	OE	40	60	100
4.	26ECOEO4	Basics of Embedded Systems	T	45	0	0	45	90	3	OE	40	60	100
5.	26ECOEO5	Basics of Internet of Things	T	45	0	0	45	90	3	OE	40	60	100
Courses Offered by the Department of Electrical and Electronics Engineering													
1.	26EEEOE01	Renewable Energy Systems	T	45	0	0	45	90	3	OE	40	60	100
2.	26EEEOE02	Industrial Drives	T	45	0	0	45	90	3	OE	40	60	100
3.	26EEEOE03	Electrical Energy Conservation and Management	T	45	0	0	45	90	3	OE	40	60	100
4.	26EEEOE04	Fundamentals of Electric Vehicle	T	45	0	0	45	90	3	OE	40	60	100
5.	26EEEOE05	Electrical Safety and Energy Auditing	T	45	0	0	45	90	3	OE	40	60	100
6.	26EEEOE06	Energy Storage Systems and its Applications	T	45	0	0	45	90	3	OE	40	60	100

Courses Offered by the Department of Mechanical Engineering

1.	26MEOE01	Design of Machine Elements and Machining	T	45	0	0	45	90	3	OE	40	60	100
2.	26MEOE02	Internal Combustion Engines	T	45	0	0	45	90	3	OE	40	60	100
3.	26MEOE03	Refrigeration and Air conditioning	T	45	0	0	45	90	3	OE	40	60	100
4.	26MEOE04	Power Plant Engineering	T	45	0	0	45	90	3	OE	40	60	100
5.	26MEOE05	Hydraulics and Pneumatics	T	45	0	0	45	90	3	OE	40	60	100
6.	26MEOE06	Industrial Engineering and Management	T	45	0	0	45	90	3	OE	40	60	100
7.	26MEOE07	Renewable Energy Sources	T	45	0	0	45	90	3	OE	40	60	100
8.	26MEOE08	Robotics and Automation	T	45	0	0	45	90	3	OE	40	60	100
9.	26MEOE09	Total Quality Management	T	45	0	0	45	90	3	OE	40	60	100
10.	26MEOE10	Automotive Systems	T	45	0	0	45	90	3	OE	40	60	100

Courses Offered by the Department of Metallurgical Engineering

1.	26MTOE01	Foundry and Welding Technology	T	45	0	0	45	90	3	OE	40	60	100
2.	26MTOE02	Surface Engineering	T	45	0	0	45	90	3	OE	40	60	100
3.	26MTOE03	Design and Selection of Materials	T	45	0	0	45	90	3	OE	40	60	100
4.	26MTOE04	Nano Science and Technology	T	45	0	0	45	90	3	OE	40	60	100
5.	26MTOE05	Materials for Automobile Components	T	45	0	0	45	90	3	OE	40	60	100
6.	26MTOE06	Metallurgy for Non-metallurgist	T	45	0	0	45	90	3	OE	40	60	100

List of Industry Oriented Course

Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CEICXX	Bar Bending and Scheduling	T	15	0	0	15	30	1	SD	100	---	100
2.	26CEICXX	AI in Civil Engineering	T	15	0	0	15	30	1	SD	100	---	100
3.	26CEICXX	Drone Surveying	T	15	0	0	15	30	1	SD	100	---	100

List of Honours Courses

Sl. No.	Course Code	Course Name
1	26CEH01	Advanced Repair & Rehabilitation of Structures
2	26CEH02	Advanced Prefabricated Structures
3	26CEH03	Advanced Finite Elements Analysis
4	26CEH04	Advanced Experimental Techniques and Instrumentation
5	26CEH05	Advanced Concrete Technology
6	26CEH06	Smart Materials and Smart Structures
7	26CEH07	Functional Planning in Building Services
8	26CEH08	Building Valuation
9	26CEH09	Environmental Impact and Risk Assessment
10	26CEH10	Unit Operations and Processes in Water and Wastewater Treatment

List of Minors Courses

Sl. No.	Course Code	Course Name
1	26CEM01	Construction Materials
2	26CEM02	Building Construction & Equipment's
3	26CEM03	Concrete Technology
4	26CEM04	Environmental Engineering
5	26CEM05	Basics of Transportation Engineering
6	26CEM06	Repair and Rehabilitation of Structures
7	26CEM07	Green Building Technology

Civil Engineering Courses handled to other Departments - 2026 R Curriculum

B.E. Electrical & Electronics Engineering

Semester I													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CM101	Basic Civil and Mechanical Engineering	T	60	0	0	60	120	4	ES(G)	40	60	100

B.E. Metallurgical Engineering

Semester II													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CEC01	Engineering Mechanics	T	45	15	0	60	120	4	ES(G)	40	60	100

Semester III													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE307	Mechanics of Deformable bodies	T	45	15	0	60	120	4	ES(G)	40	60	100

B.E. Mechanical Engineering

Semester III													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26CE306	Strength of Materials and Fluid Mechanics Laboratory	L	0	0	45	15	60	2	ES(PC)	60	40	100

All Departments

Semester IV													
Sl. No.	Course Code	Course Name	Course Type	Hours per Semester					Credits	Category	Weightage		
				L	T	P	SL	TH			CA %	ES %	Total
1.	26MCC03	Disaster Management and Preparedness	T	30	0	0	30	60	0	MC	100	-	100

26ENC02	PROFESSIONAL ENGLISH B.E. (Common to all Branches)		SEMESTER				I
Prerequisites		Category	HM	Credits			2
Basic language skills listening, speaking, reading and writing		Hours/ Semester	L	T	P	SL	TH
			30	0	15	15	60
COURSE OBJECTIVES							
1.	To develop learners' overall communication competence through integrated listening, reading, speaking, and writing activities.						
2.	To enhance learners' reading fluency and comprehension with appropriate pronunciation, intonation, and expression across different text types.						
3.	To build learners' oral communication skills for narration, speeches, presentations, and professional interactions.						
4.	To equip learners with organizational and presentation skills required for academic, technical, and event-based communication.						
5.	To enable learners to describe processes, ideas, and technical activities clearly and confidently in real-life contexts.						
UNIT - I	FUNDAMENTALS OF COMMUNICATION						9
Listening: Interview with personal assistant, An interview with a business consultant, Describing changes in a company. Reading: Reading a short story – learning pronunciation, intonation, splitting of sentences to form meaningful units. Speaking: Self-introduction, name, home background, study details, area of interest, hobbies, strengths and weaknesses, etc. Writing: Communication and its types - Technical Communication, Review of a favourite movie or a book. Grammar: Tenses – Present tense, Past tense, Future tense. Voices – Active voice, Passive voice.							
UNIT - II	PRESENTATION SKILLS						9
Listening: An interview about a production process, Telephone conversations, Making and changing appointments. Reading: Reading a poem – learning the skill of reciting, appreciate rhyme and music, change in tone etc. Speaking: Power point presentation on a general topic. Writing: Essay writing – Descriptive and narrative essays, Precise writing. Grammar: Common errors in English – Subject Verb agreement, Articles.							
UNIT - III	PUBLIC SPEAKING						9
Listening: Conversation between two employees, Interview about change in job and corporate gift giving. Reading: Reading newspaper article – learning vocabulary and language pattern of official communication. Speaking: Oral presentation on a topic from basic engineering related to their branch. Writing: Writing a news article, Minutes of meetings. Grammar: Prefix and suffix, Phrasal verbs, Degrees of comparison.							
UNIT - IV	ORGANIZING EVENTS						9
Listening: Working in an international team, Statistical information, Interview with investor relations. Reading: Company profiles, Statement of Purpose (SOP), An excerpt of interview with professionals. Speaking: Proposing welcome address, vote of thanks and organizing events. Writing: Letter Writing – Formal Letters and Informal Letters, Job Application, Cover letter with resume. Grammar: Reported speech, Question tags, Simple, Compound and Complex sentences.							

UNIT - V	PROCESS DESCRIPTION		9
Listening: An interview with recruitment agent, Meeting extracts, Description of how a product is advertised.			
Reading: Reading advertisements, gadget reviews, user manuals.			
Speaking: Describing a process – taking print outs, purchasing equipment for a company, booking a hall for meeting etc.			
Writing: Process description, Designing advertisements.			
Grammar: Cloze test, Homophones, Cause and effect expressions.			
L:30, T:0, P:15, SL:15, Total:60 Hours			
Weightage:			
Continuous Assessment : 50%			
End Semester Examinations : 50%			
REFERENCE BOOKS:			
1.	Beare, Kenneth. Reading Skills Success in 20 Minutes a Day. 4th ed., Learning Express, 2017.		
2.	Hewings, Martin. Advanced English Grammar. 3rd ed., Cambridge University Press, 2019.		
3.	Koneru, Aruna. English Language Skills for Engineers. McGraw Hill Education, 2020.		
4.	Murphy, Raymond. English Grammar in Use. 5th ed., Cambridge University Press, 2019.		
5.	Guffey, Mary Ellen, and Dana Loewy. Essentials of Business Communication. 12th ed., Cengage Learning, 2021		
E-RESOURCES:			
1.	https://learnenglish.britishcouncil.org/		
2.	https://www.futurelearn.com/		
3.	https://www.ted.com/		
4.	https://www.cambridgeenglish.org/		
5.	https://www.coursera.org/		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Demonstrate effective listening, reading, speaking, and writing (LSRW) skills in academic and professional communication contexts.	PO9, PO11	
CO2	Apply appropriate grammar, vocabulary, pronunciation, and language conventions to ensure accurate, fluent, and effective communication across various contexts.	PO9, PO11	
CO3	Deliver oral presentations, speeches, and self-introductions confidently using suitable verbal and non-verbal communication strategies.	PO9, PO11	PSO1
CO4	Analyze and interpret different forms of written texts such as stories, poems, newspaper articles, company profiles, advertisements, and technical documents.	PO9, PO11	PSO2
CO5	Develop professional writing skills for drafting reviews, essays, news articles, minutes of meetings, letters, resumes, cover letters, process descriptions, and advertisements.	PO9, PO10	PSO3
CO6	Organize and participate effectively in workplace and social communication activities by demonstrating presentation, event management, interpersonal, and professional communication skills.	PO8, PO9, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1									3		2			
CO2									3		2			
CO3									3		2	1		
CO4									3		2		1	
CO5									3	2				2
CO6								2	3		2			2

Activities:

1.	CO5: Develop professional writing skills for drafting reviews, essays, news articles, minutes of meetings, letters, resumes, cover letters, process descriptions, and advertisements. (i) Review Writing Activity: Write a critical review of a favorite book, movie, gadget, or product by analyzing its features, strengths, weaknesses, and overall impact on the audience. (ii) News Article and Meeting Minutes Preparation: Attend a mock event, seminar, club activity, or classroom discussion and prepare a news article and formal minutes of the meeting following standard format. (iii) Professional Correspondence Portfolio: Prepare a portfolio consisting of formal letters, informal letters, job application letters, resumes, and cover letters for different academic and professional scenarios. (iv) Process Description: Develop a step-by-step process description for technical and administrative activities such as online registration, booking a meeting hall, purchasing equipment, printing documents, or conducting an event. (v) Advertisement and Creative Writing Project: Design print or digital advertisements for products, services, technical events, or social awareness campaigns highlighting their purpose and target audience.
2.	CO6: Organize and participate effectively in workplace and social communication activities by demonstrating presentation, event management, interpersonal, and professional communication skills. (i) Professional Presentation Activity: Prepare and deliver an individual or group PowerPoint presentation on a technical, social, or current-affairs topic, demonstrating effective verbal and non-verbal communication skills. (ii) Organizing Events: Plan and organize a mock academic or professional event by assigning roles, preparing schedules, coordinating tasks, and delivering welcome addresses and vote of thanks. (iii) Workplace Communication Role Play: Participate in role-play activities involving interviews, telephone conversations, appointment scheduling, team discussions, client interactions, and workplace problem-solving situations. (iv) Public Speaking and Group Discussion Activity: Engage in extempore speeches, group discussions, debates, and seminar presentations on engineering, social, or professional topics to improve confidence and interpersonal communication.

	(v) Professional Interaction and Team Collaboration Project: Work collaboratively in teams to conduct meetings, coordinate event-related tasks, prepare communication plans, and demonstrate leadership, teamwork, and professional etiquette in achieving common objectives.
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Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Content Relevance and Completeness	10	Content is highly relevant, complete, and fully meets task requirements	Mostly relevant and complete with minor omissions	Adequate content but lacks depth or some key points missing
2.	Organization and Format	10	Excellent adherence to format	Proper format with minor structural issues	Basic structure present but inconsistent formatting
3.	Clarity and Coherence	10	Ideas are very clear, logically sequenced, and easy to follow	Generally clear with minor lapses in flow	Understandable but lacks smooth transitions
4.	Language Use	10	Excellent grammar, precise vocabulary, no errors	Minor grammatical/spelling errors	Noticeable errors but meaning is clear
	Total	40			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Presentation Skills	10	Highly confident, clear articulation, excellent eye contact, and engaging delivery	Clear and confident with minor issues in delivery	Adequate presentation with some hesitation
2.	Communication Effectiveness	10	Excellent verbal & non-verbal communication; ideas conveyed clearly and persuasively	Good communication with minor gaps	Understandable communication but lacks impact
3.	Interpersonal Skills and Teamwork	10	Excellent collaboration, leadership, and positive interaction with team members	Good teamwork and cooperative behavior	Works with team but limited engagement
4.	Event/Activity Organization Skills	10	Excellent planning, coordination, and execution of tasks/events	Good organization with minor gaps in execution	Basic organization with limited efficiency
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Theory Component				Laboratory Component		Percentage allocation	Mapping Strength
	Test I	Test II	Activity I	Activity II	Observation and Record	Practical Test		
C01	12	12			10	10	11	2
C02	24	24			20	20	22	3
C03	12	12			30	30	21	3
C04	12	12			20	20	16	2
C05			40		10	10	15	2
C06				40	10	10	15	2
Total	60	60	40	40	100	100	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);
Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26HMC01	தமிழர் மரபு B.E. (Common to all Branches)		பருவம்			I	
முன்நிபந்தனைகள்		Category	HM	Credits		1	
இலக்கணம் மற்றும் இலக்கியத்தின் அடிப்படைகள்		Hours/ Semester	L	T	P	SL	TH
			15	0	0	15	30
பாட நெறி நோக்கங்கள்							
1.	தமிழ்மொழி மற்றும் இலக்கியம் பற்றிய அறிவைப் பெற முடியும்.						
2.	பாரம்பரியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் மற்றும் சிற்பக்கலைகள் பற்றி தெரிந்து கொள்ள முடியும்.						
3.	நாட்டுப்புறக்கலைகள் மற்றும் வீர விளையாட்டுகள் பற்றி அறிந்து கொள்ளமுடியும்.						
4.	தமிழர்களின் ஒழுக்க நெறிமுறைகளைப் பற்றி தெரிந்து கொண்டு அதன்படி நடந்து கொள்ள முடியும்.						
5.	பழங்கால இந்திய தேசிய இயக்கம் பற்றியும், இந்தியமக்களின் பண்பாட்டில் தமிழர்களின் பங்களிப்பு பற்றியும் நன்கு அறிந்து கொள்ள முடியும்.						
அலகு - I மொழி மற்றும் இலக்கியம்:							
							3
இந்திய மொழிக்குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் -சங்க இலக்கியத்தின் சமயசார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மை கருத்துக்கள் - தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி- தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.							
அலகு - II		மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை					3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன்சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் - தேர்செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப் புறத்தெய்வங்கள் - குமரி முனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
அலகு - III		நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்					3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஓயிலாட்டம், தோல் பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.							
அலகு - IV		தமிழர்களின் திணைக் கோட்பாடுகள்					3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்கொப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும்- சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.							

அலகு - V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலை போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சுவரலாறு.		
L:15, T:0, P:0, SL:15, Total:30 Hours		
மதிப்பீட்டு விகிதம்: தொடர்மதிப்பீடு: 40% பருவ இறுதித்தேர்வுகள்: 60%		
குறிப்பு நூல்கள்:		
1.	தமிழக வரலாறு - மக்களும் பண்பாடும்- கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)	
2.	கணினித்தமிழ்- முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)	
3.	கீழடி- வைகை நதிகரையில் சங்ககால நகரநாகரீகம் (தொல்லியல்துறை வெளியீடு)	
4.	பொருநை - ஆற்றங்கரைநாகரீகம் (தொல்லியல்துறைவெளியீடு)	
5.	முத்திராமலிங்கம் சு. & சரவணகுமார்மு. "தமிழர்மரபு) Heritage of Tamils)", 2023 Yes Dee Publishing Pvt. Ltd., சென்னை.	
மின்னணுவளங்கள்:		
1.	https://en.wikipedia.org/wiki/Dravidian_languages	
2.	https://www.tamilvu.org/courses/degree/	
3.	https://www.scribd.com/document/802136891/Heritage-of-Tamils	
4.	https://www.scribd.com/document/718189396/AKAM-AND-PURAM	
5.	https://pmc.ncbi.nlm.nih.gov/articles/PMC10357311/	
பாடநெறிமுடிவுகள் (COs) / இந்தப்படிப்பு முடிந்ததும், மாணவர்களால்		
CO1	இந்திய மொழிகள், மொழிக்குடும்பங்கள், இலக்கியத்தின் தோற்றம் மற்றும் வளர்ச்சி ஆகியவற்றை விளக்குவதோடு, தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்புகளை மதிப்பிடுவார்கள்.	PO9
CO2	பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை தமிழர்களின் கலை மரபுகளை அறிந்து, தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் கோவில்களின் பங்கை விளக்குவார்கள்.	PO9
		Mapping PSOs

C03	தமிழர்களின் வாழ்வியல் முறைகளோடு தொடர்புடைய நாட்டுப்புறக்கலைகள், வீரவிளையாட்டுகள் மற்றும் சங்ககாலத்திணைக் கோட்பாடுகளைப் புரிந்து கொண்டு அவற்றின் பண்பாட்டு முக்கியத்துவத்தை எடுத்துரைப்பார்கள்.	PO9	PSO1
C04	இந்திய தேசிய இயக்கத்திலும் இந்தியப்பண்பாட்டு வளர்ச்சியிலும் தமிழர்களின் பங்களிப்பை ஆய்ந்து அதன் வரலாற்றுச் சிறப்பை விளக்குவார்கள்.	PO9	-
C05	இந்திய மொழிகள், இலக்கிய வளர்ச்சி, தமிழ் இலக்கிய அறிஞர்களின் பங்களிப்புகள், சங்ககாலத்திணைக் கோட்பாடுகள் ஆகியவற்றை அடிப்படையாகக் கொண்டு கருத்தரங்குகள், விளக்கவுரைகள், குழு விவாதங்கள் மற்றும் திட்டப்பணிகளை மேற்கொண்டு தங்களது பகுப்பாய்வுத்திறனை வெளிப்படுத்துவார்கள்.	PO9, PO11	PSO3
C06	தமிழர்களின் கலை, பண்பாடு, நாட்டுப்புறக்கலைகள், வீரவிளையாட்டுகள், கோவில் மரபுகள் மற்றும் தேசிய இயக்கத்தில் தமிழர்களின் பங்களிப்பு தொடர்பான கள ஆய்வு, ஆவணப்படுத்தல், படைப்பாற்றல் செயல்பாடுகள் மற்றும் வழங்கல்களின் மூலம் பண்பாட்டு விழிப்புணர்வு மற்றும் ஆய்வுத்திறன்களை வளர்த்துக் கொள்வார்கள்.	PO9, PO11	PSO3

வரையறுக்கப்பட்ட பாடக் கற்றல் விளைவுகளுக்கான பாட ஒருங்கிணைப்பு அட்டவணை (CAM)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
C01									3					
C02									3					
C03									3			2		
C04									3					
C05									3		2			2
C06									3		2			2

செயல்பாடுகள்:

	C05: தமிழர்களின் பாரம்பரிய அறிவியல் அறிவு, தொழில்நுட்பச் சாதனைகள் மற்றும் பண்பாட்டு மரபுகளை ஆராய்ந்து, அவற்றின் வரலாற்று மற்றும் தற்கால முக்கியத்துவத்தைப் புரிந்து கொள்வார்கள். செயல்பாடுகள்: 1. பழந்தமிழர்களின் அறிவியல் மற்றும் தொழில்நுட்பச் சாதனைகள் (எ.கா., நீர்ப்பாசன அமைப்புகள், கட்டிடக்கலை, உலோகவியல், கடல்சார்வாணிபம்) குறித்த கருத்தரங்கு வழங்கல். 2. பாரம்பரியத்தமிழ் அறிவு முறைகளின் தற்காலப் பயன்பாடு மற்றும் முக்கியத்துவம் குறித்த குழு விவாதம்.
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	3. தமிழர் பண்பாட்டு மரபுச் சின்னங்கள், வரலாற்று நினைவுச் சின்னங்கள் மற்றும் பொறியியல் அற்புதங்கள் தொடர்பான வழக்குக்கள் ஆய்வு (Case Study Analysis). 4. தமிழர்களின் பண்பாட்டு மற்றும் தொழில் நுட்பப்பங்களிப்புகளை எடுத்துக்காட்டும் வகையில் விளக்கப்படங்கள், மாதிரிகள் மற்றும் புகைப்படங்களைக் கொண்டு பாரம்பரியக் கண்காட்சி நடத்துதல், தமிழர் இலக்கியம், அறிவியல் மற்றும் பண்பாட்டுச் சாதனைகள் குறித்த வினாடி வினா மற்றும் பட்டிமன்றம் / விவாதம் நடத்துதல் 5. அருங்காட்சியகங்கள், பாரம்பரியத்தளங்கள், கோவில்கள் அல்லது தொல்லியல் தளங்களுக்கு களப்பயணம் மேற்கொண்டு ஆய்வறிக்கை சமர்ப்பித்தல்.
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2.	C06: தமிழர்களின் அறிவியல், தொழில் நுட்ப மற்றும் பண்பாட்டுப்பங்களிப்புகளின் பயன்பாடுகளையும் அவற்றின் தற்காலப் பொருத்தத்தையும் செயல் வழிக்கற்றல், வழக்குக்கள் ஆய்வுகள் மற்றும் திட்டப்பணிகள் மூலம் வெளிப்படுத்துவார்கள். செயல்பாடுகள்: 1. தமிழர்களின் பாரம்பரியத் தொழில் நுட்பங்கள் (நீர்மேலாண்மை, வேளாண் முறைகள், பாரம்பரியக் கட்டிடக்கலை போன்றவை (தொடர்பான சிறுதிட்டப்பணி (Mini Project) மேற்கொள்ளுதல். 2. தமிழர் பொறியியல் சாதனைகளை (எ.கா., கல்லணை, கோவில்கட்டிடக்கலை, பண்டைய கடற்படைக் கப்பல்கள் (விளக்கும் மாதிரி வடிவமைத்தல்) Model Making Activity). 3. பண்டைய தமிழர் தொழில் நுட்பங்களையும் நவீனதொழில் நுட்பங்களையும் ஒப்பிட்டு வழக்குக்கள் ஆய்வு வழங்கல் (Case Study Presentation) மேற்கொள்ளுதல். 4. பாரம்பரியக்கலைகள், கைவினைப்பொருட்கள், நாட்டுப்புற நடைமுறைகள் அல்லது பூர்வீகத் தொழில்நுட்பங்கள் தொடர்பான செயல் விளக்கக்காட்சி) Practical Demonstration) நடத்துதல். 5. தமிழர்களின் அறிவியல் மற்றும் தொழில்நுட்பப் பங்களிப்புகளை எடுத்துரைக்கும் சுவரொட்டி (Poster) மற்றும் தகவல் விளக்கப்படம் (Infographic) தயாரித்தல், உள்ளூர் பாரம்பரிய அறிவு, நாட்டுப்புறப் பழக்க வழக்கங்கள் அல்லது பண்பாட்டு மரபுகள் தொடர்பான சமூக அடிப்படையிலான ஆய்வுத்திட்டம் மேற்கொண்டு அதன் முடிவுகளை வழங்குதல்.
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C05-க்கான மதிப்பீட்டு அளவு கோல்கள்

வரி சை எண்	மதிப்பீட்டு அளவுகோல்	மதிப் பெண் கள்	மிகச்சிறப்பு (7-8)	சிறப்பு (4-6)	திருப்திகரம் (1-3)
1.	தமிழர் பாரம்பரியம் குறித்த அறிவு	8	தமிழர்களின் அறிவியல், தொழில்நுட்ப மற்றும் பண்பாட்டு மரபுகள் குறித்து துல்லியமான விவரங்களுடன் விரிவான புரிதலை வெளிபடுத்துகிறார்.	சிறிய குறைபாடுகளு டன் நல்ல புரிதலை வெளிபடுத்துகி றார்.	வரையறுக்கப்பட்ட விவரங்களுடன் அடிப்படைப்புரித லை வெளிபடுத்துகிறார்

2.	வரலாற்றுப்புரிதல்	8	வரலாற்றுப் பின்னணி மற்றும் அதன் முக்கியத்துவத்தைபொருத்தமானஎடுத்துக்காட்டுகளுடன் தெளிவாகவிளக்குகிறார்.	சிலஎடுத்துக்காட்டுகளுடன்வரலாற்றுப்பின்னணியைவிளக்குகிறார்.	வரலாற்றுப்பின்னணியைகுறைந்தஅளவில்விளக்குகிறார்.
3.	தற்காலப்பொருத்தம்	8	பாரம்பரிய அறிவு மற்றும் சாதனைகளை இன்றைய பயன்பாடுகள் மற்றும் பிரச்சினைகளுடன் திறம்பட தொடர்புபடுத்துகிறார்.	பாரம்பரிய அறிவை நவீன பயன்பாடுகளுடன் ஓரளவு தெளிவாக தொடர்புபடுத்துகிறார்.	சில நவீன தொடர்புகளை மட்டுமே அடையாளம்காண்கிறார்.
4.	வழங்கல்மற்றும்தொடர்புத்திறன்	8	தகவல்கள் சிறப்பாக ஒழுங்கமைக்கப்பட்டு, தெளிவாகவும் சுவாரஸ்யமாகவும் பொருத்தமான ஆதாரங்களுடன் வழங்கப்படுகின்றன.	தகவல்கள் ஒழுங்கமைக்கப்பட்டு பெரும்பாலும் தெளிவாக வழங்கப்படுகின்றன.	தகவல்கள் புரிந்து கொள்ளக்கூடியதாக இருந்தாலும்க தெளிவு மற்றும் ஒழுங்கமைப்பு குறைவாக உள்ளது.
5.	தொடர்புத்திறன்	8	கருத்துகள் தெளிவாகவும், தன்னம்பிக்கையுடனும், ஈர்க்கக் கூடியவகையிலும், பொருத்தமான ஆதாரங்களுடன் வெளிப்படுத்தப்படுகின்றன.	கருத்துகள் தெளிவாகவும், மிதமான தன்னம்பிக்கையுடனும், போதுமான ஆதாரங்களுடனும் வெளிப்படுத்தப்படுகின்றன.	கருத்துப்பரிமாற்றம் புரிந்துகொள்ளக்கூடியதாக இருந்தாலும்க தெளிவு, தன்னம்பிக்கை அல்லது பொருத்தமான ஆதாரங்களின் குறைபாடுகாணப்படுகிறது.
	மொத்தம்	40			

CO6-க்கான மதிப்பீட்டு அளவு கோல்கள்

வரி சை எண்	மதிப்பீட்டு அளவுகோல்	மதிப் பெண் கள்	மிகச்சிறப்பு (7-8)	சிறப்பு (4-6)	திருப்திகரம் (1-3)
1.	அறிவின் பயன்பாடு	8	தமிழர்களின் அறிவியல், தொழில்நுட்ப மற்றும் பண்பாட்டுக்கருத்து க்களை செயல் வழிப்பணிகள் மற்றும் திட்டங்களில் திறம்படப்பயன்படு த்துகிறார்.	கருத்துக்களை சிறிய வழிகாட்டுதலு டன் சரியாகப் பயன்படுத்துகி றார்.	கருத்துக்களை அடிப்படை அளவில் மட்டுமே பயன்படுத்துகிறார்.
2.	திட்டப்பணி செயல்படுத்த ல்	8	திட்டப்பணி முழுமையானதாக வும், புதுமையானதாகவு ம், சிறந்த திட்டமிடலுடன்வெ ற்றிகரமாக நிறைவேற்றப்பட்ட தாகவும் உள்ளது.	திட்டப்பணி சிறிய குறைபாடுக ளுடன் நன்கு செயல்படுத்த ப்பட்டுள்ளது.	திட்டப்பணி குறைந்தபட்ச தேவைகளைப் பூர்த்தி செய்கிறது; ஆனால் ஆழமும் முழுமையும் குறைவாக உள்ளன.
3.	ஆதாரங்கள் மற்றும் வளங்களின் பயன்பாடு	8	திட்டத்தின் முடிவுகளை ஆதரிக்க பொருத்தமான தரவுகள், ஆதாரங்கள் மற்றும் எடுத்துக்காட்டுக ளை திறம்படப் பயன்படுத்துகிறார்.	போதுமான ஆதாரங்களுட ன் பொருத்தமான வளங்களைப் பயன்படுத்துகி றார்.	குறைந்த அளவிலான ஆதாரங்கள் மற்றும் வளங்களைப் பயன்படுத்துகிறார்.
4.	வழங்கல் மற்றும்ஆவ ணப்படுத்தல்	8	முடிவுகளைத் தெளிவாகவும் தொழில்முறைமு றையிலும் சிறப்பான ஆவணப்படுத்தலுட ன் வழங்குகிறார்.	நல்ல ஆவணப்படுத்த லுடன் தெளிவாக வழங்குகிறார்.	வழங்கல் மற்றும் ஆவணப்படுத்தல் போதுமானதாக இருந்தாலும் தெளிவும் விவரங்களும் குறைவாக உள்ளன.

5.	ஆவணப்படுத்தலின்தரம்	8	ஆவணப்படுத்தல் முழுமையானதாகவும், துல்லியமானதாகவும், நன்கு ஒழுங்கமைக்கப்பட்டதாகவும், சரியான வடிவமைப்புடன் அமைந்ததாகவும் உள்ளது.	ஆவணப்படுத்தல் முழுமையாகவும், சிறிய விடுபாடுகளுடன் ஒழுங்கமைக்கப்பட்டதாகவும் உள்ளது.	ஆவணப்படுத்தல் போதுமானதாக இருந்தாலும், விவரம், துல்லியம் அல்லது சரியான ஒழுங்கமைப்பு ஆகியவற்றில் குறைபாடுகள் காணப்படுகின்றன.
	மொத்தம்	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12	-	-	12	2
C02	24	24			24	3
C03	12	12			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	2
Total	60	60	40	40	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);
Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26HMC01	HERITAGE OF TAMILS B.E. (Common to all Branches)		SEMESTER				I
Prerequisites		Category	HM	Credits			1
Basics of Tamil Language and Literature.		Hours/ Semester	L	T	P	SL	TH
			15	0	0	15	30
COURSE OBJECTIVES							
1.	To obtain the knowledge of Tamil Language and Literature.						
2.	To familiarize with painting and Sculpture.						
3.	To know about the folks and martial arts.						
4.	To understand the Thinaï concept of Tamils.						
5.	To know about the contribution of Tamils to Indian National Movement and Indian Culture.						
UNIT - I	LANGUAGE AND LITERATURE						3
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.							
UNIT - II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE						3
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.							
UNIT - III	FOLK AND MARTIAL ARTS						3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.							
UNIT - IV	THINAI CONCEPT OF TAMILS						3
Lora and Fauna of Tamils, Aham and Puram Concepts from Tholkappiyam and Sangam Literature-Aram Concept of Tamils, Education and Literacy during the Sangam Age. Ancient Cities and Ports of the Sangam Age, Export and Import during the Sangam Age Overseas Conquests of the Cholas.							
UNIT - V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE						3
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.							
L:15, T:0, P:0, SL:15, Total:30 Hours							
Weightage:							
Continuous Assessment : 40%							
End Semester Examinations : 60%							

1.	Dr. K. K. Pillay., "Social Life of Tamils" A joint publication of TNTB & ESC and RMRL – (in print)
2.	Dr. S. Singaravelu., "Social Life of the Tamils - The Classical Period", International Institute of Tamil Studies Publications.
3.	"Porunai Civilization", Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation Publications, Tamil Nadu.
4.	"Keeladi-Sangam City Civilization on the banks of river Vaigai", Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation Publications, Tamil Nadu.
5.	"Heritage of Tamils", Muthuramalingam S and Dr Saravanakumar. M, Yes Dee Publication, 2023.

1. https://en.wikipedia.org/wiki/Dravidian_languages
2. <https://www.tamilvu.org/courses/degree/>
3. <https://www.scribd.com/document/802136891/Heritage-of-Tamils>
4. <https://www.scribd.com/document/718189396/AKAM-AND-PURAM>
5. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10357311/>

The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01									3					
C02									3					
C03									3			2		
C04									3					
C05									3		2			2
C06									3		2			2

1.	CO5: Examine the traditional scientific knowledge, technological achievements, and cultural heritage of the Tamils, and understand their historical and contemporary significance. Seminar Presentation on ancient Tamil scientific and technological achievements (e.g., irrigation systems, architecture, metallurgy, maritime trade). Group Discussion on the relevance of traditional Tamil knowledge systems in modern society.	
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	Case Study Analysis of Tamil cultural heritage sites, monuments, and engineering marvels. Heritage Exhibition displaying charts, models, and photographs related to Tamil cultural and technological contributions, Quiz and Debate on Tamil literary, scientific, and cultural achievements. Field Visit to museums, heritage sites, temples or archaeological locations and submission of a report.
2.	CO6: Demonstrate the applications and relevance of Tamil scientific, technological, and cultural contributions through practical activities, case studies, and project-based work. Mini Project on traditional Tamil technologies such as water management, agricultural practices, or indigenous architecture. Model Making Activity depicting Tamil engineering achievements (e.g., Kallanai Dam, temple architecture, ancient ships). Case Study Presentation comparing ancient Tamil technologies with contemporary technologies. Practical Demonstration of traditional arts, crafts, folk practices, or indigenous techniques. Community-Based Project documenting local traditional knowledge, folk practices, or cultural heritage and presenting the findings, Digital Portfolio Development showcasing project outcomes, photographs, reports, and reflections on Tamil heritage and technology.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Knowledge of Tamil Heritage	8	Demonstrates comprehensive understanding of Tamil scientific, technological, and cultural heritage with accurate details.	Demonstrates good understanding with minor omissions.	Demonstrates basic understanding with limited details
2.	Historical Understanding	8	Clearly explains historical context and significance with relevant examples.	Explains historical context with some supporting examples.	Provides limited explanation of historical context.
3.	Contemporary Relevance	8	Effectively relates traditional knowledge and achievements to present-day applications and issues.	Relates traditional knowledge to modern applications with some clarity.	Identifies a few modern connections.
4.	Presentation Skills	8	Content is well-organized, visually appealing, and presented effectively.	Content is organized and presented clearly	Content is organized and presented clearly with minor shortcomings.
5.	Communication Skills	8	Ideas are communicated clearly, confidently, and engagingly with appropriate supporting evidence.	Ideas are communicated clearly with moderate confidence and adequate support.	Communication is understandable but lacks clarity, confidence, or supporting evidence.
	Total	40			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Application of Knowledge	8	Effectively applies Tamil scientific, technological, and cultural concepts to practical tasks and projects.	Applies concepts correctly with minor guidance.	Applies concepts at a basic level with limited effectiveness.
2.	Project Execution	8	Project is comprehensive, innovative, well-planned, and successfully completed.	Project is well-executed with minor shortcomings.	Project meets minimum requirements but lacks depth or completeness.
3.	Use of Evidence and Resources	8	Effectively uses relevant data, sources, and examples to support project outcomes.	Uses appropriate resources with adequate supporting evidence.	Uses limited resources and supporting evidence.
4.	Presentation Skills	8	Presents findings clearly, professionally, and effectively.	Presents findings clearly with minor shortcomings.	Presentation is adequate but lacks clarity, organization or professionalism.
5.	Documentation Quality	8	Documentation is comprehensive, accurate, well-organized and properly formatted.	Documentation is complete and organized with minor omissions.	Documentation is adequate but lacks detail, accuracy, or proper organization.
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	12	12			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26PHC02	MATERIALS SCIENCE			SEMESTER			I	
Prerequisites			Category	BS	Credits			3
			Hours/ Semester	L	T	P	SL	TH
				45	0	0	45	90
COURSE OBJECTIVES								
1.	To understand the fundamental concepts of semiconductor materials, carrier transport mechanisms, and their applications.							
2.	To explain the polarization mechanisms, dielectric behaviour and practical applications of dielectric materials in electrical and electronic systems.							
3.	To analyse the properties and applications of magnetic materials and superconductors used in modern engineering technologies.							
4.	To gain knowledge of nanomaterials, their synthesis techniques, characterization methods, properties and multidisciplinary applications.							
5.	To understand advanced engineering materials such as metallic glasses, shape memory alloys, ceramics, composites and their applications.							
UNIT - I	SEMICONDUCTING MATERIALS							9
Semiconductor materials: Intrinsic and extrinsic semiconductors - Carrier concentration(derivation) for intrinsic semiconductor, n-type and p-type semiconductor – Fermi level – Variation of carrier concentration on temperature and impurity – Direct and indirect band gap semiconductor – Drift and diffusion currents – Hall effect – Determination of Hall coefficient – Applications – Metal–semiconductor junctions (Ohmic and Schottky junctions). Activity: Virtual demonstration of Hall effect								
UNIT - II	DIELECTRIC MATERIALS							9
Dielectric materials: Dielectric polarization – Electronic, ionic, orientational and space charge polarization – Internal fields in solids – Clausius – Mossotti relation – Frequency dependence of polarization - Application of dielectric materials (transformers and capacitors), Dielectric loss – Dielectric breakdown - Ferro and piezo electric materials. Activity: Virtual demonstration of ferro electric materials								
UNIT - III	MAGNETIC AND SUPERCONDUCTING MATERIALS							9
Magnetic Materials: Magnetic material parameters, Ferromagnetic materials – Hysteresis - Ferrites – Soft and Hard magnetic materials, GMR sensors, magnetic disk memories, Principle of magnetic recording, Materials for magnetic data storage. Superconductivity: Properties – Type I & Type II superconductors – BCS theory – Applications – magnetic levitation – SQUID. Activity: Virtual demonstration of MAGLEV trains								
UNIT - IV	NANOMATERIALS							9
Nanomaterials: Introduction – Classification of nanomaterials – Top-down and bottom-up approaches – Synthesis techniques: Ball milling, Plasma arcing, Sol-Gel method – Quantum confinement effect – Quantum structures: Quantum wells, Quantum wires and Quantum dots –Band gap of nanomaterials. Carbon nanotubes – Graphene, Fullerene and Buckyballs – Structure – Properties – Applications. Nanodevices: Quantum dot LEDs (QLEDs), Nanosensors and Nano-transistors Activity: Virtual demonstration of QLED								

UNIT - V	ADVANCED ENGINEERING MATERIALS	9	
Metallic Glasses: Preparation – Properties – Applications. Shape Memory Alloys (SMA): Types – Properties – Applications. Ceramic Materials: Classification – Properties – Traditional and advanced ceramics – Applications. Composite Materials: Classification – Fibre reinforced composites – Particle reinforced composites – Properties – Applications.			
Activity: Virtual demonstration of melt-spinning process			
L:45, T:0, P:0, SL:45, Total:90 Hours			
Weightage:			
Continuous Assessment : 40%			
End Semester Examinations : 60%			
TEXT BOOKS:			
1.	M. Arumugam, 'Materials Science', Anuradha Publications, Kumbakonam, 2018.		
2.	V. Rajendran and A. Marikani, 'Materials Science', Tata McGraw Publications, New Delhi, 2012.		
3.	S.O. Pillai, 'Solid State Physics', New Age International Publishers, New Delhi, 2026.		
REFERENCE BOOKS:			
1.	Charles Kittel, 'Introduction to Solid state Physics', John Wiley and Sons, 7 th Edition, Singapore, 2019.		
2.	Charles P. Poole and Frank J. Owens, 'Introduction to Nanotechnology', Wiley India, 2007.		
3.	S. O. Kasap, 'Principles of electronic materials and devices', McGrawHill Education, 2007.		
E-RESOURCES:			
1.	Hall Effect: https://ssp-amrt.vlabs.ac.in/exp/hall-effect-chargecarrier/simulation.html		
2.	Hysteresis curve: https://em-amrt.vlabs.ac.in/exp/quinckes-method		
3.	Magnets and Electromagnets: https://phet.colorado.edu/en/simulations/magnets-and-electromagnets		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			
CO1	Explain the preparation, properties and applications of various materials.	Mapping POs	Mapping PSOs
CO2	Apply the principles of various materials to identify suitable materials for diverse applications.	PO1	
CO3	Analyse the properties and performance of different materials suitable for specific applications.	PO2	
CO4	Perform experimentations as a group and interpret the results.	PO4, PO8	
CO5	Communicate the societal, environmental and technological impacts of engineering materials in solving real-world problems.	PO6, PO9	PSO3
CO6	Analyse emerging engineering materials to address modern industrial and societal needs in engineering applications through self-learning activities.	PO11	

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01														
C02	3													
C03		3												
C04				2				2						
C05						2			2					2
C06											2			

Activities:

1.	a. Experimental determination of Hall coefficient / Hysteresis loop for a ferromagnetic material (C04) b. Seminar / Poster presentation on dielectric materials in renewable energy systems / Economic, Environmental and Social issues of material usage (C05)
2.	a. Literature review on nanomaterial product for real-world problems (C06) b. Seminar/Poster presentation on emerging concepts and advancements in materials science, considering the economic, environmental, and societal impacts of material usage. (C05)

Rubrics for evaluation: C04

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Formula / Theory	5	Clearly explains the concept with correct formula	Explains the concept with minor errors	Limited understanding of theory and formula
2.	Procedure & Observation	5	Clearly performs and explains the experimental procedure with accurate observations	Performs the procedure with minor mistakes	Procedure and observations are poorly explained
3.	Result & Interpretation	10	Correctly calculates and correlates the result with theoretical concepts	Result is obtained with partial interpretation	Incorrect or incomplete result interpretation
	Total	20			

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Subject Knowledge	5	Clearly explains the concept with relevant examples	Good explanation with minor gaps	Basic understanding of the topic
2.	Content Organization	5	Information is well-organized, clear, and logically presented	Organization is good with minor improvements needed	Average organization of content

3.	Poster / Presentation Design	5	Attractive, creative, and easy-to-understand design with effective visuals	Good design with minor issues	Adequate design with limited visuals
4.	Communication Skills	5	Confident presentation with clear explanation and effective response to questions	Good communication with slight hesitation	Basic communication skills
	Total	20			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Topic Understanding	5	Clearly explains the concept and its real-world application with relevant details	Good explanation with minor gaps	Basic understanding of the topic
2.	Literature Review	5	Reviews and compares multiple relevant research articles effectively	Reviews relevant articles with some comparison	Limited review of articles
3.	Analysis & Interpretation	5	Critically analyses the product performance, advantages, and limitations	Good analysis with minor shortcomings	Basic analysis provided
4.	Presentation & Communication	5	Well-organized report/presentation with clear communication and proper references	Organized presentation with minor errors	Average presentation and communication
	Total	20			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	24	24			24	3
CO4			20		10	2
CO5			20	20	20	2
CO6				20	10	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);
Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MAC01	MATRICES AND CALCULUS B.E. (Common to all Branches Except EEE)		SEMESTER			I	
Prerequisites		Category	BS	Credits		4	
Basic 12th level Matrices, Differential Calculus and Integral Calculus.		Hours/ Semester	L	T	P	SL	TH
			45	15	0	60	120
COURSE OBJECTIVES							
1.	To understand the fundamental concepts of matrices, eigen values, eigen vectors, diagonalization and quadratic forms for solving algebraic and engineering problems.						
2.	To develop knowledge in functions of several variables, partial differentiation, Jacobians, and optimization techniques involving maxima, minima and Lagrange multipliers.						
3.	To apply techniques of integral calculus, including differentiation under the integral sign, Leibnitz rule, and Beta and Gamma functions in the evaluation of integrals.						
4.	To acquire problem-solving skills in double and triple integrals, change of variables and applications related to area and volume computations.						
5.	To understand and apply vector calculus concepts such as gradient, divergence, curl, line, surface, and volume integrals along with Green's, Stoke's and Gauss divergence theorems in mathematical and engineering applications.						
UNIT - I	MATRICES						9+3
Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors– Cayley–Hamilton theorem (excluding proof) – Diagonalization of matrices – Reduction of Quadratic form to canonical form by using orthogonal transformation – Nature of a Quadratic form.							
UNIT - II	FUNCTIONS OF SEVERAL VARIABLES						9+3
Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Jacobians – Taylor's formula for two variables– Maxima and Minima of functions of two variables – Lagrange's method of undermined multipliers.							
UNIT - III	INTEGRAL CALCULUS						9+3
Differentiation under integrals – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions– Properties – Evaluation of single integrals by using Beta and Gamma functions.							
UNIT - IV	MULTIPLE INTEGRALS						9+3
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals.							
UNIT - V	VECTOR CALCULUS						9+3
Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields – Line integrals over a plane curve – Surface integrals – Area of a curved surface – Volume Integral – Green's theorem, Stoke's and Gauss divergence theorems (without proofs)– Verification and applications in evaluating line, surface and volume integrals.							
L:45, T:15, P:0, SL:60, Total:120 Hours							
Weightage:							
Continuous Assessment : 40%							
End Semester Examinations : 60%							

TEXT BOOKS:			
1.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45 th Edition, New Delhi, 2020.		
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", 10 th Edition, Wiley India Pvt Ltd., New Delhi, 2018.		
REFERENCE BOOKS:			
1.	James Stewart, Daniel K Clegg & Saleem Watson, "Calculus with Early Transcendental Functions", Cengage Learning, 6 th Edition, New Delhi, 2023.		
2.	Joel Hass, Christopher Heil, Maurice D.Weir, "Thomas' Calculus", 14 th Edition, Pearson Education, New Delhi, 2018.		
3.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.		
E-RESOURCES:			
1.	NPTEL, "Engineering Mathematics-I", National Programme on Technology Enhanced Learning, https://www.nptel.ac.in/courses/111105121		
2.	MIT Open Course Ware, "Single Variable Calculus and Multivariable Calculus", Massachusetts Institute of Technology, https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/		
3.	Khan Academy, "Linear Algebra and Multivariable Calculus", https://www.khanacademy.org/math/linear-algebra , https://www.khanacademy.org/math/multivariable-calculus		
4.	Paul's Online Math Notes, "Calculus III and Linear Algebra", Lamar University, https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx		
5.	Wolfram Math World, "Mathematics Resource", Wolfram Research, https://mathworld.wolfram.com/topics/VectorCalculus.html		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Remember and understand the fundamental concepts and methods in matrices, functions of several variables, integral calculus, multiple integrals and vector calculus including eigen values and eigen vectors, Cayley–Hamilton theorem, quadratic forms, partial derivatives, Jacobians, maxima and minima, Beta and Gamma functions, double and triple integrals, gradient, divergence, curl and Green's, Stoke's and Gauss divergence theorems.	--	--
CO2	Apply the concepts and techniques of matrices, functions of several variables, integral calculus, multiple integrals and vector calculus to solve mathematical and engineering problems involving eigen values and quadratic forms, optimization of multivariable functions, evaluation of integrals using Beta and Gamma functions, computation of areas and volumes through multiple integrals and evaluation of line, surface, and volume integrals using Green's, Stoke's and Gauss divergence theorems.	PO1	PSO1
CO3	Analyze mathematical and engineering problems using the principles of matrices, functions of several variables, integral calculus, multiple integrals and vector calculus by interpreting eigen values and quadratic forms, examining extrema of multivariable functions, selecting suitable integration techniques, transforming multiple integrals using coordinate changes and analyzing vector fields through divergence, curl and integral theorems.	PO2	PSO1

C04	Design and develop mathematical solution strategies using matrices, multivariable calculus, multiple integrals, and vector calculus techniques for solving engineering problems related to optimization, coordinate transformations, area and volume computations and vector field analysis.	PO3	PSO2
C05	Communicate and interpret mathematical results effectively by applying appropriate mathematical representations, analytical methods and vector integral theorems in solving practical and engineering-oriented problems.	PO10	PSO2
C06	Utilize mathematical and computational techniques from matrices, multivariable calculus, integral calculus, multiple integrals, and vector calculus to model, interpret and solve real-world engineering and scientific problems effectively.	PO5	PSO2

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01														
C02	3											3		
C03		2										2		
C04			1										2	
C05										3			2	
C06					3								2	

Activities:

1.	Mathematical Presentation and Report Writing on Engineering Applications of Vector Calculus (C05) Students can choose one application-based problem from vector calculus such as work done by a force field, flux through a surface, verification of Green's theorem, Stoke's theorem or Gauss divergence theorem. They should solve it step by step, interpret the answer and present it with proper mathematical notation, diagram and short report.
2.	Computational Exploration of Matrices, Multiple Integrals, and Vector Fields using Software (C06) Students can use Python, GeoGebra or any open-source mathematical software to solve and visualize problems. Examples include finding eigen values and eigen vectors, diagonalization, plotting functions of two variables, evaluating double/triple integrals, plotting vector fields, and interpreting gradient, divergence and curl.

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection and understanding of problem	8	Application-oriented problem is clearly selected and concept is correctly explained	Problem is selected properly, but explanation needs minor improvement	Problem selection is basic and conceptual understanding is limited

2.	Mathematical formulation and solution	8	Correct formulation, step-by-step solution and proper use of formulae/theorems	Formulation and solution are mostly correct with minor errors	Formulation is incomplete and solution contains several errors
3.	Interpretation of results	8	Results are clearly interpreted with physical or engineering meaning	Results are interpreted, but explanation is not detailed enough	Interpretation is weak or unclear
4.	Communication, presentation and report writing	8	Neat presentation with correct notation, diagrams and well-structured report	Presentation is understandable, but needs improvement in notation or organization	Presentation is poorly organized and mathematical communication is unclear
5.	Overall analytical approach	8	Work demonstrates excellent analytical thinking and professional academic approach	Analytical approach is good with minor limitations	Analytical approach is satisfactory but lacks depth
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Use of computational tool	8	Appropriate software/tool is selected and used effectively	Tool is used properly, but with minor limitations	Use of tool is limited or not clearly demonstrated
2.	Accuracy of computation and mathematical method	8	Computations are accurate and mathematical method is correctly applied	Computations are mostly correct with minor errors	Computations contain significant errors or method is unclear
3.	Visualization and interpretation	8	Graphs, plots, matrices, vector fields or integral regions are clearly visualized and interpreted	Visualization is given, but interpretation needs improvement	Visualization is incomplete or interpretation is unclear
4.	Report preparation and conclusion	8	Report has objective, procedure, output, interpretation and conclusion	Report is acceptable, but needs better structure or explanation	Report is incomplete or poorly structured
5.	Overall presentation and analytical quality	8	Work demonstrates excellent analytical approach and professional presentation	Analytical quality and presentation are good with minor issues	Analytical quality is satisfactory but lacks depth
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12	-	-	12	2
C02	24	24	-	-	24	3
C03	16	16	-	-	16	2
C04	8	8	-	-	8	1
C05	-	-	40	-	25	3
C06	-	-	-	40	25	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MEC01	ENGINEERING GRAPHICS	SEMESTER				I	
Prerequisites		Category	ES(G)	Credits		4	
Basic geometry and Usage of drawing instrument		Hours/ Semester	L	T	P	SL	TH
			30	45	0	45	120
COURSE OBJECTIVES							
1.	To impart knowledge on dimensions and drawing standards.						
2.	To explore the projection of points, lines, planes and solids.						
3.	To explore the section of solids with various cutting planes						
4.	To provide the understanding of orthographic and isometric views.						
5.	To provide the understanding of perspective views and its applications.						
UNIT - I	PLANE CURVES, PROJECTION OF POINTS AND LINES						15
Fundamentals: Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning. Construction of curves - ellipse, parabola, and hyperbola (eccentricity method only), Construction of cycloids, involutes - Drawing of tangents and normal to the above curves. Projection of points and Lines – Projections points in all four quadrants, Projections of straight lines located in first quadrant – parallel and inclined to both planes - determination of true length and true inclinations by rotating line method.							
UNIT - II	PROJECTION OF PLANES AND PROJECTION OF SOLIDS						15
Projections of plane surfaces - polygonal lamina and circular lamina, located in the first quadrant and inclined to both reference planes. Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane.							
UNIT - III	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES						15
Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.							
UNIT - IV	ORTHOGRAPHIC PROJECTION						15
Orthographic Projection: First angle projection, Visualization concepts - Representation of three-dimensional objects - layout of views - Different views of inclined, curved and simple objects.							
UNIT - V	ISOMETRIC AND PERSPECTIVE PROJECTION						15
Isometric projection , Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders, cones and simple objects. (For Exam) Perspective Projection: Simple solids - Prism and Pyramid by visual ray method. (For practice only)							
L:30, T:45, P:0, SL:45, Total:120 Hours							
Weightage: Continuous Assessment : 40% End Semester Examinations : 60%							

REFERENCE BOOKS:	
1.	Natarajan K.V., Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
2.	Warren J. Luzadder and Jon. M. Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., New Delhi, Eleventh Edition, 2005.
3.	Gopalakrishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.
4.	Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008.
5.	Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, New Delhi, 2008.

E-RESOURCES:	
1.	Online Resources (Open sources): 1. nptel.ac.in/courses/112102304 2. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr25_ed52
2.	Engineering Drawing and Computer Graphics, Prof.RajaramLakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview
3.	MIT Design Handbook: Engineering Drawing and Sketching – https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the fundamentals of engineering drawing, BIS standards, dimensioning methods, and standard drawing practices.	--	--
CO2	Construct engineering curves such as ellipse, parabola, hyperbola, cycloid, and involute, using standard drafting techniques.	PO1, PO2,PO3, PO5, PO10, PO11	PSO1, PSO2, PSO3
CO3	Apply the principles of projection to construct the projections of points, lines, planes, solids, sectional views, and surface developments.	PO1, PO2,PO3, PO5, PO10, PO11	PSO1, PSO2, PSO3
CO4	Apply projection principles to create orthographic, isometric, and perspective views of engineering objects using standard drawing practices.	PO1, PO2,PO3, PO5, PO10, PO11	PSO1, PSO2, PSO3
CO5	Construct engineering drawings of curves, projections, sectional views, and surface developments of simple solids using standard drafting instruments and BIS conventions.	PO1, PO2,PO3, PO5, PO10, PO11	PSO1, PSO2, PSO3
CO6	Create orthographic, isometric, and perspective drawings of engineering components and physical models to effectively communicate design and improve spatial visualization skills.	PO1, PO2,PO3, PO5, PO10, PO11	PSO1, PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3	2	2		2					2	1	3	2	1
CO3	3	3	2		2					1	1	3	2	1
CO4	3	2	3		2					1	1	3	3	1
CO5	3	3	2		2					1	1	3	2	1
CO6	3	2	3		2					2	1	3	3	2

Activities:					
1.	Construct conic sections, cycloids, involutes, and spirals using drawing instruments and demonstrate their formation using physical models or CAD tools.				
2.	Mini Design Project – Create the complete drawing of a simple engineering component (e.g., bracket, machine block, pipe support) including orthographic, isometric, sectional view and dimensions.				
Rubrics for evaluation: CO5					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Accuracy of Engineering Curves	8	Curves are constructed accurately with correct dimensions and geometry	Minor errors in construction or dimensions	Noticeable errors affecting accuracy
2.	Projection and Sectional View Construction	10	Projections and sectional views are complete, correct, and clearly represented	Minor mistakes in views or missing details	Incomplete or incorrect representation
3.	Surface Development of Solids	8	Developments are accurate with correct geometry and layout	Minor dimensional or layout errors	Significant errors in development
4.	Use of Drawing Instruments and Standards	6	Proper use of instruments with BIS standards followed throughout	Small deviations from standards or instrument usage	Improper use of standards and instruments
5.	Neatness, Presentation, and Sheet Organization	8	Excellent line quality, lettering, dimensioning, and sheet layout	Acceptable presentation with few inconsistencies	Poor presentation and organization
	Total	40			
Rubrics for evaluation: CO6					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Accuracy of Orthographic Views	10	Produces complete and accurate orthographic views with correct dimensions and alignment	Produces views with minor dimensional or projection errors	Produces basic views with noticeable errors or incomplete details
2.	Quality of Isometric Representation	10	Drawings are accurate, proportionate, and clearly represent the object	Drawings are mostly accurate with minor proportional issues	Drawings show limited accuracy and representation

3.	Perspective Drawing Skills	8	Applies perspective principles correctly with realistic depth and proportions	Applies perspective concepts with minor errors	Demonstrates basic perspective drawing with several inaccuracy
4.	Visualization and Interpretation Skills	8	Easily visualizes and converts objects into multiple graphical views accurately	Demonstrates good visualization with few interpretation mistakes	Shows limited visualization and interpretation ability
5.	Drawing Standards, Neatness, and Presentation	4	Excellent line quality, dimensioning, lettering, and neat presentation	Presentation is clear with minor issues in neatness or standards	Presentation is acceptable but lacks consistency and neatness
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	10	10			10	2
CO2	10				5	1
CO3	40	20			30	2
CO4		30			15	2
CO5			40		20	3
CO6				40	20	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26EEEC01	BASIC ELECTRICAL & ELECTRONICS ENGINEERING		SEMESTER				I	
Prerequisites			Category	ES(G)	Credits			4
			Hours/ Semester	L	T	P	SL	TH
				45	0	45	30	120
COURSE OBJECTIVES								
1.	To impart foundational knowledge in principles and applications of electrical and electronics engineering.							
UNIT - I		DC CIRCUITS						9+9
Electrical circuit elements: Resistor (R), Inductor (L) and Capacitor (C) – Independent Voltage and Current Sources – Ohm’s Law and Kirchhoff’s Laws – Resistance in Series and Parallel Circuits – Voltage Division and Current Division Rules – Analysis of simple electrical circuits with DC excitation using fundamental laws (Mesh and Nodal Analysis) – Superposition Theorem – Thevenin’s Theorem.								
Practical: Verification of Kirchhoff’s Law, Superposition theorem and Thevenin’s theorem. Measurement of time constant of Series / Parallel R-C circuit.								
Activities: Solving Problems in DC electric circuits.								
UNIT - II		AC CIRCUITS						9+9
Introduction to Single-Phase AC Circuits – Representation of Sinusoidal Waveforms: Average Value, RMS Value, Form Factor, Peak Factor and Phasor Representation – Analysis of Single-Phase AC Circuits consisting of RL, RC, and RLC Series Combinations: Impedance, Power factor, Power and Phasor diagram, Three-Phase AC Circuits: Voltage and Current Relationships in Balanced Star and Delta Connections.								
Practical: Sinusoidal steady state response of Series RL, and RC circuits – measurement of impedance and power factor. Measurement of three-phase power by two wattmeter method in three-phase circuits. Study of Resonance in Series RLC Circuit.								
Activities: Solving Problems in AC electric circuits.								
UNIT - III		ELECTRICAL MACHINES AND TRANSFORMERS						9+9
Construction, Principle of Operation, Types, Characteristics and Applications: DC Motor (Shunt and Series), BLDC Motor, Three-Phase Induction Motor, Single-Phase Induction Motors (Split-Phase and Capacitor-Start Capacitor-Run Type), Transformers (Core and Shell type).								
Practical: Speed control of DC shunt motor & Load test on DC shunt motor. Load test on single-phase transformer Measurement of core loss and full load copper loss in a single-phase transformer.								
Activities: Demonstration of working of DC and AC motor starters. Virtual demonstration of electrical machines and transformers.								
UNIT - IV		BASICS OF ELECTRONIC DEVICES, SENSORS AND TRANSDUCERS						9+9
Basic Structure of Semiconductor Devices–PN Junction Diode and Zener Diode–V-I Characteristics and Applications; Bipolar Junction Transistor (BJT): CE, CB, and CC Configurations and Working Principle – Operational Amplifier: Principle of Operation, Characteristics and Applications, Inverting and Non-Inverting, Summing and Differential Amplifiers.								

Practical: V-I characteristics of PN junction diode and Zener diode.			
Activities: Virtual Demonstration of Hall Effect, Piezoelectric and Smart Sensors. Virtual Demonstration of LVDT, Optical and digital transducer.			
UNIT - V	BASICS OF POWER SYSTEMS, MEASUREMENTS AND WIRING		9+9
Structure of Electrical Power Systems: Generation, Transmission, and Distribution – Earthing and Methods of Earthing – Protective Devices: SFU, MCB, MCCB, and ELCB. Functional Elements of Measuring Instruments – Construction and Working Principle of Moving-Coil and Moving-Iron Instruments.			
Practical: Demonstration of House wiring, Stair-case wiring and Fluorescent lamp wiring. Study of basic electrical safety precautions and use of measuring instruments such as voltmeter, ammeter and multimeter.			
Activities: Physical demonstration of House Wiring tools and components. Physical Demonstration of Types of House Wiring. Physical demonstration of Types of Wires and Cables.			
L:45, T:0, P:45, SL :30, Total:120 Hours			
Weightage: Continuous Assessment : 50% End Semester Examinations : 50%			
TEXT BOOKS:			
1.	Kothari, D. P., and Nagrath, I. J., "Basic Electrical Engineering", Tata McGraw Hill, 2010.		
2.	Muthu Subramaniam. R., Salivaganan. R., and Muralidharan. K. A., "Basic Electrical and Electronics Engineering", Second Edition, Tata McGraw Hill, 2010.		
3.	Kulshreshtha. D.C., "Basic Electrical Engineering", Tata McGraw Hill, 2009.		
4.	Theraja, B. L., and Theraja, A. K., "A Textbook of Electrical Technology, Vol. I: Basic Electrical Engineering", S. Chand Publishing, 2014.		
REFERENCE BOOKS:			
1.	Mehta. V. K., and Mehta, Rohit, "Principles of Electrical Engineering", S. Chand Publications, 2008.		
2.	Hughes. E., "Electrical and Electronics Technology", Pearson, 2010.		
3.	Bobrow. L. S., "Fundamentals of Electrical Engineering", Oxford University Press, 2011.		
E-RESOURCES:			
1.	https://nptel.ac.in/courses/117106108		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			Mapping POs
CO1	Analyze the basic DC and AC electric circuits.		PO2
CO2	Apply electromagnetic principles to interpret the working of electrical machines and transformers.		PO1
CO3	Analyze the operation and characteristics of electronic devices.		PO2
CO4	Choose appropriate protective devices, earthing and measuring instruments in power system for safe electrical installation.		PO5, PO11
CO5	Apply knowledge of fundamental laws and theorems for solving problems in DC and AC electric circuits.		PO1, PO3, PO11
CO6	Make an effective technical seminar presentation as a Team: Measuring instruments, sensors and transducers, Types of House wiring, Types of wires and Cable, DC and AC motor starters.		PO8, PO9, PO11

The Course Articulation Matrix (CAM) for defined Cos															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03	
CO1		3													
CO2	3														
CO3		3													
CO4					3						2				
CO5	3		3								2				
CO6								3	3		2				
Activities:															
1.	Solving Problems in DC and AC electric Circuits. (CO5)														
2.	Technical Seminar Presentation on Measuring instruments, sensors and transducers, Types of House wiring, Types of Wires and Cable, DC and AC motor starters. (CO6)														
LIST OF EXPERMENTS:													Cos		
1.	Study of basic electrical safety precautions and use of measuring instruments such as voltmeter, ammeter, and multimeter.													CO4	
2.	Verification of Kirchhoff's Law.													CO1	
3.	Verification of Superposition / Thevenin's Theorem													CO1	
4.	Sinusoidal Steady-State Response of R-L and R-C Circuits – Impedance and Power factor Calculation and Verification / Study of Resonance in Series RLC Circuit / Measurement of Time Constant of an R-C Circuit.													CO1	
5.	Measurement of Three-Phase Power by Two-Wattmeter Method in Three-Phase Circuits													CO1	
6.	Load Test on DC Shunt Motor.													CO2	
7.	Speed Control of DC Shunt Motor													CO2	
8.	Load Test on Single-Phase Transformer.													CO2	
9.	Measurement of Core Loss and Full-Load Copper Loss in a Single-Phase Transformer													CO2	
10.	V-I Characteristics of PN Junction Diode / Zener Diode.													CO3	
11.	Demonstration of House Wiring, Staircase Wiring and Fluorescent Lamp Wiring.													CO4	
Rubrics for evaluation: CO5-Solving Problems in DC and AC electric circuits.															
Sl. No.	Criterion			Marks	Excellent (3)			Good (2)			Satisfactory (1)				
1.	Problem Understanding			25	Correctly interprets the problem and identifies the required parameters independently			Understands the problem with minor guidance			Requires significant guidance to understand the problem				
2.	Formula Selection and Application			25	Selects and applies appropriate formulas/concepts accurately			Minor errors in formula selection or application			Incorrect or incomplete application of formulas				
3.	Calculation Accuracy			25	Performs calculations accurately with correct units and logical steps			Minor calculation or unit errors			Frequent errors resulting in incorrect answers				

4.	Result Interpretation and Presentation	25	Presents solutions systematically with correct interpretation and conclusions	Minor errors in presentation or interpretation	Incomplete or incorrect presentation and interpretation
	Total	100			

Rubrics for evaluation: C06- Technical Seminar Presentation on Instruments, Transducers, Sensors, and House Wiring.

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Technical Understanding	25	Demonstrates clear and thorough understanding of the topic	Demonstrates moderate understanding	Demonstrates basic understanding only
2.	Presentation and Communication Skills	25	Presents ideas clearly, confidently, and effectively	Presentation is understandable with minor issues	Presentation lacks clarity/confidence
3.	Report/Content Organization	25	Well-structured report/presentation with proper technical content	Adequate organization with minor errors	Poorly organized content/report
4.	Participation and Activity Involvement	25	Actively participates and contributes independently	Participates with occasional support	Limited participation and involvement
	Total	100			

Laboratory Experiment Evaluation

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Aim	5	Have excellent knowledge on necessities of experiment. (5 or 4)	Have acceptable knowledge on necessities of experiment. (3 or 2)	Poor knowledge on necessities of experiment. (1)
2.	Identification of apparatus / Software / Materials need	5	Highly capable of conducting experiment, with minimal or no support. (5 or 4)	Able to conduct experiment with quantifiable support. (3 or 2)	Unable to conduct experiment. (1)
3.	Experimentation	15	Clearly able to define output and conclude result. (13 to 15)	Able to define output but notable to conclude result. (8 to 12)	Poor ability to define output. (1 to 7)
4.	Observation& Result	15	On-time legibly written record with all requirements and without mistake. (13 to 15)	On-time legibly written record but not with all requirements and without mistake. (8 to 12)	Poorly written record. (1 to 7)

5.	Record	5	Answered almost all questions. (5 or 4)	Answered some of the questions. (3 or 2)	Answered a few questions. (1)
6.	Vivavoice	5	Have excellent knowledge on necessities of experiment. (5 or 4)	Have acceptable knowledge on necessities of experiment. (3 or 2)	Poor knowledge on necessities of experiment. (1 or 0)
	Total	50			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Theory Component				Laboratory Component		Percentage allocation	Mapping Strength
	Test I	Test II	Activity I	Activity II	Observation and Record	Practical Test		
C01	44				40	40	31	3
C02	16	16			30	30	23	3
C03		22			10	10	10.5	2
C04		22			20	20	15.5	2
C05			40				10	2
C06				40			10	2
Total	60	60	40	40	100	100	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE101	CONSTRUCTION MATERIALS AND TECHNOLOGY		SEMESTER				I
Prerequisites		Category	ES(PC)	Credits			3
NIL		Hours/ Semester	L	T	P	SL	TH
			45	0	0	45	90
COURSE OBJECTIVES							
1.	To study the characteristics and Properties of Stones, Bricks and Concrete blocks.						
2.	To impart Knowledge on Lime, Cement, Aggregate and Mortar.						
3.	To Understand the behaviour of Metals and Seasoning timber.						
4.	To impart fundamental knowledge of tradition and modern building materials used in construction.						
5.	To introduce methods of Construction such as masonry, formwork, scaffolding, plastering and joints.						
UNIT - I	STONES, BRICKS AND CONCRETE BLOCKS						9
Stone as building materials, Criteria for selection, Test on Stones, Deterioration and Preservation of stone work. Bricks, Classification, Manufacturing of clay bricks, Test on bricks, Compressive strength, Water Absorption, Efflorescence, Bricks for special uses, Refractory bricks, Concrete blocks, Types, Hollow and solid blocks, Lightweight concrete blocks, Applications.							
UNIT - II	LIME, CEMENT, AGGREGATE 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 aggregate, Crushing strength, impact strength, flakiness and elongation index, abrasion resistance, Grading, Mortar, Cement and lime mortars, Uses and properties.							
UNIT - III	TIMBER, METALS AND OTHER MATERIALS						9
Timber, Market forms, Industrial timber, Plywood, Laminated panels, Metals, Steel Aluminium, Composition, Market forms, Mechanical treatment, Aluminium 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.							
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.							
UNIT - V	ADVANCED MATERIALS, CONSTRUCTION EQUIPMENT AND PLANNING						9
Advanced materials, Glass, Solar Panels-Ceramics, Clay products, Refectories, Fibre reinforced plastics, Fibre textiles, Geomembranes, Geo textiles. Composite materials, Types, Laminar composites, Application in Construction, Construction equipment, Selection for earthwork, Concreting, Material handling, dewatering and pumping, construction planning.							
L:45, T:0, P:0, SL:45, Total:90 Hours							
Weightage:							
Continuous Assessment : 40%							
End Semester Examinations : 60%							

REFERENCE BOOKS:			
1.	Varghese P.C (2015), Building Materials. PHI Learning Pvt. Ltd.		
2.	Arora, S.P & Bindra, S.P (2013), Building Construction, Dhanpat Rai Publications.		
3.	Punmia, B.C (2008), Building construction, Laxmi Publications Pvt. Ltd.		
4.	Peurify, R.L., Schexnayder, C.J Shapira.A., & Schmitt.R, (2011), Construction planning, equipment and methods. Tata McGraw-Hill.		
5.	Srinath, L.S (2001), PERT and CPM : Principles and Application. Affiliated East –West Press.		
6.	Rangwala, S.C (2017), Building Materials. Charotar Publishing House Pvt. Ltd.		
E-RESOURCES:			
1.	NPTEL – Construction Materials and Technology https://nptel.ac.in/courses/105106206		
2.	SWAYAM- https://onlinecourses.nptel.ac.in/noc21_ce10/preview		
3.	https://learnskart.in/anna-university-notes/civil/ce3302-construction-materials-and-technology/		
4.	http://ndl.ethernet.edu.et/bitstream/123456789/18771/1/6.pdf		
5.	https://dl.ojocv.gov.et/admin_/book/Building%20Materials%20by%20S.K%20Duggal.pdf		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the properties, classification, and applications of conventional and advanced building materials.	--	--
CO2	Evaluate the quality and suitability of stones, bricks, cement, lime, aggregates, and mortar using standard tests.	PO1, PO2, PO3, PO4, PO5	PSO1, PSO2
CO3	Apply knowledge of construction practices such as masonry, formwork, scaffolding, joints and finishes in building works.	PO1, PO2, PO3, PO6	PSO1, PSO2
CO4	Utilize construction planning techniques (CPM, PERT, network models) and Equipment selection for effective project execution.	PO1, PO2, PO3, PO4, PO5, PO6, PO10	PSO1, PSO2
CO5	Study self-Learning knowledge of construction materials and construction practices through industrial visits, virtual demonstrations and case study activities.	PO1, PO2, PO4, PO5, PO6, PO8, PO9, PO11	PSO1, PSO2, PSO3
CO6	Develop self-Learning, teamwork, communication and presentation skills through case studies, technical seminars and independent study on modern construction materials, equipment and planning while considering social, environmental and Economic aspects.	PO5, PO6, PO7, PO8, PO9, PO10, PO11	PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3	3	2	2	2							3	2	
CO3	2	2	3			2						3	2	
CO4	2	3	2	2	3	2				2		2	3	
CO5	2	2		3	5	2		2	3		2	2	2	3
CO6					2	2	3	3	3	2	3		2	3
Activities:														
1.	Industrial Visit and Technical Report Preparation (CO5)													
2.	Case Study on Modern Construction Materials (CO6) (Independent study)													
Rubrics for evaluation: CO5														
Sl. No.	Criterion		Marks	Excellent (3)		Good (2)		Satisfactory (1)						
1.	Observation and Data Collection		10	Detailed observations recorded accurately with relevant photographs/sketches		Minor omissions in observations		Incomplete or inaccurate observations						
2.	Technical Understanding		10	Demonstrates thorough understanding of materials, equipment, and construction practices observed		Adequate understanding with minor gaps		Limited understanding of observed processes						
3.	Analysis and Interpretation		10	Clear analysis with engineering significance and practical insights		Analysis present but lacks depth		Limited or unclear analysis						
4.	Report presentation		10	Well-structured report with proper formatting, figures, and conclusions		Satisfactory report with minor deficiencies		Poorly organized report with inadequate conclusions						
	Total		40											
Rubrics for evaluation: CO6														
Sl. No.	Criterion		Marks	Excellent (3)		Good (2)		Satisfactory (1)						
1.	Technical Understanding of Topic		10	Demonstrates comprehensive understanding of modern construction materials and their applications		Adequate understanding with minor gaps		Limited understanding of the topic						

2.	Evidence of Self-Learning	10	Uses recent journals, standards, technical reports and multiple references	Uses a few relevant sources	Very limited references
3.	Sustainability, Safety and Economic Considerations	10	Critically evaluates environmental impact, safety aspects and cost effectiveness	Discussion present but lacks depth	Minimal discussion
4.	Presentation and Communication Skills	10	Clear, confident and well-organized presentation/report with effective visual aids	Acceptable presentation with minor issues	Poor organization and communication
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26ENC01	COMMUNICATIVE ENGLISH B.E. (Common to all Branches)		SEMESTER				II
Prerequisites		Category	HM	Credits			2
Basic language skills listening, speaking, reading and writing		Hours/ Semester	L	T	P	SL	TH
			45	0	0	15	60
COURSE OBJECTIVES							
1.	To develop integrated Listening, Speaking, Reading, and Writing (LSRW) skills for academic and professional communication.						
2.	To enable learners to comprehend, interpret, and respond to spoken and written texts in technical and workplace contexts.						
3.	To strengthen the use of grammar, vocabulary, and language structures for accurate communication.						
4.	To enhance learners' oral communication skills for discussions, presentations, interviews, and workplace interactions.						
5.	To develop learners' ability to analyze, summarize, report, recommend, and interpret information from texts and real-world data.						
UNIT - I		COMMUNICATION BASICS					9
Listening: Listening to simple conversations, Understanding tone and intent. Speaking: Narrating personal experience and events, Expressing opinions. Reading: Reading for comprehension and specific information, Understanding notices, messages, timetables, graphs etc. Writing: Dialogue writing in a business context. Grammar: Parts of speech - Nouns, Pronouns, Verbs – Main verbs, auxiliary verbs, modal verbs, Adverbs.							
UNIT - II		WORKPLACE COMMUNICATION					9
Listening: Listening to short speeches and TED talks, Extracting information. Speaking: Informal conversation between office colleagues, asking for information to fill details in a form. Reading: Reading technical texts from journals, newspapers and technical blogs. Writing: Writing checklists, Writing recommendations. Grammar: Parts of speech – Adjectives, Conjunctions, Prepositions, Interjections.							
UNIT - III		INTERACTIVE COMMUNICATION					9
Listening: Listening to debates and discussions, Different viewpoints on an issue. Speaking: Role play - customer and sales manager, team leader and team member, interviewer and applicant. Reading: Reading technical description of gadgets – learning the different parts of devices. Writing: Writing instructions, Writing E-mails - Attending workshops, Paper submission for conferences, Arranging a meeting. Grammar: Synonyms, Antonyms, Redundancies, Collocations.							
UNIT - IV		PROFESSIONAL WRITING					9
Listening: Listening to documentaries depicting a technical problem and suggesting solutions. Speaking: Giving a speech, Describing given data, Discussing company information, Summarizing an article. Reading: Reading longer technical texts, Reading biographies and travelogues. Writing: Paragraph writing – Different types of paragraphs, Report Writing – Status reports, Feasibility reports and event reports. Grammar: Conditional statements, Compound words, Sentence completion, Negation in statements and questions.							

UNIT - V	INTERPRETATATION	9	
Listening: Listening to informal communication and longer technical talks. Speaking: Qualities required for employability, Improving employee’s productivity, teamwork, creativity and leadership quality. Reading: Reading brochures, telephone messages, social media messages relevant to technical contexts. Writing: Mind maps, Charts - interpreting statistical data, charts, graphs and tables. Grammar: One word substitution, Abbreviations and acronyms in technical context, Technical vocabulary, Idioms.			
L:45, T:0, P:0, SL:15, Total:60 Hours			
Weightage: Continuous Assessment : 40% End Semester Examinations : 60%			
REFERENCE BOOKS:			
1.	Sharma, S., and B. Mishra. <i>Communication Skills for Engineers and Scientists</i> . 2nd ed., PHI Learning, 2024.		
2.	Miller, Katherine Q., and Susan T. Wahl. <i>Business and Professional Communication: KEYS for Workplace Excellence</i> . 5th ed., SAGE Publications, 2023.		
3.	Viswamohan, Aysha. <i>English for Technical Communication</i> . McGraw-Hill Education, 2013.		
4.	Raman, Meenakshi, and Sangeeta Sharma. <i>Technical Communication: Principles and Practice</i> . 3rd ed., Oxford University Press, 2015.		
5.	Rizvi, M. Ashraf. <i>Effective Technical Communication</i> . McGraw Hill Education India, 2017.		
E-RESOURCES:			
1.	https://learnenglish.britishcouncil.org/		
2.	https://www.bbc.co.uk/learningenglish/		
3.	https://www.ted.com/talks		
4.	https://www.cambridgeenglish.org/		
5.	https://www.toastmasters.org/		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the fundamentals of listening, speaking, reading, and writing (LSRW) skills for effective academic and workplace communication.	PO9, PO11	
CO2	Apply appropriate grammar, vocabulary, sentence structures, and language conventions to communicate accurately in technical and professional contexts.	PO9, PO11	
CO3	Demonstrate effective oral communication skills through discussions, presentations, interviews, debates, and workplace interactions with confidence and clarity.	PO9, PO11	PSO1
CO4	Analyze technical and professional texts, reports, charts, and workplace documents to interpret, summarize, and present relevant information effectively.	PO9, PO11	
CO5	Develop professional writing skills for drafting reports, emails, proposals, status reports, feasibility reports, and other workplace documents.	PO9, PO10, PO11	PSO3
CO6	Integrate communication, interpersonal, and leadership skills in real-life and workplace situations while demonstrating ethical, social, and professional responsibility.	PO8, PO9, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01									3		2			
C02									3		2			
C03									3		2	1		
C04									3		2			
C05									3	2	2			2
C06								2	3		2			2

Activities:

1.	C05: Develop professional writing skills for drafting reports, emails, proposals, status reports, feasibility reports, and other workplace documents. (i) Technical Report Writing Project: Prepare a detailed technical report based on a case study, industrial visit, survey, or mini project including abstract, findings, analysis, and recommendations. (ii) Business Proposal Development: Design and present a professional proposal for a startup idea, product launch, campus initiative, or technical solution addressing real-world problems. (iii) Workplace Email: Draft formal emails, circulars, notices for different workplace situations such as complaints, negotiations, approvals, and scheduling. (iv) Feasibility and Status Report Preparation: Analyze a technical or business scenario and prepare feasibility reports and periodic status reports using charts, data interpretation, and recommendations. (v) Collaborative Documentation Activity: Work in teams to create project documentation including meeting minutes, progress reports, executive summaries, and client communication records.
2.	C06: Integrate communication, interpersonal, and leadership skills in real-life and workplace situations while demonstrating ethical, social, and professional responsibility. (i) Group Discussion and Leadership Role Play: Participate in team-based discussions where students rotate as leader, moderator, presenter, and evaluator to solve workplace problems. (ii) Mock Interview and HR Interaction Attend simulated HR, technical, and panel interviews focusing on communication, confidence, interpersonal behaviour, and professional ethics. (iii) Corporate Meeting Simulation: Conduct formal meetings involving agenda preparation, negotiation, conflict resolution, decision-making, and presentation of outcomes. (iv) Community Outreach / Social Responsibility Project: Attend workshops, organize awareness campaigns, literacy drives, environmental programs, or social initiatives emphasizing teamwork, leadership, and ethical responsibility. (v) Problem-Solving Case Study Presentation: Analyze real-time workplace or ethical case studies and present solutions collaboratively using leadership, communication, and decision-making skills

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Purpose and Audience	10	Clearly identifies the purpose, context, and target audience; content is highly relevant	Purpose and audience are identified with minor gaps in relevance	Purpose and audience are inadequately addressed
2.	Content Development and Organization	10	Content is comprehensive, logically organized, and professionally structured	Content is organized with minor omissions or inconsistencies	Content lacks organization and completeness
3.	Professional Writing and Communication	10	Uses appropriate tone, style, and workplace conventions effectively	Generally appropriate tone and style with minor errors	Tone, style, or workplace conventions are inappropriate or unclear
4.	Language, Formatting, and Accuracy	10	Excellent grammar, vocabulary, formatting, and document presentation with no significant errors	Minor grammatical, formatting, or language errors	Frequent errors in grammar, formatting, and presentation affecting readability
	Total	40			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Communication Skills	10	Communicates ideas clearly, confidently, and effectively using appropriate verbal and non-verbal communication	Communicates ideas adequately with minor clarity or delivery issues	Communication is unclear, hesitant, or ineffective
2.	Interpersonal and Teamwork Skills	10	Demonstrates excellent collaboration, active listening, respect for others, and conflict resolution skills	Participates effectively in teamwork with occasional guidance	Limited participation and difficulty in working with others
3.	Leadership and Decision-Making	10	Shows initiative, responsibility, problem-solving ability, and effective leadership in group activities	Demonstrates leadership qualities with minor limitations	Shows limited initiative and leadership ability

4.	Ethical, Social, and Professional Responsibility	10	Consistently demonstrates ethical behaviour, professionalism, accountability, and social responsibility	Demonstrates responsibility and professionalism with minor lapses	Shows inadequate awareness of ethical or professional responsibilities
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	12	12			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);
Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26HMC02	தமிழரும் தொழில்நுட்பமும் B.E. (அனைத்து துறைகளுக்கும் பொதுவானது)		SEMESTER				II	
Prerequisites			Category	HM	Credits			1
தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படைகள்			Hours/ Semester	L	T	P	SL	TH
				15	0	0	15	30
COURSE OBJECTIVES								
1.	நெசவுத் தொழில்நுட்பம் மற்றும் மட்பாண்டத் தொழில்நுட்பம் குறித்த அறிவைப் பெறுதல்.							
2.	சங்ககாலம் மற்றும் ஆங்கிலேயர் ஆட்சிக் கால கட்டிட வடிவமைப்பு மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிதல்.							
3.	உற்பத்தித் தொழில்நுட்பங்களைப் பற்றிய புரிதலை வளர்த்தல்.							
4.	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்ப அறிவைப் பெறுதல்.							
5.	அறிவியல் தமிழ் மற்றும் தமிழ் கணினியியல் வளர்ச்சியை அறிதல்.							
UNIT - I		நெசவு மற்றும் பானை தொழில்நுட்பம்						3
சங்க காலத்தில் நெசவுத் தொழில் - பானை தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.								
UNIT - II		வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் , கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபொட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ சாரோசெனிக் கட்டிடக் கலை.								
UNIT - III		உற்பத்தித் தொழில் நுட்பம்:						3
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலொற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.								
UNIT - IV		வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்						3
வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் அணைகள், ஏரிகள், குளங்கள் மற்றும் மதகு அமைப்புகள் சோழர் கால குமிழித் தூம்பின் முக்கியத்துவம் கால்நடை வளர்ப்பு மற்றும் கால்நடைகளுக்கான கிணறு வடிவமைப்புகள் வேளாண்மை மற்றும் வேளாண் செயலாக்கம் கடல் மற்றும் பெருங்கடல் அறிவுமீன்பிடித்தல், முத்துக்குளித்தல் மற்றும் சங்கு மூழ்குதல் அறிவு சார்ந்த சமூக அமைப்பு அறிவியல் தமிழின் வளர்ச்சி தமிழ் கணினியியல் தமிழ் நூல்களின் மின்னாக்கம்தமிழ் மென்பொருள் வளர்ச்சி தமிழ்								

இணையக் கல்விக்கழகம் தமிழ் மின்னணு நூலகம் இணையத் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்			
UNIT - V		அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:	
		3	
அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி- தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.			
L:15, T:0, P:0, SL:15, Total:30 Hours			
Weightage: Continuous Assessment : 40% End Semester Examinations : 60%			
REFERENCE BOOKS:			
1.	பி. டி. சீனிவாச அய்யங்கார், தமிழர்களின் வரலாறு(History of the Tamils), கியான் பப்ளிஷிங் ஹவுஸ், 2020.		
2.	கே. ஏ. நீலகண்ட சாஸ்திரி, சங்க இலக்கியம்: அதன் சமயங்களும் பண்பாடுகளும் (Sangam Literature: Its Cults and Cultures), ஸ்வாதி பப்ளிகேஷன்ஸ், 2006.		
3.	சித்ரா மாதவன், தமிழ்நாட்டின் வரலாறும் பண்பாடும்(History and Culture of Tamil Nadu), டி.கே. பிரிண்ட் வேர்ல்ட், 2005.		
4.	ஆர். பொன்னுசாமி, தமிழ் கணினியியல் (Tamil Computing), அலைட் பப்ளிஷர்ஸ் பிரைவேட் லிமிடெட், 2025.		
5.	எஸ். முத்துராமலிங்கம்&மு. சரவணகுமார், தமிழர்களும் தொழில்நுட்பமும் (Tamils and Technology), விஜய் நிக்கோல் இம்பிரிண்ட்ஸ் பிரைவேட் லிமிடெட், 2024		
E-RESOURCES:			
1.	https://atlanticbooks.com/products/history-of-the-tamils-from-the-earliest-times-to-600-a-d-9788121235518		
2.	https://books.google.co.in/books/about/Sangam Literature Its Cults and Cultures.html?id=j1ZsnQEA CAAJ&redir_esc=y		
3.	https://books.google.co.in/books/about/History and Culture of Tamil Nadu		
4.	https://www.booksamillion.com/p/Tamil-Computing/R-Ponnusamy/9789390951055		
5.	https://www.amazon.in/Tamils-Technology-English-S-Muthuramalingam/dp/8119243307		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	நெசவு மற்றும் மட்பாண்டத் தொழில்நுட்பம் பற்றிய அறிவைப் பெறுவர்.	PO9	
CO2	சங்ககாலம் மற்றும் ஆங்கிலேயர் கால கட்டிட வடிவமைப்பு மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிந்திருப்பர்.	PO9	
CO3	உற்பத்தித் தொழில்நுட்பங்களைப் புரிந்துகொள்வர்.	PO9	PSO1
CO4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பத் திறன்களைப் பெறுவர்.	PO9	
CO5	அறிவியல் தமிழ் மற்றும் தமிழ் கணினியியல் வளர்ச்சி குறித்த அறிவைப் பெறுவர்	PO9, PO11	PSO3
CO6	களப்பணி மற்றும் மின்னணு கற்றல் நடவடிக்கைகள் மூலம் தமிழ் பாரம்பரியத்தைப் புரிந்துகொள்வர்.	PO9, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01									3					
C02									3					
C03									3			2		
C04									3					
C05									3		2			2
C06									3		2			2

Activities:

1.	C05: - அறிவியல் தமிழின் வளர்ச்சி வரலாற்றை விளக்கும் அறிக்கை தயாரித்தல். - தமிழ் மென்பொருட்கள், எழுத்துருக்கள் மற்றும் மின்னணு தளங்கள் குறித்த PowerPoint வழங்கல் தயாரித்தல். - இணையத் தமிழ் அகராதி, தமிழ் இணையக் கல்விக்கழகம் மற்றும் தமிழ் மின்னணு நூலகப் பயன்பாட்டை விளக்குதல். - Unicodeகருவிகளைப் பயன்படுத்தி தமிழ் தட்டச்சு மற்றும் வடிவமைப்பு செயல்முறை பயிற்சி. நவீன அறிவியல் மற்றும் தொழில்நுட்பத் தகவல் பரிமாற்றத்தில் தமிழின் பங்கு குறித்த குழு விவாதம்.
2.	C06: - பாரம்பரியத் தளங்கள் / அருங்காட்சியகங்கள் / கோயில்களுக்கு களப்பயணம் செய்து புகைப்படங்களுடன் அறிக்கை சமர்ப்பித்தல். - உள்ளூர் கலாச்சாரப் பாரம்பரியம் குறித்த ஆவணத் திட்டம் தயாரித்தல். - தமிழ் தொழில்நுட்ப சாதனைகள் குறித்த போஸ்டர் அல்லது விளக்கப்படம் உருவாக்குதல். - சங்ககால அறிவியல் மற்றும் தொழில்நுட்ப நடைமுறைகள் குறித்த கருத்தரங்கு நடத்துதல். தமிழ் பாரம்பரிய அம்சங்களை வெளிப்படுத்தும் மின்னணு ஸ்கிராப் புத்தகம் அல்லது e-Portfolio உருவாக்குதல், பண்டைய தமிழ் தொழில்நுட்பம் அல்லது அறிவு அமைப்புகளில் ஏதேனும் ஒன்றை அடிப்படையாகக் கொண்ட வழக்குக்கூற்று வழங்குதல்

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	தமிழ் பாரம்பரிய அறிவு	8	தமிழ் அறிவியல், தொழில்நுட்ப மற்றும் பண்பாட்டு பாரம்பரியத்தை முழுமையாகவும் துல்லியமாகவும் விளக்குகிறது.	நல்ல புரிதலை வெளிப்படுத்துகிறது, சில சிறிய விடுபாடுகள் இருக்கலாம்	அடிப்படை அறிவை மட்டுமே காட்டுகிறது; விவரங்கள் குறைவாக உள்ளன.

2.	வரலாற்றுப் புரிதல்	8	வரலாற்றுப் பின்னணி மற்றும் அதன் முக்கியத்துவத்தை பொருத்தமான எடுத்துக்காட்டுகளுடன் தெளிவாக விளக்குகிறது.	வரலாற்றுப் பின்னணியை சில எடுத்துக்காட்டுகளுடன் விளக்குகிறது.	வரலாற்றுப் பின்னணி குறித்த விளக்கம் மிகவும் வரையறுக்கப்பட்டுள்ளது.
3.	தற்காலப் பொருத்தம்	8	பாரம்பரிய அறிவையும் சாதனைகளையும் தற்போதைய பயன்பாடுகளுடன் திறம்பட இணைக்கிறது.	பாரம்பரிய அறிவை நவீன பயன்பாடுகளுடன் ஒரளவு தெளிவாக தொடர்புபடுத்துகிறது.	சில நவீன தொடர்புகளை மட்டுமே அடையாளம் காட்டுகிறது.
4.	வழங்கல் திறன்	8	உள்ளடக்கம் சிறப்பாக ஒழுங்குபடுத்தப்பட்டு, காட்சிப்பூர்வமாக கவர்ச்சிகரமாகவும் பயனுள்ளதாகவும் வழங்கப்படுகிறது.	உள்ளடக்கம் நன்கு ஒழுங்குபடுத்தப்பட்டு, சில குறைகளுடன் வழங்கப்படுகிறது.	வழங்கல் அடிப்படை நிலையில் உள்ளது; தெளிவு மற்றும் ஒழுங்கமைப்பு குறைவாக உள்ளது.
5.	தொடர்புத் திறன்	8	கருத்துக்கள் தெளிவாகவும் நம்பிக்கையுடனும் ஆதாரங்களுடன் விளக்கப்படுகின்றன.	கருத்துக்கள் போதுமான ஆதாரங்களுடன் தெளிவாக வெளிப்படுத்தப்படுகின்றன.	கருத்துக்கள் புரியும் வகையில் இருந்தாலும் தெளிவு, நம்பிக்கை அல்லது ஆதாரங்கள் குறைவாக உள்ளன.
Total		40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	அறிவின் பயன்பாடு	8	தமிழ் அறிவியல், தொழில்நுட்ப மற்றும் பண்பாட்டு கருத்துக்களை செயல்முறைப் பணிகளில் திறம்படப் பயன்படுத்துகிறது.	கருத்துக்களை சரியாகப் பயன்படுத்துகிறது; குறைந்த வழிகாட்டுதல் தேவைப்படுகிறது.	அடிப்படை அளவில் மட்டுமே கருத்துக்களைப் பயன்படுத்துகிறது

2.	திட்ட செயல்படுத்தல்	8	திட்டம் முழுமையானதாகவும் புதுமையானதாகவும் நன்கு திட்டமிடப்பட்டு வெற்றிகரமாக நிறைவேற்றப்பட்டுள்ளது.	திட்டம் நன்றாக செயல்படுத்தப்பட்டுள்ளது; சில சிறிய குறைகள் உள்ளன.	குறைந்தபட்ச தேவைகளை பூர்த்தி செய்கிறது; ஆனால் ஆழம் மற்றும் முழுமை குறைவாக உள்ளது.
3.	ஆதாரங்கள் மற்றும் வளங்களின் பயன்பாடு	8	பொருத்தமான தரவுகள், ஆதாரங்கள் மற்றும் எடுத்துக்காட்டுகளை திறம்படப் பயன்படுத்துகிறது.	பொருத்தமான வளங்களைப் பயன்படுத்தி போதுமான ஆதாரங்களை வழங்குகிறது.	குறைந்த அளவிலான வளங்கள் மற்றும் ஆதாரங்களை மட்டுமே பயன்படுத்துகிறது
4.	வழங்கல் திறன்	8	கண்டறிவுகளை தெளிவாகவும் தொழில்முறையாகவும் திறம்படவும் வழங்குகிறது.	கண்டறிவுகள் தெளிவாக வழங்கப்படுகின்றன; சில சிறிய குறைகள் உள்ளன.	வழங்கல் போதுமானதாக இருந்தாலும் தெளிவு, ஒழுங்கமைப்பு அல்லது தொழில்முறைத் தன்மை குறைவாக உள்ளது.
5.	ஆவணப்படுத்தல் தரம்	8	ஆவணங்கள் முழுமையாகவும் துல்லியமாகவும் ஒழுங்குபடுத்தப்படும் சரியான வடிவமைப்புடனும் உள்ளன.	ஆவணங்கள் முழுமையாகவும் ஒழுங்காகவும் உள்ளன; சில சிறிய விடுபாடுகள் இருக்கலாம்.	ஆவணங்கள் போதுமானதாக இருந்தாலும் விவரம், துல்லியம் அல்லது ஒழுங்கமைப்பு குறைவாக உள்ளது.
Total		40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26HMC02	TAMILS AND TECHNOLOGY B.E. (Common to all Branches)		SEMESTER				II	
Prerequisites			Category	HM	Credits			1
Basics of Tamil Language and Literature.			Hours/ Semester	L	T	P	SL	TH
				15	0	0	15	30
COURSE OBJECTIVES								
1.	To obtain the knowledge of weaving and ceramic technology.							
2.	To familiarize about design and construction technology during Sangam age and British period.							
3.	To know about the manufacturing technologies.							
4.	To obtain the knowledge of agriculture and irrigation technology.							
5.	To know about the development of Scientific Tamil and Tamil computing.							
UNIT - I		WEAVING AND CERAMIC TECHNOLOGY						3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.								
UNIT - II		DESIGN AND CONSTRUCTION TECHNOLOGY						3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period								
UNIT - III		MANUFACTURING TECHNOLOGY						3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.								
UNIT - IV		SCIENCE, TECHNOLOGY AND KNOWLEDGE SYSTEMS OF TAMILS						3
Agriculture and Irrigation Technology – Dam, Tank, Ponds and Sluice Systems – Significance of Kumizhi Thoompu of the Chola Period – Animal Husbandry and Wells Designed for Cattle Use – Agriculture and Agro-Processing – Knowledge of Sea and Ocean – Fisheries, Pearl and Conch Diving – Knowledge-Specific Society – Development of Scientific Tamil – Tamil Computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.								
UNIT - V		ACTIVITY AND PROJECT WORK						3
Prepare of models/charts related to ancient Tamil technologies such as irrigation systems – shipbuilding - weaving, pottery – temples - and coin minting. Document and present on Tamil scientific and technological heritage based on literary – archaeological - and historical sources - undergo a Field visit to heritage sites – museums – temples - archaeological sites - handicraft centre’s - or traditional industries and submission of a field report. Study and digitally document of Tamil inscriptions - hero stones – temples - traditional occupations -or local heritage resources.								
L: 15, T: 0, P:0, SL: 15, Total:30 Hours								

Weightage:

Continuous Assessment : 40%

End Semester Examinations : 60%

REFERENCE BOOKS:

- | | |
|----|--|
| 1. | "History of the Tamils", P.T. Srinivasa Iyengar, Gyan Publishing House, 2020 |
| 2. | "Sangam Literature: Its Cults and Cultures", K.A. NilakantaSastri, Swathi Publications, 2006 |
| 3. | "History and Culture of Tamil Nadu", Chitra Madhavan, D.K. Print world, 2005 |
| 4. | "Tamil Computing", R. Ponnusamy, Allied Publishers Pvt. Ltd, 2025 |
| 5. | "Tamils and Technology", S Muthuramalingam, M Saravanakumar, Vijay Nicole Imprints Pvt. Ltd., 2024 |

E-RESOURCES:

- | | |
|----|---|
| 1. | https://atlanticbooks.com/products/history-of-the-tamils-from-the-earliest-times-to-600-a-d-9788121235518 |
| 2. | https://books.google.co.in/books/about/Sangam Literature Its Cults and Cultures.html?id=j1ZsnQEA-CAAJ&redir_esc=y |
| 3. | https://books.google.co.in/books/about/History and Culture of Tamil Nadu |
| 4. | https://www.booksamillion.com/p/Tamil-Computing/R-Ponnusamy/9789390951055 |
| 5. | https://www.amazon.in/Tamils-Technology-English-S-Muthuramalingam/dp/8119243307 |

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Obtain the knowledge about weaving and ceramic technology.	PO9	
CO2	Familiarize about design and construction technology during Sangam age and British period.	PO9	
CO3	Understanding about the manufacturing technologies	PO9	PSO1
CO4	Acquire the skills in agriculture and irrigation technology.	PO9	
CO5	Acquire the knowledge about the development of Scientific Tamil and Tamil computing.	PO9, PO11	PSO3
CO6	Develop an understanding of Tamil heritage through field-based and digital learning activities.	PO9, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01									3					
C02									3					
C03									3			2		
C04									3					
C05									3		2			2
C06									3		2			2

Activities:	
1.	C05: Acquire the knowledge about the development of Scientific Tamil and Tamil Computing 1. Prepare a report on the evolution of Scientific Tamil, highlighting key milestones and contributors. 2. Create a PowerPoint presentation on Tamil computing tools, including Tamil software, fonts, and digital platforms. 3. Demonstrate the use of online Tamil dictionaries, Tamil Virtual Academy, and Tamil Digital Library. 4. Conduct a hands-on activity on typing and formatting Tamil text using Unicode tools. Group discussion on the role of Tamil in modern science and technology communication.
2.	C06: Develop an understanding of Tamil heritage through field-based and digital learning activities 1. Organize a field visit to heritage sites, museums, temples and submit a detailed report with photographs. 2. Prepare a documentation project on local cultural heritage (architecture, crafts, inscriptions, or traditions). 3. Create a poster or chart on Tamil technological achievements (irrigation systems, shipbuilding, metallurgy) 4. Conduct a group seminar on Sangam age scientific and technological practices. Develop a digital scrapbook or e-portfolio showcasing Tamil heritage elements, present a case study on any one ancient Tamil technology or knowledge system.

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Knowledge of Tamil Heritage	8	Demonstrates and understanding of Tamil scientific, technological, and cultural heritage with accurate details.	Demonstrates good understanding with minor omissions.	Demonstrates basic understanding with limited details
2.	Historical Understanding	8	Clearly explains historical context and significance with relevant examples.	Explains historical context with some supporting examples.	Provides limited explanation of historical context.
3.	Contemporary Relevance	8	Effectively relates traditional knowledge and achievements to present-day applications and issues.	Relates traditional knowledge to modern applications with some clarity.	Identifies a few modern connections.
4.	Presentation Skills	8	Content is well-organized, visually appealing, and presented effectively.	Content is organized and presented clearly with minor shortcomings.	Content is organized and presented clearly with minor shortcomings.
5.	Communication Skills	8	Ideas are communicated clearly, confidently, and engagingly with appropriate supporting evidence.	Ideas are communicated clearly with moderate confidence and adequate support.	Communication is understandable but lacks clarity, confidence, or supporting evidence.
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Application of Knowledge	8	Effectively applies Tamil scientific, technological, and cultural concepts to practical tasks and projects.	Applies concepts correctly with minor guidance.	Applies concepts at a basic level with limited effectiveness.
2.	Project Execution	8	Project is comprehensive, innovative, well-planned, and successfully completed.	Project is well-executed with minor shortcomings.	Project meets minimum requirements but lacks depth or completeness.
3.	Use of Evidence and Resources	8	Effectively uses relevant data, sources and examples to support project outcomes.	Uses appropriate resources with adequate supporting evidence.	Uses limited resources and supporting evidence.
4.	Presentation Skills	8	Presents findings clearly, professionally, and effectively.	Presents findings clearly with minor shortcomings.	Presentation is adequate but lacks clarity, organization, or professionalism.
5.	Documentation Quality	8	Documentation is comprehensive, accurate, well-organized and properly formatted.	Documentation is complete and organized with minor omissions.	Documentation is adequate but lacks detail, accuracy, or proper organization.
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MAC02	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES B.E.(Common to CIVIL, ECE, MECH & METT)		SEMESTER		II		
Prerequisites		Category	BS	Credits		4	
Basic knowledge of calculus, differential equations, complex numbers and elementary integration techniques.		Hours/ Semester	L	T	P	SL	TH
			45	15	0	60	120
COURSE OBJECTIVES							
1.	To understand the theory and solution methods of ordinary differential equations, including higher order Equations, Euler– Cauchy equations, Legendre’s equations and systems of simultaneous differential equations.						
2.	To develop proficiency in Laplace transform techniques and their applications in solving initial value Problems arising in science and engineering.						
3.	To acquire knowledge of Fourier series representations, harmonic analysis and Parseval’s identity for Analyzing periodic functions.						
4.	To understand Fourier, transform methods, their properties and applications in solving problems related to Signal analysis and integral transforms.						
5.	To learn the concepts of Z-transforms and difference equations and apply transform techniques for solving Discrete mathematical and engineering models.						
UNIT - I		ORDINARY DIFFERENTIAL EQUATIONS					9+3
Homogeneous linear ordinary differential equations of second order- general solution- Particular Integral- Solution by variation of parameters- Homogeneous equations of Euler–Cauchy and Legendre’s type– System of simultaneous linear differential equations with constant coefficients.							
UNIT - II		LAPLACE TRANSFORMS					9+3
Existence theorem - Transform of standard functions – Transform of Unit step function and Dirac delta function – Basic properties- Shifting theorems- Transforms of derivatives and integrals–Transform of periodic functions- Initial and Final value theorem –Inverse Laplace transforms-Convolution theorem (without proof) – Solving Initial value problems by using Laplace Transform techniques.							
UNIT - III		FOURIER SERIES					9+3
Dirichlet’s conditions– General Fourier series– Odd and even functions– Half- range Sine and Cosine series– Parseval’s identity – Computation of harmonics.							
UNIT - IV		FOURIER TRANSFORMS					9+3
Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transform – Properties – Transform of elementary functions – Inverse Fourier Transforms - Convolution theorem (without proof) – Parseval’s identity.							
UNIT - V		Z–TRANSFORM AND DIFFERENCE EQUATIONS					9+3
Z-transform – Properties of Z-transform – Inverse Z-transform – Convolution theorem – Evaluation of Inverse Z transform using partial fraction method and convolution theorem-Initial and final value theorems–Formation of Difference equations–Solution of difference equations using Z- transform.							
L:45, T:15, P:0, SL:60, Total: 120 Hours							

Weightage:

Continuous Assessment : 40%

End Semester Examinations : 60%

REFERENCE BOOKS:

1.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45 th Edition, New Delhi, 2020.
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", 10 th Edition, Wiley India Pvt Ltd., New Delhi, 2018.
3.	N.P.Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008
4.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.
5.	Peter V.O 'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi, 2012.

E-RESOURCES:

1.	NPTEL, "Differential Equations", National Programme on Technology Enhanced Learning, https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma115
2.	NPTEL, "Transforms and Their Applications", National Programme on Technology Enhanced Learning, https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ma56
3.	MIT Open Course Ware, "Differential Equations", Massachusetts Institute of Technology, https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/
4.	Paul's Online Math Notes, "Differential Equations", Lamar University, https://tutorial.math.lamar.edu/classes/de/de.aspx
5.	Wolfram Math World, "Fourier Series, Fourier Transform, Laplace Transform and Z-Transform", Wolfram Research, https://mathworld.wolfram.com/LaplaceTransform.html

COURSE OUTCOMES (COs) /**At the end of the course, the students will have the ability to****Mapping
POs****Mapping
PSOs**

CO1	Remember and understand the fundamental concepts and methods of ordinary differential equations, Laplace transforms, Fourier series, Fourier transforms, and Z-transforms including solutions of differential equations, transform techniques, Fourier expansions, transform properties, convolution theorems and difference equations used in mathematical and engineering applications.		
CO2	Apply the techniques of ordinary differential equations, Laplace transforms, Fourier series, Fourier transforms and Z-transforms to solve mathematical and engineering problems involving initial value problems, periodic functions, signal analysis, transform methods and difference equations.	PO1	PSO1
CO3	Analyze mathematical and engineering problems using ordinary differential equations, Laplace transforms, Fourier series, Fourier transforms, and Z-transforms by selecting appropriate analytical methods, interpreting transform- domain representations, examining periodic behaviours and solving continuous and discrete system models.	PO2	PSO1
CO4	Investigate and interpret mathematical models through assignments, case-based problems and transform techniques to develop logical reasoning and problem-solving skills for engineering applications.	PO3	PSO2
CO5	Solve assignment-based analytical problems involving differential equations, Laplace transforms, Fourier series, Fourier transforms and Z-transforms by applying systematic mathematical procedures and computational techniques.	PO5	PSO2

C06	Communicate mathematical concepts, transform techniques, solution procedures and results effectively through proper mathematical notation, graphical representation, computational output, assignments and structured report writing for engineering and applied Science problems.	PO10	
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The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01														
C02	3											3		
C03		2										2		
C04			1										1	
C05					3								1	
C06										3				

Activities:

1.	Students shall solve selected problems from ordinary differential equations, Laplace transforms, Fourier series, Fourier transforms, Z-transforms and difference equations using systematic analytical methods and suitable computational tools such as Python, GeoGebra or open-source software. This activity develops the ability to apply transform techniques and computational methods to solve engineering and applied science problems with accuracy and logical reasoning.
2.	Students shall prepare a structured assignment report or presentation on selected application-oriented problems involving ordinary differential equations, Laplace transforms, Fourier series, Fourier transforms, Z-transforms and difference equations. The activity may include problem formulation, step-by-step solution, graphical representation, computational output, interpretation of results, and conclusion. This activity develops the ability to communicate mathematical concepts, transform techniques, solution procedures and results effectively using proper notation, graphs and organized report writing.

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection and understanding of problem	8	Suitable analytical problem is selected and the concept is clearly understood	Problem is selected properly, but conceptual explanation needs minor improvement	Problem selection is basic and conceptual understanding is limited
2.	Application of mathematical method	8	Correct method is applied with clear step-by-step solution	Method is mostly correct with minor errors	Method is unclear or contains major errors
3.	Use of analytical/computational technique	8	Analytical or computational technique is used effectively and results are accurate	Technique is used properly, but minor computational/procedural errors are present	Technique usage is incomplete or not clearly demonstrated

4.	Accuracy and interpretation of results	8	Results are accurate and clearly interpreted with engineering/ Application relevance	Results are mostly correct, but interpretation needs improvement	Results are inaccurate or interpretation is weak
5.	Presentation and professional communication	8	Work is professionally presented with clear mathematical communication	Presentation is good with minor organizational issues	Presentation is satisfactory but lacks consistency
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Clarity of mathematical explanation	8	Concepts, formulae and solution procedures are explained clearly and correctly	Explanation is understandable, but needs minor improvement	Explanation is incomplete or unclear
2.	Use of mathematical notation, graphs and representation	8	Proper notation, equations, graphs, tables or computation a outputs are used effectively	Notation and representation are mostly correct with minor errors	Notation is poor or graphical/ computational representation is missing
3.	Organization of assignment/report/ presentation	8	Report/ presentation is well structured with problem statement, method, solution, result, interpretation and conclusion	Report/ presentation is organized, but some sections need improvement	Report/ presentation is poorly organized or incomplete
4.	Interpretation and communication of results	8	Results are interpreted clearly and communicated effectively with Logical conclusion	Results are communicated properly, but interpretation is limited	Interpretation and communication of results are weak
5.	Overall presentation and academic quality	8	Work demonstrates excellent academic quality and professional presentation	Academic quality is good with minor issues	Academic presentation is satisfactory
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	16	16			16	2
C04	8	8			8	1
C05			40		20	2
C06				40	20	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);
 Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CEC01	ENGINEERING MECHANICS		SEMESTER				II	
Prerequisites			Category	ES(G)	Credits			4
			Hours/ Semester	L	T	P	SL	TH
				45	15	0	60	120
COURSE OBJECTIVES								
1.	To explain the importance of mechanics in the context of engineering and conservation equations.							
2.	To apply resolution of forces.							
3.	To explain the significance of centroid, center of gravity and moment of inertia.							
4.	To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration.							
5.	To apply Impulse Momentum principle.							
UNIT - I	BASICS & STATICS OF PARTICLES							9+3
Introduction – Units and Dimensions – Laws of Mechanics – Lamé’s theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces– Equilibrium of a particle– Equilibrium of a particle in three dimensions– Equivalent systems of forces– Principle of transmissibility–Single equivalent force.								
UNIT - II	EQUILIBRIUM OF RIGID BODIES							9+3
Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples– Moment of a force about a point and about an axis– Vectorial representation of moments and couples–Scalar components of a moment– Varignon’s theorem– Equilibrium of Rigid bodies in two dimensions– Equilibrium of Rigid bodies in three dimensions.								
UNIT - III	PROPERTIES OF SURFACES AND FRICTION							9+3
Determination of Areas and Volumes–Theorems of Pappus and Guldinus- First moment of area and the Centroid of sections– Second and product moments of plane area of various sections– Parallel axis theorem and perpendicular axis theorem-Polar moment of inertia– Principal moments of inertia of plane areas-Principal axes of inertia - Frictional force-Laws of Coulomb friction-simple Contact friction-Rolling resistance–Belt friction.								
UNIT - IV	KINEMATICS AND KINETICS OF PARTICLES							9+3
Displacement, Velocity and acceleration, their relationship- Relative motion- Newton’s low of motion -Work Energy Equation-Impulse and Momentum-Impact of elastic bodies.								
UNIT - V	KINEMATICS AND KINETICS OF RIGID BODIES							9+3
Plane motion- Absolute motion- Relative motion -Translating axes and Rolling Axes-Work and Energy - Impulse and Momentum.								
L: 45, T:15, P:0, SL:60, Total:120 Hours								

Weightage: Continuous Assessment : 40% End Semester Examinations : 60%			
REFERENCE BOOKS:			
1.	Rajasekaran S and Sankara subramanian G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2017.		
2.	Bansal R.K., Engineering Mechanics, Laxmi Publications (P) Ltd., 8thEdition, 2015.		
3.	Palanichamy M.S. and NaganS, Engineering Mechanics, Laxmi Publication (P) Ltd., 2022.		
4.	Beer F.P and Johnson Jr. E.R. Vector Mechanics for Engineers, Vol. 1 Statics and Vol. 2 Dynamics, McGraw –Hill International Edition, 12th Edition, 2019.		
5.	Dr.N.Kottiswaran., Engineering Mechanics., Sri Balaji Publications., 9th Edition, Reprint 2010		
E-RESOURCES:			
1.	Moment of Inertia Calculator - https://skyciv.com/free-moment-of-inertia-calculator/		
2.	OpenStax-UniversityPhysicsVolume1- https://openstax.org/books/university-physics-volume-1/pages/10-4-moment-of-inertia-and-rotational-kinetic-energy		
3.	Engineering Mechanics, Dr. Dwarakish. G. S. - https://onlinecourses.swayam2.ac.in/ntr24_ed75/preview		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			
CO1	Understand the laws of mechanics for particle statics, equilibrium conditions for rigid bodies, surface properties including friction, and the kinematics and kinetics of both Particles and rigid bodies.		
CO2	Apply vector operations for particle statics, support reactions for rigid body equilibrium, centroid and moment of inertia calculations, and motion principles for both particles and rigid bodies.	PO1, PO2, PO3	PSO2
CO3	Analyze mechanical systems involving coplanar forces on particles, moments on rigid bodies, frictional resistance on surfaces, and the work-energy and impulse-momentum of particles and rigid bodies.	PO1, PO2, PO3, PO4	PSO2
CO4	Evaluate engineering problems by integrating the statics of particles, equilibrium of rigid bodies, frictional surface properties, and the kinetics of particles and rigid bodies under Various motions.	PO1, PO2, PO3, PO4, PO5	PSO2
CO5	Perform a simple team activity to draw free-body diagrams and calculate forces for a basic real-world structure.	PO1, PO5, PO6, PO8, PO9	PSO1, PSO3
CO6	Prepare a short assignment report on the practical applications of friction and motion in everyday life.	PO6, PO9, PO11	PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3	2	1										2	
CO3	3	2	1	2									2	
CO4	3	3	2	1	2								2	
CO5	2				2	2		3	2			2		3
CO6						2			3		2		2	3

Activities:

1.	Conduct basic virtual experiments or build simple physical models to demonstrate equilibrium or friction (CO5)
2.	Chart preparation or mini-presentation on real-world applications of statics or dynamics in everyday life (CO6)

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Problem identification & free-body diagram	10	Free-body diagram is clearly drawn with all forces labeled	Diagram drawn, but some forces/ labels are missing	Diagram is incomplete or in correctly drawn
2.	Calculation of forces	10	Force calculations are accurate and Clearly laid out	Calculations done, but contain minor mathematical errors	Calculations are incomplete or highly flawed
3.	Interpretation of results	10	Results are clearly interpreted with solid reasoning	Results are stated but with limited reasoning	Unclear or missing interpretation
4.	Report presentation	10	Report is clear, neat, and well-structured	Report is structured, but needs formatting improvement	Poorly structured or untidy report
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of friction & motion	10	Clearly explains the practical aspects of friction and motion	Explanation is basic and needs minor improvement	Very limited understanding shown
2.	Safety & real-world application	10	Clearly discusses how friction/motion impacts safety in daily life	Safety aspects mentioned but loosely connected to the topic	Poorly explained or omitted

3.	Evidence of team effort & learning	10	Clear evidence of collaborative work and good use of references	Basic team effort with limited outside references	Very limited effort and no references
4.	Presentation & Communication	10	Assignment is clearly communicated And well-written	Writing is decent but needs grammatical improvement	Poorly written and structured
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CSC01	C PROGRAMMING		SEMESTER				II
Prerequisites		Category	ES(G)	Credits			4
		Hours/ Semester	L	T	P	SL	TH
			45	0	30	45	120
COURSE OBJECTIVES							
1.	To provide students with fundamental knowledge of C programming concepts, syntax, data types, operators, and control structures for developing computational solutions.						
2.	To develop logical thinking and problem-solving abilities through algorithm design, flowcharts, and structured programming techniques.						
3.	To enable students to design and implement modular programs using functions, arrays, pointers, strings, and user-defined data types in C.						
4.	To enhance students' debugging, testing, and program analysis skills for developing efficient and reliable software solutions.						
5.	To prepare students to apply C programming concepts in engineering applications, real-world problem solving, and further advanced computing courses.						
UNIT - I	C PROGRAMMING BASICS						9+6
Introduction to C programming- C program structure- Program Compilation and Execution- Language processing systems-Problem Solving Strategies-Algorithm-Flow Chart- Character Set- Identifiers& keywords- Data Types, Enumerations- Type conversions- Input & output statements in C – Operators- Preprocessor Directives (#include and #define): Macros. Practical Component: Develop simple C programs using basic programming constructs, Input / output operations and operators. Create algorithms, flowcharts and pseudo code for problem solving.							
UNIT - II	CONTROL STATEMENTS						9+6
Making decisions: If statement- if / else statement- if/else if statement- Nested if statements- dangling else- Switch Multiple Selection Statement- Repetition: Repetition essentials- while loop- do- while Loop- for loop- Nested loops- Breaking out of a loop- continue statement- go to statement. Practical Component: Develop programs using decision-making statements, looping constructs, control transfer statements.							
UNIT - III	FUNCTIONS						9+6
Modular Programming- Function prototypes – Defining and Calling functions: Call by Value, Call by Address- Function call stack and Activation Records- Passing Arguments to Functions- Returning a value from a function- Recursion – Recursion Vs. Iteration- Scope and life time of variables- Memory layout of a C program- Storage Classes – Auto – Static – Extern and Register Variables. Practical Component: Implement programs using functions, parameter passing techniques, recursive functions, storage classes.							
UNIT - IV	ARRAYS, POINTERS AND STRINGS						9+6
Defining Array- Array Initialization- Accessing array elements- Processing Arrays- Multidimensional arrays- memory address calculation of an array- Row major and column major order- Pointers – Pointer Declaration- Operations on Pointer- Function pointer -Relation between pointers and arrays- String Handling Practical Component: Develop programs using arrays, strings and pointers.							

UNIT - V	STRUCTURES, UNION AND DATA FILES	9+6	
Defining and processing a structure, Nested structures, passing structure to functions – Array of structure, Pointer to structure – Union – Dynamic memory allocation – Files: Streams, Opening and closing a file, Reading and writing a file.			
Practical Component: Develop programs using structures, unions and file handling operations.			
L: 45, T:0, P:30, SL:45, Total: 120 Hours			
Weightage: Continuous Assessment : 50% End Semester Examinations : 50%			
REFERENCE BOOKS:			
1.	H.M. Deitel and P.J. Deitel, 'C: How to Program'. 9th edition, Pearson, New Delhi, 2022.		
2.	Herbert Schildt, 'C: The Complete Reference'. 4th edition, McGraw Hill, Noida, 2017.		
3.	Pradip Dey and Manas Ghosh, 'Programming in C'. Oxford University, New Delhi, 2018.		
4.	Mike McGrath, C Programming In Easy Steps Limited'. 5th edition, United Kingdom, 2018.		
5.	B.W. Kernighan and D.M. Ritchie, 'The C Programming Language'. 2nd edition, Pearson, New Delhi, 2015.		
6.	Yashavant P. Kanetkar "Let Us C", BPB Publications., 2017, 16th edition		
E-RESOURCES:			
1.	"Introduction to C Programming", Swayam MOOC Course, - https://onlinecourses.swayam2.ac.in/imb25_mg71/		
2.	Geeks for Geeks - C Programming - https://www.geeksforgeeks.org/c-programminglanguage/		
3.	Learn - C.org - https://www.learn-c.org/		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the fundamentals and core concepts of C programming.		PSO1
CO2	Apply programming skills to develop C programs for the given problem statement/mathematical equation.	PO1	PSO1
CO3	Analyze the given C program and debug/predict its output.	PO2	PSO1
CO4	Develop and execute C programs to represent, compute, and solve mathematical equations or specified parameters.	PO3	PSO1
CO5	Illustrate the applications of C programming concepts in solving computational problems through individual learning activities.	PO6, PO9, PO11	PSO1
CO6	As a member of a team, identify and formulate programming problems, and develop, implement, and demonstrate appropriate solutions using suitable C programming concepts, techniques, and tools while abiding by ethics.	PO5, PO8, PO11	PSO1

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1												3		
CO2	3											3		
CO3		3										3		
CO4			3									3		
CO5						2			2		2	2		
CO6					3			3			2	2		

Activities:

1.	Technical Quiz /MCQ-Based Assessment (CO5)
2.	Hackathon / Coding Challenge Participation/ Team-Based Activities (CO6)

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Conceptual Understanding	10	Thorough understanding of concepts	Moderate understanding	Basic understanding
2.	Accuracy in Responses	10	Answers almost all correctly	Answers most correctly	Answers few correctly
3.	Logical Reasoning Ability	10	Strong analytical ability	Moderate reasoning ability	Limited reasoning ability
4.	Time Management	5	Completes within time confidently	Moderate reasoning ability	Unable to complete on time
5.	Participation and Preparedness	5	Highly active and well prepared	Moderately prepared	Limited participation
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Team Participation and Collaboration	10	Actively contributes and collaborates effectively with team members	Participates with moderate contribution	Limited participation in team activities
2.	Problem Solving Ability	10	Develops efficient and innovative solutions for the given problem	Develops acceptable solutions with minor issues	Unable to develop complete solutions
3.	Coding and Implementation Skills	10	Writes correct, efficient, and well-structured programs	Writes functional programs with few errors	Programs contain major errors / incomplete implementation

4.	Creativity and Innovation	5	Demonstrates creative thinking and innovative ideas	Shows moderate creativity	Limited creativity in approach
5.	Presentation and Demonstration	5	Clearly explains and demonstrates the solution confidently	Provides moderate explanation and demonstration	Unable to explain or demonstrate effectively
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Theory Component				Laboratory Component		Percentage allocation	Mapping Strength
	Test I	Test II	Activity I	Activity II	Observation and Record	Practical Test		
CO1	12	12					6	1
CO2	24	24			70	70	47	3
CO3	12	12			20	20	16	2
CO4	12	12			10	10	11	2
CO5			40				10	2
CO6				40			10	2
Total	60	60	40	40	100	100	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);
Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CYC01	APPLIED CHEMISTRY		SEMESTER				II
Prerequisites		Category	BS	Credits			4
Basic Chemistry concepts		Hours/ Semester	L	T	P	SL	TH
			45	0	45	30	120
COURSE OBJECTIVES							
1.	To understand the fundamental scientific principles related to water chemistry, electrochemical systems, polymers, acid–base equilibria, corrosion phenomena, and spectroscopic techniques used in engineering applications.						
2.	To acquire the ability to apply chemical laws, numerical methods, and analytical reasoning for solving engineering problems involving water quality, electrochemical cells, buffer systems, corrosion, and instrumental analysis.						
3.	To examine the behaviour of chemical and material systems and interpret the influence of process parameters on performance in water treatment, electrochemical processes, corrosion control, polymers, and spectroscopy.						
4.	To assess different engineering materials, chemical processes, and analytical techniques for selecting suitable methods in industrial and technological applications.						
5.	To develop practical laboratory skills by performing experiments related to water analysis, electrochemistry, polymers, acid–base systems, corrosion studies, and spectroscopic measurements, and to interpret experimental data effectively.						
UNIT - I		WATER TECHNOLOGY:					9+9
Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA–numerical problems– dissolved oxygen significance – boiler troubles (scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning)–External treatment – demineralization, zeolite process – desalination of brackish water – reverse osmosis. Practical: 1. Estimation of total hardness by EDTA method. 2. Estimation of alkalinity of water. Activities: 1. Determination of DO by Winkler titration. 2. Coagulation of water by adding alum.							
UNIT - II		ELECTROCHEMISTRY:					9+9
Cells–types–Electrochemical cell–representation of electrochemical cell –redox reaction– single electrode potential–oxidation and reduction potential –Nernst equation for single electrode potential– numerical problems. Electrochemical series – significance and application – measurement of emf of cell – poggendorff's method. Potentiometric titrations (acid-base, redox and precipitation titrations). Practical: 1. Estimation of iron by potentiometric titration. 2. Estimation of strong acid by conductometric titration. 3. Estimation of mixture of acids by conductometric titration. Activity: Electrochemical cell demonstration							
UNIT - III		POLYMERS AND PHASE RULE:					9+9
Polymers – definition – polymerization – types – addition and condensation polymerization – mechanism of free radical addition polymerization– plastics, classification– thermosetting and thermo plastic – preparation, properties and uses of PVC, Teflon, polyurethane, nylon-6,6, PET. Phase rule– Introduction, definition of terms with examples, one component system –water system. Practical: Determination of molecular weight of polymer by viscometry. Activity: Comparing biodegradable and non-biodegradable polymers.							

UNIT - IV	ACID BASE CONCEPTS AND CORROSION:	9+9
Acids and bases – Arrhenius concept – Bronsted-Lowry concept – Lewis concept – pH and pKa –buffer solutions – types– mechanism of buffer action – Henderson–Hasselbalch equation– derivation and problems. Corrosion – causes – types of corrosion – chemical, electrochemical corrosion (galvanic, differential aeration) – factors influencing the rate of corrosion – electrochemical protection – sacrificial anode method and impressed current cathodic method. Practical: 1. Estimation of strong acid by pH meter. 2. Estimation of pKa of weak acid by pH meter. Activities: 1. Using litmus paper finding out the nature (acid or base) of household substances. 2. Corrosion study by weight loss method		
UNIT - V	SPECTROSCOPIC TECHNIQUES:	9+9
Beer-Lambert's law (problem) –UV visible spectroscopy: Principle, chromophore, auxochrome, electronic transitions and instrumentation (No applications). Flame photometry –principle –instrumentation – estimation of sodium by flame photometer. Atomic absorption spectroscopy –principle –instrumentation –estimation of nickel by atomic absorption spectroscopy. Practical: 1. Estimation of iron by spectrophotometer. 2. Estimation of copper by calorimeter. Activity: Determining chlorophyll content in leaves with a spectrophotometer.		
L:45, T:0, P:45, SL:30, Total:120 Hours		
Weightage: Continuous Assessment : 50% End Semester Examinations : 50%		
REFERENCE BOOKS:		
1.	S. S. Dara and S. S. Umare, —A Textbook of Engineering Chemistry S. Chand & Company LTD, New Delhi, 2015	
2.	P. C. Jain and Monika Jain, —Engineering Chemistry Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015	
3.	S. Vairam, P. Kalyani and Suba Ramesh, —Engineering Chemistry Wiley India PVT, LTD, New Delhi, 2013.	
4.	Dr.Shashi Chawla - A Textbook of Engineering Chemistry - Dhanpat Rai & Co. (Pvt.) Ltd., New Delhi - 2001	
5.	Dr. O. G. Palanna - Engineering Chemistry - McGraw-Hill Education (India) Private Limited - 2009	
E-RESOURCES:		
1.	www.onlinecourses.nptel.ac.in/	
2.	www.ePathshala.nic.in	
3.	eGyanKosh – IGNOU Repository (http://egyankosh.ac.in) – ID: 123456789/43343	
4.	Royal Society of Chemistry Education (https://edu.rsc.org)	
5.	MIT Open Course Ware (https://ocw.mit.edu)	

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the fundamental principles of water chemistry, electrochemical systems, polymers, phase equilibria, acid–base concepts, corrosion processes, and spectroscopic techniques relevant to engineering applications.	---	---
CO2	Apply chemical laws, mathematical relationships, and analytical methods to solve engineering problems related to water quality analysis, electrochemical systems, buffer solutions, corrosion, and spectroscopic measurements.	PO1	---
CO3	Analyze chemical systems and engineering problems by correlating theoretical principles with material behaviour, process performance, and experimental observations in water treatment, electrochemistry, corrosion, polymers, and spectroscopy.	PO2	---
CO4	Perform laboratory experiments based on water quality parameters, electrochemical processes, polymer properties, acid–base equilibria, corrosion mechanisms, and spectroscopic analysis.	PO4, PO8	---
CO5	Execute activity-based investigations related to water analysis, acid–base systems, corrosion studies, polymer characterization, and spectroscopic techniques, and interpret the results using standard analytical methods	PO5, PO8	---
CO6	Engage in self-learning activities to understand and explore the role of chemical principles, materials, and analytical techniques in water treatment, corrosion control, polymers, electrochemical systems, and spectroscopy, and present the findings in engineering applications.	PO9, PO11	---

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	2													
CO3		2												
CO4				3				3						
CO5					2			2						
CO6									2		3			

Activities:

1.	Undertake experimental studies and virtual/self-learning activities on water treatment, acid–base systems, corrosion, polymers, and spectroscopy, and report the observations and conclusions. (CO5) (Individual and Collaborative Team Work)
2.	Engage in self-learning and evaluated through quizzes, case studies, seminars, and presentations on the application of chemical principles, materials, and analytical techniques in engineering systems. (CO6) (Independent study)

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Concept	10	Understanding of the concept with clear explanations.	Understanding with minor errors or omissions.	Shows basic understanding but with significant gaps or misconceptions.
2.	Team Participation and Collaboration	10	Actively contributes, collaborates effectively, and supports team members throughout the activity.	Participates regularly and contributes to team tasks with moderate involvement.	Limited participation and contribution to team activities.
3.	Interpretation of Results	10	Results are accurately analyzed, clearly interpreted, and well justified using scientific principles.	Results are interpreted correctly with some justification.	Basic interpretation of results with limited analysis or justification.
4.	Response to Questions	10	Answers questions accurately and effectively.	Answers most questions correctly.	Answers questions with partial accuracy.
	Total	40			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Conceptual Clarity and Knowledge	10	Shows complete conceptual clarity with strong understanding and accurate knowledge.	Shows good conceptual clarity with minor errors.	Basic understanding with limited clarity and several gaps.
2.	Accuracy of Content / Answers	10	All answers are correct, precise, and scientifically accurate.	Most answers are correct with minor mistakes.	Some correct answers but several errors present.
3.	Application and Analytical Thinking	10	Effectively applies concepts to solve problems and analyze situations.	Applies concepts with minor difficulty in analysis.	Limited ability to apply concepts; mostly descriptive.
4.	Participation and Preparedness	10	Fully prepared, actively participates, and demonstrates strong engagement throughout the activity.	Well prepared and participates actively with minor gaps.	Partially prepared with limited participation or engagement.
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Theory Component				Laboratory Component		Percentage allocation	Mapping Strength
	Test I	Test II	Activity I	Activity II	Observation and Record	Practical Test		
CO1	12	12					6	1
CO2	24	24					12	2
CO3	24	24					12	2
CO4					100	100	50	3
CO5			40				10	2
CO6				40			10	2
Total	60	60	40	40	100	100	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);
Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26PHC01	APPLIED PHYSICS		SEMESTER				II
Prerequisites		Category	BS	Credits			4
		Hours/ Semester	L	T	P	SL	TH
			45	0	45	30	120
COURSE OBJECTIVES							
1.	To understand the fundamental principles of mechanics and rotational motion.						
2.	To analyze ultrasonic wave production, detection, and applications.						
3.	To develop conceptual understanding of quantum mechanics and nanoscale systems.						
4.	To understand the fundamental principles of laser operation, laser characteristics and different types of laser.						
5.	To understand the principles of optical fiber transmission and communication system for high-speed data transmission.						
UNIT - I	MECHANICS						9+9
Rotation of rigid bodies: Rotational kinematics – Rotational kinetic energy and moment of inertia – Theorems of moment of inertia – Moment of inertia of diatomic molecule – Torque – Rotational dynamics of rigid bodies – Conservation of angular momentum – Rotational energy state of a rigid diatomic molecule – gyroscope – Torsional pendulum – Introduction to nonlinear oscillations.							
Practical:							
1. Torsional Pendulum – Determination of rigidity modulus of the given material							
2. Determination of moment of inertia of a rigid body							
Activity: Virtual demonstration of Gyroscopic Motion							
UNIT - II	ULTRASONICS						9+9
Properties - Production: Magnetostriction effect - Magnetostriction generator - Piezoelectric effect – Piezoelectric generator – Detection of ultrasonic waves - Cavitation– Acoustical grating– Velocity measurement – Industrial Applications: SONAR – Non Destructive Testing: Pulse echo system through transmission and reflection modes – Medical application - Sonogram							
Practical:							
1. Ultrasonic interferometer – Determination of velocity of ultrasonic waves and compressibility of given liquid							
2. Acoustical Grating - Determination of velocity of ultrasonic waves in a given liquid							
Activity: Virtual demonstration of SONAR.							
UNIT - III	QUANTUM MECHANICS						9+9
Matter waves – Experimental evidence - Davisson and Germer experiment – Schrodinger’s wave equation - Time independent and dependent equations – Physical significance of wave function – Normalization – Particle in an infinite potential well (1D) – Tunnelling effect (Qualitative) – Scanning Tunnelling Microscope (STM).							
Practical:							
1. Quantum Mechanics of Particle in a Potential Well – simulation							
2. Quantum tunnelling through a potential barrier – simulation							
Activity: Virtual demonstration of Scanning Tunnelling Microscope							

UNIT - IV	LASER	9+9	
Characteristics of laser light – absorption, spontaneous emission and stimulated emission – Einstein Co-efficient (derivation) – Population inversion – Pumping methods – Types of laser – Construction and working of Nd:YAG laser, CO ₂ Laser, Semiconductor laser (homojunction and heterojunction) – Industrial and medical applications (Qualitative).			
Practical: 1. Determination of wavelength of laser using grating 2. Determination of particle size using laser			
Activity: Virtual demonstration of semiconductor laser			
UNIT - V	FIBRE OPTICS	9+9	
Principle of optical fibre – Structure – Critical angle – Propagation of light through optical fibre – Numerical aperture and Acceptance angle – Classification of optical fibre – Fibre optic communication (Block diagram) – Fibre optic sensors: Displacement and Temperature Sensor - Medical Application- Fibre optic endoscope.			
Practical: 1. Determination of Acceptance angle and Numerical aperture of a given fibre 2. Determination of displacement using fibre optics sensor			
Activity: Virtual demonstration of fibre optic sensors			
L:45, T:0, P:45, SL:30, Total:120 Hours			
Weightage: Continuous Assessment : 50% End Semester Examinations : 50%			
REFERENCE BOOKS:			
1.	A. Marikani, 'Engineering Physics', PHI Learning Publishers, 2024.		
2.	M. Arumugam, 'Engineering Physics', Anuradha Publications, 2014.		
3.	R.K. Gaur & S.L. Gupta, 'Engineering physics', Dhanpat Rai Publications, 2022.		
4.	H.D. Young & R.A. Freedman, 'University physics with modern physics', Pearson, 2020.		
5.	Arthur Beiser, 'Concepts of Modern Physics', McGraw-Hill, 2017.		
6.	K. Thyagarajan and Ajoy Ghatak, 'Lasers: Theory and Applications', Springer, 2012.		
E-RESOURCES:			
1.	Ultrasonics: https://nptel.ac.in/courses/122107035		
2.	CO ₂ Laser: https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ph03		
3.	Quantum Mechanics: https://www.youtube.com/playlist?list=PL0F530F3BAF8C6FCC		
4.	Optical Sensors: https://auece.digimat.in/nptel/courses/video/108106173/L02.html		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			
CO1	Explain the fundamental principles and concepts of applied physics and their engineering applications.		
CO2	Apply physics principles to solve problems encountered in engineering context	PO1	
CO3	Analyse the solution strategies for applied physics problems, selecting appropriate approaches based on theoretical and practical considerations.	PO2	

C04	Perform practical experiments and activity-based demonstrations in groups and present the observed results.	PO4, PO8	
C05	Communicate emerging concepts and advancements in physics while considering environmental sustainability and societal impact through virtual laboratory activities and seminar presentations.	PO6, PO9	PSO3
C06	Engage in self-learning to explore emerging physics concepts, advanced technologies, and contemporary engineering applications, fostering continuous professional development.	PO11	

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01														
C02	2													
C03		3						3						
C04				3										
C05						2			2					2
C06											2			

Activities:

1.	Determination of physics concepts through virtual lab. (C05) Seminar presentation of emerging physics concepts. (C05)
2.	Self-learning study and presentation on emerging physics-based technologies with safety considerations. (C06)

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Subject Knowledge	10	Clearly explains the concept with relevant examples	Good explanation with minor gaps	Basic understanding of the topic
2.	Content Organization	10	Information is well-organized, clear, and logically presented	Organization is good with minor improvements needed	Average organization of content
3.	Communication Skills	10	Confident presentation with clear explanation and effective response to questions	Good communication with slight hesitation	Basic communication skills
4.	Interpretation of Results	10	Results are accurately analyzed, clearly interpreted, and well justified using scientific principles.	Results are interpreted correctly with some justification	Basic interpretation of results with limited analysis or justification.
	Total	40			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Topic Understanding	10	Clearly explains the concept and its real-world application with relevant details	Good explanation with minor gaps	Basic understanding of the topic
2.	Literature Review	10	Reviews and compares multiple relevant research articles effectively	Reviews relevant articles with some comparison	Limited review of articles
3.	Analysis & Interpretation	10	Critically analyses the product performance, advantages, and limitations	Good analysis with minor shortcomings	Basic analysis provided
4.	Presentation & Communication	10	Well-organized report/presentation with clear communication and proper references	Organized presentation with minor errors	Average presentation and communication
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Theory Component				Laboratory Component		Percentage allocation	Mapping Strength
	Test I	Test II	Activity I	Activity II	Observation and Record	Practical Test		
CO1	12	12					6	1
CO2	24	24					12	2
CO3	24	24			40	40	32	3
CO4					60	60	30	3
CO5			40				10	2
CO6				40			10	2
Total	60	60	40	40	100	100	100	

Note: Purely as an Example: Strength = 3 (if percentage >20%);
Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MEC02	ENGINEERING PRACTICES LABORATORY	SEMESTER				II	
Prerequisites		Category	SD	Credits			2
Fundamental understanding of measurement tools and safety procedures		Hours/ Semester	L	T	P	SL	TH
			0	0	45	15	60
COURSE OBJECTIVES							
1.	To provide hands-on exposure in basic manufacturing and fabrication practices.						
2.	To develop practical skills in carpentry, fitting, plumbing and sheet metal operations.						
3.	To train students in machining, welding and foundry practices.						
4.	To develop problem solving, safety awareness and teamwork skills through laboratory activities.						
LIST OF EXPERIMENTS							
1.	SAFETY & WORKSHOP PRACTICES Study of workshop safety measures, PPE and first aid practices. Demonstration of workshop tools, measuring instruments and machine shop practices.						4
2.	FITTING AND CARPENTRY PRACTICES Preparation of Half-Lap / T-Joint / Dovetail Joint using carpentry tools and wooden workpieces Preparation of V-fitting Square and Curve fitting using mild steel specimen.						14
3.	SHEET METAL AND PLUMBING PRACTICES Preparation of Square Tray / Cylinder / Conical Funnel using GI sheet. Preparation of Single Seam and Double Seam joints. Preparation of PVC pipe connections and saddle connection.						14
4.	FOUNDRY AND WELDING PRACTICES Green sand preparation and mould cavity preparation using foundry tools. (Single and Split Patterns) Demonstration and practice of Arc welding of Butt, Lap and T-joints.						14
5.	MACHINING PRACTICES Lathe operations – Facing, Turning, Chamfering, Knurling and Taper turning. Drilling and Tapping operations on mild steel specimen.						14
L:0, T:0, P:45, SL:15, Total:60 Hours							
Weightage: Continuous Assessment : 60% End Semester Examinations : 40%							
REFERENCE BOOKS:							
1.	Bawa, H.S, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.						
2.	Jeyachandran.K, Natarajan.K and Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.						
3.	Jeyapoovan.T, SaravanaPandian.M, and Pranitha.S, "Engineering Practices Lab Manual", Vikas Publishing House Pvt. Ltd, 2006.						
4.	Dr.P.Kannan, Mr. T.Satheeskumar & Mr.K.Rajasekar, "Engineering practices laboratory" Manual first edition 2017.						
5.	Dr. V. Rameshbabu "Engineering practices laboratory" VRB publication pvt Id.						
E-RESOURCES:							
1.	Virtual Labs - NPTEL Labs for Mechanical Engineering						

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain safety procedures, workshop tools and engineering practices used in manufacturing environments.	PO1, PO2, PO5, PO6, PO7, PO8, PO10	PSO1
CO2	Construct wooden and metal fitting joints using appropriate carpentry and fitting tools.	PO1, PO2, PO3, PO5, PO9	PSO1, PSO2
CO3	Fabricate sheet metal and plumbing components using suitable tools and techniques.	PO1, PO2, PO3, PO5, PO9	PSO1, PSO2
CO4	Perform welding and foundry operations to manufacture engineering components.	PO1, PO2, PO3, PO4, PO5, PO9	PSO1, PSO2
CO5	Perform various machining operations in mild steel rod by operating lathe and drilling machines	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11	PSO1, PSO2, PSO3
CO6	Develop a model product using practical engineering skills, teamwork and problem-solving ability through workshop practices and self-learning activities.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11	PSO1, PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	3	2			1	2	2	3		1		1		
CO2	3	3	2		2				2			3	2	
CO3	3	3	3		2				2			3	2	
CO4	3	3	3	2	2				2			3	3	
CO5	3	2	2	1	3	2	1		1			2	3	1
CO6	2	3	2	1	1			2	3	3	2	2	2	3

Activities:

1.	Design and Fabrication of a Multi-Utility Tool Stand
2.	Design and Fabrication of a Portable Study Lamp with Storage Box

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Safety Practices & Discipline	20	Consistently follows all safety procedures independently	Uses tools accurately and independently with high proficiency	Follows safety procedures inconsistently
2.	Tool Handling & Technical Skills	20	Uses tools accurately and independently with high proficiency	Uses tools correctly with occasional support	Uses tools with frequent assistance

3.	Execution of Practical Work	25	Produces accurate work meeting specifications with excellent finish	Produces acceptable work with minor errors	Produces work with noticeable errors requiring correction
4.	Problem Solving & Application Skills	15	Identifies and solves problems independently with innovative approach	Identifies and solves problems independently with innovative approach	Requires continuous support for solving problems
5.	Teamwork & Participation	10	Actively contributes and works effectively in teams	Participates adequately in team activities	Limited participation in teamwork
6.	Documentation & Self-Learning	10	Well-maintained records with additional learning inputs	Records maintained with minor omissions	Incomplete records with limited learning evidence
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
CO1	20		10	2
CO2	20		10	2
CO3	20		10	2
CO4	20		10	2
CO5	20		10	2
CO6		100	50	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MCS01		ENGINEERING SPRINTS			SEMESTER			II		
Prerequisites					Category	SD	Credits			0
Basic knowledge of calculus, differential equations, complex numbers and elementary integration techniques.					Hours/ Semester	L	T	P	SL	TH
						0	0	15	15	30
COURSE OBJECTIVES										
1.	To strengthen conceptual understanding of fundamental engineering concepts.									
2.	To spark curiosity in students’ Minds.									
3.	To focus on teaching through a problem-solving approach using Street Fight Engineering principles pioneered.									
4.	To foster the growth of functional independence and self-driven learning habits									
5.	To maximize the interest levels toward learning - as students aspire to create meaningful changes in the world.									
UNIT - I		STREET FIGHTING ENGINEERING								3
Why Street fight engineering - How to street fight engineering - Decode real-world problems - Observe key patterns - Relationship study - Derive actionable inferences - Perform data driven insights- Generate concepts and case studies										
UNIT - II		PROGRAMMING PARADIGM								3
Need for programming - Outside box thinking to solve problems - Need for algorithms and data structures -Flowcharts & Algorithms - Memory Allocation - Conditions and loops - Creating effective functions - Case studies - Visual Programming - Types of programming languages& paradigms - Getting started with development - Build & test an algorithm - best practices										
UNIT - III		BRAINS OF MACHINES								3
Key Innovations in Tesla Electric car - Case study - Brains of Electric cars - Transdisciplinary systems - Adapting Transdisciplinary systems to Accelerate innovation - Idea Hexagon - Exercise to think new innovations using Idea Hexagon - Brains of Digital camera										
UNIT - IV		MACHINES THAT MAKE-UP THE WORLD								3
Basic of Electronics Passive Components -Need for sensors & Actuators - Analyzing & Understanding electronic circuits - How to Build a Basic Custom Hardware - Bootloader& its purpose										
UNIT - V		ENGINEERING THE REAL WORLD								3
Real-world as systems - Introduction to Systems Thinking - Stock and Flow Diagrams - System Traps - Intervening in System - Living in a World of Systems										
Total:30 Hours										
Weightage:										
Continuous Assessment 100%										

REFERENCE BOOKS:			
1.	Learning to code: How to think like a programmer		
2.	How to find innovative ideas: Ramesh Raskar’s note		
3.	Case study: How Tesla changed the auto industry		
4.	Ultimate Guide: How to develop a new electronic hardware product		
5.	Think like a programmer: An introduction to creative problem solving		
E-RESOURCES:			
1.	Coursera, “Design Thinking for Innovation”, University of Virginia, https://www.coursera.org		
2.	“Engineering Systems and Innovation”, Massachusetts Institute of Technology, https://www.edx.org		
3.	MIT OpenCourseWare, “Engineering Systems Analysis for Design”, Massachusetts Institute of Technology, https://ocw.mit.edu		
4.	Stanford Online, “Design Thinking and Innovation”, Stanford University, https://online.stanford.edu		
5.	NPTEL, “Problem Solving Through Programming in C”, National Programme on Technology Enhanced Learning (NPTEL), https://onlinecourses.nptel.ac.in		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Remember and understand the concepts of Street Fighting Engineering, programming paradigms, innovation tools, basic electronics and systems thinking used in engineering applications.	-	-
CO2	Apply Street Fighting Engineering principles, algorithms and programming concepts to solve engineering problems.	PO1	PSO1
CO3	Analyze engineering problems using innovation methodologies, transdisciplinary systems and systems thinking approaches	PO2	PSO1
CO4	Investigate engineering systems involving electronics, sensors, actuators and hardware design through assignments and case studies.	PO3	PSO2
CO5	Solve real-world engineering problems by applying analytical thinking, data-driven insights and systematic problem-solving techniques.	PO5	PSO2
CO6	Communicate engineering concepts, innovative ideas, solutions and findings effectively through reports, presentations and technical documentation.	PO10	-

The Course Articulation Matrix (CAM) for defined Cos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-	1	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	1	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-	-	-

Activities:

1.	Students shall analyse a real-world engineering problem using Street Fighting Engineering principles, systems thinking concepts and appropriate analytical tools. The activity may include problem identification, pattern analysis, inference generation and solution proposal.
2.	Students shall prepare a structured report or presentation on an innovative engineering product, programming application, electronic system or engineering case study highlighting methodology, findings and engineering significance.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Problem Identification	10	Real-world problem clearly identified and justified	Problem identified with minor gaps	Problem selection lacks clarity
2.	Analytical Thinking	10	Strong analysis and logical reasoning	Analysis adequate with minor errors	Limited analysis
3.	Application of Engineering Concepts	10	Concepts applied effectively and correctly	Mostly correct application	Weak application
4.	Solution Development	10	Innovative and feasible solution proposed	Solution acceptable	Solution incomplete
5.	Interpretation of Results	10	Results clearly interpreted with engineering relevance	Interpretation adequate	Weak interpretation
	Total	50			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Technical Communication	10	Ideas communicated clearly and professionally	Mostly clear communication	Communication needs improvement
2.	Organization of Report / Presentation	10	Well-structured and systematic	Minor organizational issues	Poor organization
3.	Use of Technical Content	10	Appropriate and accurate technical content	Minor inaccuracies	Limited technical content
4.	Presentation Skills	10	Highly effective presentation and explanation	Good presentation	Basic presentation
5.	Overall Academic Quality	10	Professional and high-quality work	Good quality work	Satisfactory quality
	Total	50			

26NCC01	NCC Course –I (Only for NCC Students)		SEMESTER				II		
Prerequisites			Category		-	Credits		2	
			Hours/ Semester		L	T	P	SL	TH
					30	0	0	30	60
COURSE OBJECTIVES									
1.	To Maintain the unity and disciplines to the students.								
UNIT - I		NCC GENERAL & NATIONAL INTEGRATION AND AWARENESS							6
Aims, Objectives and Organization of NCC – Incentives to NCC Cadets – Duties of NCC Cadets – NCC Camps: Types and Conduct – National Integration: Importance and Necessity – Factors Affecting National Integration – Unity in Diversity – Threats to National Security.									
UNIT - II		PERSONALITY DEVELOPMENT & LEADERSHIP DEVELOPMENT							6
Personality Development Capsule – Self Awareness – Empathy – Creative and Critical Thinking – Decision Making – Communication Skills – Group Discussion – Stress Emotions – Change Your Mindset – Interpersonal Relations and Teamwork – Time Management – Civil Sense – Career Counselling – SSB Procedures and Interview Skills; Leadership Capsule – Traits, Indicators, Motivation, Ethics and Honour Code – Case Studies: Shivaji, APJ Abdul Kalam, Deepa Malik, Maharana Pratap, Ratan Tata, Kiran Majumdar Shaw, Jhansi Ki Rani, Narayan Murthy, Prakash Padukone, Tipu Sultan, Rabindranath Tagore.									
UNIT - III		DISASTER MANAGEMENT AND HEALTH & HYGIENE							6
Disaster Management Capsule – Social Service and Community Development – Types of Disasters – Organization, Capability and Role of NCC Cadets – Fire Service and Fire Fighting – Initiative Training – Organization Skills – Do’s and Don’ts – Natural Disasters – Man-Made Disasters – Health and Sanitation – First Aid in Common Medical Emergencies – Treatment and Care of Wounds – Introduction to Yoga and Exercises.									
UNIT - IV		PRINCIPLES OF FLIGHT & GENERAL SERVICE KNOWLEDGE							6
Laws of Motion – Glossary Terms – Bernoulli’s Principle – Aerofoil – Forces Acting on Aircraft – Lift and Drag – Flaps and Slats – Stall – Thrust – Armed Forces and IAF Capsule – Modes of Entry in IAF – Civil Aviation – Aircraft Recognition – Latest Trends and Acquisitions.									
UNIT - V		NAVIGATION, AERO ENGINES, AIR CAMPAIGNS & AIRMANSHP							6
Requirements of Navigation – Glossary Terms – Maps – Map Reading – Basic Theory – Types of Engines – Piston Engines – Jet Engines – Turbo Prop Engines – Indo-Pak War 1971 – Operation Safed Sagar – Famous Air Heroes – Airmanship – Airfield Layout – Rules of the Air – Circuit Procedures – ATC RT Procedures – Aviation Medicine – Survival.									
L:30, P:0, SL:30, Total:60 Hours									
REFERENCE BOOKS:									
1.	William H. McRaven, <i>The Hero Code: Lessons Learned from Lives Well Lived</i> , Grand Central Publishing, 2019.								
2.	S. K. Mangal, <i>Leadership and Personality Development</i> , PHI Learning Pvt. Ltd., 2018.								
3.	N. V. K. Raju, <i>Disaster Management and Preparedness</i> , CBS Publishers, 2019.								
4.	A. K. Gandhi, <i>National Security and National Integration in India</i> , New Century Publications, 2017.								
5.	V. K. Sharma, <i>Fundamentals of Aviation and Air Navigation</i> , Himalaya Publishing House, 2018.								

E-RESOURCES:	
1.	National Cadet Corps (NCC) https://indiancc.nic.in/
2.	Ministry of Defence, Government of India https://mod.gov.in/
3.	National Disaster Management Authority (NDMA) https://ndma.gov.in/
4.	Indian Air Force https://indianairforce.nic.in/

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Acquire knowledge about the history, organization, objectives, incentives, duties, and camps of NCC.	PO8, PO11	-
CO2	Understand the concept of national integration, national security, unity in diversity, and their significance in nation building.	PO6, PO8, PO11	PSO1
CO3	Apply principles of personality development, leadership, communication, teamwork, ethics, and decision-making in personal and professional life.	PO8, PO9, PO10,	PSO1
CO4	Understand the fundamentals of disaster management, health, hygiene, first aid, and the role of NCC cadets during emergencies and disaster situations.	PO6, PO7, PO8	PSO2
CO5	Understand the principles of flight, aviation systems, navigation, aero engines, armed forces, and airmanship practices.	PO1, PO2, PO8	PSO2
CO6	Demonstrate discipline, leadership, social responsibility, patriotism, and service-oriented attitudes through NCC training and community-oriented activities.	PO8, PO9, PO10, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PS O 01	PS O 02	PS O 03
C01	-	-	-	-	-	-	-	3	-	-	2	-	-	-
C02	-	-	-	-	-	2	-	3	-	-	2	2	-	-
C03	-	-	-	-	-	-	-	3	3	2	-	2	-	-
C04	-	-	-	-	-	2	2	3	-	-	-	-	2	-
C05	2	2	-	-	-	-	-	3	-	-	-	-	2	-
C06	-	-	-	-	-	-	-	3	3	3	2	-	-	3

Activities:

1.	Activity 1: Participate in NCC orientation programmes and awareness sessions to understand the organization, objectives, and role of NCC in nation building.
2.	Activity 2: Participate in leadership, personality development, and communication skill workshops to enhance teamwork, decision-making, and interpersonal skills.
3.	Activity 3: Participate in disaster management drills, first aid training, and community service activities to develop social responsibility and emergency response skills.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Knowledge of Aviation Concepts	25	Demonstrates comprehensive understanding of aviation and flight principles	Demonstrates good understanding with minor gaps	Demonstrates basic understanding
2.	Technical Interpretation	25	Accurately explains aviation systems and navigation concepts	Explains concepts with minor errors	Limited explanation of concepts
3.	Application and Analysis	25	Effectively relates theory to practical aviation scenarios	Adequately relates concepts to applications	Limited application of concepts
4.	Presentation and Communication	25	Presents ideas clearly and confidently	Communicates adequately with minor hesitation	Communication lacks clarity
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Discipline and Commitment	25	Consistently demonstrates discipline, punctuality, and commitment	Demonstrates good discipline with minor lapses	Demonstrates basic discipline
2.	Leadership and Teamwork	25	Effectively leads and collaborates with peers	Participates actively with minor limitations	Limited leadership and teamwork
3.	Social Responsibility and Service	25	Actively contributes to community service and social initiatives	Participates satisfactorily in service activities	Limited participation in service activities
4.	Patriotism and Ethical Conduct	25	Demonstrates strong patriotic values and ethical behavior	Demonstrates good values and conduct	Demonstrates basic awareness of values and ethics
	Total	100			

26MAC04	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES B.E. (Common to CIVIL, ECE, MECH & METT)		SEMESTER			III	
Prerequisites		Category	BS	Credits			3
Basic knowledge of calculus, differential equations, complex numbers and elementary vector calculus.		Hours/ Semester	L	T	P	SL	TH
			45	15	-	30	90
COURSE OBJECTIVES							
1.	To understand the formation and solution methods of partial differential equations including first order and higher order linear equations.						
2.	To develop knowledge in solving boundary value problems using Fourier series and separation of variables techniques for heat and wave equations.						
3.	To acquire understanding of analytic functions, harmonic functions and conditions for analyticity in complex analysis.						
4.	To learn conformal mapping techniques and standard complex transformations used in mathematical and engineering applications.						
5.	To understand complex integration methods, residue theorem and contour integration techniques for evaluating complex and real integrals.						
UNIT - I	PARTIAL DIFFERENTIAL EQUATIONS						9+3
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Lagrange’s Linear equation – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.							
UNIT - II	APPLICATIONS OF FOURIER SERIES TO PARTIAL DIFFERENTIAL EQUATION						9+3
Classification of partial differential equations- Method of separation of variables – Solutions of one-dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation.							
UNIT - III	ANALYTIC FUNCTIONS						9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties of analytic functions – Harmonic conjugates – Construction of analytic function.							
UNIT - IV	CONFORMAL MAPPING						9+3
Introduction to complex mapping - Conformal mapping – Condition for conformality – Standard mappings: $a + z, az, az + b, \frac{1}{z}, z^2, e^z$ and Bilinear transformations.							
UNIT - V	INTEGRATION OF COMPLEX FUNCTIONS						9+3
Line integral - Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s and Laurent’s series – Singularities – Residues – Cauchy’s Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contours (excluding poles on real lines).							
L:45, T:15, SL:30, Total:90 Hours							

Weightage: Continuous Assessment: 40% End Semester Examinations: 60%				
REFERENCE BOOKS:				
1.	Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley & Sons. , New Delhi, 2015.			
2.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45 th Edition, New Delhi, 2020.			
3.	Wylie C. R. and Barrett L. C, "Advanced Engineering Mathematics", Tata McGraw-Hill., New Delhi, 2019.			
4.	Peter V.O Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt. Ltd., New Delhi, 2016.			
5.	Dennis G Zill, "Advanced Engineering Mathematics", Jones & Bartlett India P Ltd., New Delhi, 2017.			
E-RESOURCES:				
1.	NPTEL, "Partial Differential Equations", National Programme on Technology Enhanced Learning, https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_ma28			
2.	NPTEL, "Complex Analysis", National Programme on Technology Enhanced Learning, https://nptel.ac.in/courses/111107056			
3.	MIT Open Course Ware, "Differential Equations", Massachusetts Institute of Technology, https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/			
4.	Paul's Online Math Notes, "Partial Differential Equations and Complex Variables", Lamar University, https://tutorial.math.lamar.edu/classes/de/intropde.aspx			
5.	Wolfram Math World, "Partial Differential Equations, Analytic Functions, Conformal Mapping and Residue Theorem", Wolfram Research, https://mathworld.wolfram.com/AnalyticFunction.html			
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			Mapping POs	Mapping PSOs
CO1	Remember and understand the fundamental concepts and methods of partial differential equations, Fourier series applications, analytic functions, conformal mappings and complex integration, including PDE solution techniques, analyticity conditions, harmonic functions, mapping transformations, complex series expansions, and residue theory.		--	--
CO2	Apply the techniques of partial differential equations, Fourier series, analytic functions, conformal mappings and complex integration to solve mathematical and engineering problems involving heat and wave equations, complex transformations, contour integration and evaluation of real integrals using residue theory.		PO1	PSO1
CO3	Analyze mathematical and engineering problems using partial differential equations, Fourier series methods, analytic functions, conformal mappings and complex integration by selecting suitable analytical techniques, interpreting complex transformations, and examining the behaviour of functions and solutions in applied contexts.		PO2	PSO1
CO4	Develop mathematical models and analytical solution strategies using partial differential equations, Fourier methods, and complex analysis techniques for solving engineering and physical science problems.		PO3	PSO2
CO5	Investigate and solve assignment-based and application-oriented problems involving PDEs, conformal mappings and contour integration to enhance analytical reasoning and computational skills.		PO5	PSO2
CO6	Communicate mathematical concepts, analytical solution procedures, graphical interpretations and results related to partial differential equations and complex analysis effectively through proper mathematical notation, assignments, presentations and structured report writing.		PO10	--

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3											3		
CO3		2										2		
CO4			1										1	
CO5					3								1	
CO6										3				

Activities:

1.	Students shall solve selected assignment-based problems involving partial differential equations, Fourier series applications, analytic functions, conformal mappings and contour integration using suitable analytical and computational methods. This activity develops analytical reasoning, computational skill, and problem-solving ability in applied mathematics.
2.	Students shall prepare a short report or presentation on selected applications of PDEs, conformal mappings, analytic functions or residue theorem. This activity develops the ability to communicate mathematical procedures, graphical interpretations, results and conclusions effectively using proper notation and structured report writing.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (7-8)	Good (4-6)	Satisfactory (1-3)
1.	Selection of problem	8	Suitable application-based problem is selected and clearly understood	Problem is relevant, but needs minor clarity	Problem selection is basic or unclear
2.	Application of analytical method	8	Correct method is applied with proper steps	Method is mostly correct with minor errors	Method is incomplete or incorrect
3.	Accuracy of solution	8	Solution is accurate and well-presented	Minor errors are present	Major errors in solution
4.	Interpretation of results	8	Results are clearly interpreted with conclusion	Interpretation is limited	Interpretation is weak or missing
5.	Presentation and documentation	8	Work is neatly organized with clear numerical presentation and documentation	Presentation is good with minor organizational issues	Presentation is satisfactory but lacks consistency
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (7-8)	Good (4-6)	Satisfactory (1-3)
1.	Clarity of explanation	8	Concepts and procedures are clearly explained	Explanation is understandable with minor gaps	Explanation is unclear

2.	Use of notation, diagrams and representation	8	Proper notation, diagrams, graphs and outputs are used	Minor errors in notation or representation	Poor or missing representation
3.	Organization of report/ presentation	8	Well-structured and neatly presented	Organized, but needs improvement	Poorly organized or incomplete
4.	Communication of results	8	Results and conclusions are communicated effectively	Communication is adequate, but limited	Communication is weak
5.	Overall presentation and academic quality	8	Work demonstrates excellent academic quality and professionalism	Academic quality is good with minor issues	Academic presentation is satisfactory
	Total	40			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12	-	-	12	2
CO2	24	24	-	-	24	3
CO3	16	16	-	-	16	2
CO4	8	8	-	-	8	1
CO5	-	-	40	-	25	3
CO6	-	-	-	40	25	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE301	MECHANICS OF FLUIDS		SEMESTER				III	
Prerequisites			Category	ES(PC)	Credits			3
			Hours/ Semester	L	T	P	SL	TH
				45	-	-	45	90
COURSE OBJECTIVES								
1.	To study the Basic properties of fluid.							
2.	To understand the Fluid statics and Kinematics.							
3.	To study the problem related to Fluid dynamics.							
4.	To study losses, the boundary layer problems.							
5.	To understand the Dimensional, Model Analysis.							
UNIT - I	FLUID PROPERTIES							9
Introduction, Fluid properties – Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Vapour pressure, Capillarity and Surface Tension. Pressure – Pascal’s law - Relationship between Pressures – Pressure Measurements by Manometers.								
UNIT - II	FLUID STATICS & KINEMATICS							9
Fluid Statics: Hydrostatic forces on plane and curved surfaces – Total Pressure and Centre of Pressure– equilibrium of floating and submerged bodies - Meta centre – Metacentric height. Fluid Kinematics: Flow visualization – Types of flow – lines of flow - velocity and acceleration - Continuity equation (one, two, three-dimensional forms) – Stream function – velocity potential function – flow nets – Measurement of Velocity								
UNIT - III	FLUID DYNAMICS							9
Equations of motion – Euler’s equation of motion along a streamline - Bernoulli’s equation – Applications – Venturimeter, Orifice meter, Pitot tube- Laminar flow – viscous flow through pipes and between parallel plates – Hagen- Poiseuille equation- turbulent flow.								
UNIT - IV	FLOW THROUGH PIPES AND BOUNDARY LAYER							9
Major Loss, Darcy - Weisbach formula – Moody diagram, Minor losses of flow in pipes – Hydraulic Gradient Line – Total Energy Line - Pipes in series and in parallel – Power transmission through pipes. Definition of boundary layer – Thickness and classification – Separation of boundary layer – Methods of preventing separation.								
UNIT - V	DIMENSIONAL AND MODEL ANALYSIS							9
Dimensional Analysis – Rayleigh’s method, Buckingham’s π -Theorem. Model analysis – Types of Similitude – Dimensionless numbers – Model Laws – classification of Models - Scale effect.								
L:45, SL:45, Total: 90 Hours								
Weightage:								
Continuous Assessment 40%								
End Semester Examinations 60%								

REFERENCE BOOKS:

1.	Rajput R.K., A text book of Fluid Mechanics in SI Units, S. Chand and Company, 10 th Edition, New Delhi, 2016
2.	Subramanya K, Fluid mechanics and hydraulic machines, Tata Mc Graw Hill, New Delhi 2010
3.	Streeter, Victor L. and Wylie, Benjamin E., Fluid Mechanics, McGraw-Hill Ltd., 2010
4.	White FM, Fluid mechanics, Tata Mc Graw Hill, New Delhi, 2017.

E-RESOURCES:

1.	NPTEL Video Lectures – Fluid Mechanics Link: https://nptel.ac.in
2.	Virtual Labs – Fluid Mechanics Laboratory Link: https://www.vlab.co.in
3.	MIT OpenCourseWare – Fluid Mechanics Link: https://ocw.mit.edu
4.	LearnChemE Interactive Fluid Mechanics Simulations Link: https://learncheme.com
5.	SWAYAM Online Courses – Fluid Mechanics and Hydraulics Link: https://swayam.gov.in

COURSE OUTCOMES (COs) /**At the end of the course, the students will have the ability to****Mapping
POs****Mapping
PSOs**

CO1	Explain the fundamental properties of fluids, pressure measurement principles, fluid statics, kinematics, dynamics, pipe flow behavior and dimensional analysis concepts.	--	--
CO2	Apply fluid mechanics principles and governing equations to determine pressure, velocity, discharge, energy losses and flow characteristics in fluid systems.	PO1, PO2, PO3, PO4, PO5, PO11	PSO1, PSO2, PSO3
CO3	Analyze hydrostatic forces, flow behavior, boundary layer development, laminar and turbulent flow conditions using continuity, Bernoulli and momentum equations.	PO1, PO2, PO3, PO4, PO5, PO11	PSO1, PSO2, PSO3
CO4	Evaluate the performance of fluid flow systems, measuring devices, pipe networks and model studies for engineering applications.	PO1, PO2, PO3, PO4, PO5, PO6, PO10, PO11,	PSO1, PSO2, PSO3
CO5	Analyze pressure measurement systems, flow visualization and pipe flow characteristics through self-learning activities.	PO2, PO5, PO9, PO11,	PSO1, PSO2, PSO3
CO6	Evaluate dimensional analysis techniques, similitude concepts and flow measuring devices through self-learning activities.	PO2, PO3, PO5, PO9, PO11,	PSO1

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO2	3	3	2	2	2	--	--	--	--	--	1	3	3	1
CO3	2	3	2	3	2	--	--	--	--	--	1	3	3	2
CO4	2	2	3	2	2	2	--	--	--	2	1	3	3	2
CO5	--	2	--	--	2	--	--	--	1	--	3	2	2	3
CO6	--	2	--	--	2	--	--	--	1	--	3	2	3	3

Activities:

1.	Flow Visualization and Pressure Measurement Activity (CO5) Students shall demonstrate different types of flow patterns using flow visualization techniques and compare pressure measurements using simple manometers. Students must explain streamline flow behavior, pressure variation and practical applications.
2.	"Design the Efficient Pipe Flow System" Challenge (CO6) Students are given different pipe flow conditions involving varying pipe diameters, lengths and discharge requirements. They must determine suitable pipe arrangements, estimate head losses and justify their design using dimensional analysis and fluid flow principles.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Flow Visualization Concepts	20	Clearly explains flow types, streamlines and pressure variation concepts	Minor conceptual errors but overall understanding is good	Partial understanding with confusion in concepts
2.	Accuracy of Experimental Observation	20	Correctly identifies and records flow patterns and pressure readings	Minor observational errors	Incomplete or unclear observations
3.	Explanation of Pressure Measurement	30	Clearly explains pressure relationships and manometer principles	Mostly correct explanation with small errors	Weak explanation with incomplete relationships
4.	Application to Engineering Systems	20	Effectively relates concepts to practical pipe flow and hydraulic systems	Basic application explained	Partial application only
5.	Presentation & Clarity	10	Very neat, organized and easy to understand	Acceptable presentation with minor issues	Poor presentation
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection of Suitable Pipe System / Flow Device	20	Correctly selects suitable pipe arrangement or device for all conditions	Mostly correct selection with minor errors	Partially correct selection
2.	Technical Justification	30	Provides clear justification based on flow rate, losses and efficiency	Good explanation with minor gaps	Good explanation with minor gaps

3.	Application of Fluid Mechanics Concepts	30	Accurately applies Bernoulli equation, continuity and dimensional analysis concepts	Applies concepts with minor inaccuracies	Basic understanding of concepts
4.	Presentation and Decision-Making Ability	20	Logical, well-organized explanation with strong engineering reasoning	Organized explanation with adequate reasoning	Basic presentation with limited reasoning
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE302	SURVEYING		SEMESTER				III
Prerequisites		Category	ES(PC)	Credits			3
Mathematics		Hours/ Semester	L	T	P	SL	TH
			45	-	-	45	90
COURSE OBJECTIVES							
1.	To understand the Fundamentals of surveying in the field of civil engineering.						
2.	To know the basics of levelling and Contouring.						
3.	To know the basics of theodolite survey and computation of Area and Volume for Different Field						
4.	To understand tacheometric surveying in different terrain						
5.	To introduce the Advanced equipment for surveying						
UNIT - I	FUNDAMENTALS OF SURVEYING						9
Definition- Basic principles- Classification - Field work and office work - Types of chain - methods of ranging a line – Maps - Scale, adjustment in wrong observations- uses of chain, cross - staff and optical square. Compass survey - Magnetic and true north, magnetic declination and its variation - Bearings - Prismatic compass - Surveyor's compass - local attraction and its elimination.							
UNIT - II	LEVELLING AND ITS APPLICATIONS						9
Levelling - Terminology - Dumpy level and levelling staff - Temporary and permanent adjustments - Methods of levelling - Differential Levelling, Fly levelling, Reciprocal levelling, Check levelling - Procedure in levelling - Booking- Problems - Reduction - Curvature and refraction - Problems- Contouring - Terminology - Methods - Characteristics and uses of contours.							
UNIT - III	THEODOLITE TRAVERSING						9
Terminology - Reiteration and repetition- Temporary and permanent adjustments - Vertical angles - Traversing - Trigonometrical levelling - Omitted measurements - Problems - Computation of Area (Trapezoidal and Simpson’s rule) and Computation of Volume (Trapezoidal and Prismoidal formula).							
UNIT - IV	TACHEOMETRIC SURVEYING AND CURVES						9
Tacheometric surveying - Systems of Tacheometric measurement - Principle of Stadia method - Methods with staff held vertical and normal - The Analytic lens - Tangential method (Elevation and Depression) - Curves – Types of Curves – Simple Circular Curve – Compound Curve – Reverse Curve – Transition Curve – Elements of Curves – Applications in Highway and Railway Projects.							
UNIT - V	ADVANCED SURVEYING						9
Importance and Applications – Modern Surveying – Types of Modern Surveying Instruments – Electronic Theodolite – Total Station – Digital Level – GPS, DGPS and GNSS – Drone Surveying (UAV) – LiDAR – Basic Concepts of GIS, Remote Sensing and Photogrammetry – Engineering Applications of Advanced Surveying in Civil Engineering Projects.							
L:45, SL:45, Total: 90 Hours							
Weightage:							
Continuous Assessment 40%							
End Semester Examinations 60%							

REFERENCE BOOKS:			
1.	Punmia, B.C., Jain, A.K., & Jain, A.K. (2020). Surveying (Vol. I & II), 18th Edition (Reprinted 2025), Laxmi Publications Pvt. Ltd.		
2.	Duggal, S.K. (2019). Surveying (Volume 1 and Volume 2), 5th Edition (Reprinted 2024), McGraw Hill Education.		
3.	Gopi, S., Sathikumar, R., & Madhu, N. (2018). Advanced Surveying: Total Station, GPS and GIS, 2nd Edition (Reprinted 2024), Pearson Education India.		
4.	Subramanian, R. (2022). Surveying and Levelling, 3rd Edition, Oxford University Press.		
5.	Chandra, A.M. (2021). Higher Surveying, 3rd Edition (Reprinted 2025), New Age International Publishers.		
E-RESOURCES:			
1.	NPTEL Course on Digital Land Surveying and Mapping (IIT Roorkee) Link: https://nptel.ac.in/courses/105107160		
2.	NPTEL Course on Higher Surveying (IIT Guwahati) Link: https://nptel.ac.in/courses/105103176		
3.	Swayam Portal – Modern Surveying Techniques Link: https://swayam.gov.in		
4.	Survey of India Technical Manuals & Training Modules Link: https://surveyofindia.gov.in		
5.	ASCE Library – Journal of Surveying Engineering Link: https://ascelibrary.org/journal/jsued2		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Describe the fundamental principles, techniques, classifications, and errors associated with traditional and advanced surveying methods across linear, angular, elevation, and digital measurements.	--	-
CO2	Apply principles of levelling, theodolite traversing, tachometry, and curve design to establish field controls and calculate elevations, angles, and alignments as per engineering standards.	PO1, PO3, PO4, PO5, PO6, PO10	PSO1
CO3	Analyze field data collected from chain, compass, theodolite, and tachometric surveys to compute closing errors, balance traverses, and calculate cross-sectional areas and cut-and-fill volumes.	PO1, PO2, PO3, PO4, PO5, PO6, PO11	PSO1
CO4	Evaluate the performance, configurations, and errors of advanced surveying tools including Electronic Distance Measurement (EDM), Total Stations, GPS segments, and Drone configurations for digital land mapping.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11	PSO1, PSO3
CO5	Apply the principles of surveying materials, traverse adjustments, and properties of fresh terrain maps to solve engineering problems and evaluate geodetic field parameters through self-learning activities (Solving GATE questions and Code book Challenge.)	PO1, PO2, PO3, PO4, PO5, PO8, PO11	PSO1, PSO3
CO6	Analyze the operations of advanced geospatial instruments, digital terrain data, and aerial mapping methods to evaluate the performance and quality control of engineering surveys through self-learning activities (technical quiz and Seminar presentation)	PO1, PO2, PO4, PO5, PO6, PO7, PO8, PO9, PO11	PSO1, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	0	3	1	2	1	0	0	0	1	0	3	-	-
CO3	3	3	2	3	2	1	0	0	0	0	1	2	-	-
CO4	3	3	3	2	2	2	1	1	1	1	2	3	-	1
CO5	2	3	1	1	3	0	0	1	0	0	2	2	-	1
CO6	2	3	0	2	1	1	1	2	3	0	2	2	-	2

Activities:

1.	Apply the principles of surveying, traverse adjustment and interpretation of survey data to solve engineering problems through self-learning activities involving GATE-level questions and surveying problem-solving exercises (CO5)
2.	Seminar presentation (CO6)

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Conceptual Understanding of Surveying	20	Demonstrates excellent understanding of surveying principles and concepts and applies them correctly	Demonstrates good understanding with minor conceptual errors	Demonstrates basic understanding with some difficulty in applying concepts
2.	Numerical Problem-Solving Ability	30	Solves GATE-level numerical problems accurately using appropriate formulae, procedures and units	Solves problems with minor calculation or procedural errors	Attempts problems but has significant errors in calculations or procedures
3.	Application of Surveying Principles	30	Effectively applies surveying principles to solve problems involving levelling, traversing, areas, volumes, tacheometry and curves	Applies surveying principles appropriately with minor gaps	Shows limited ability to apply surveying principles to engineering problems
4.	Engineering Interpretation and Accuracy	20	Correctly interprets results and demonstrates accuracy with clear engineering relevance	Provides appropriate interpretation with minor errors or gaps	Provides limited interpretation and shows insufficient accuracy
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of advanced surveying concepts	20	Clearly explains geospatial, mapping, or instrumentation details	Average	Poor

2.	Case study analysis & design considerations	30	Comprehensive analysis with practical execution strategies	Important aspects are missing	Poorly explained
3.	Evidence of Self learning	30	Uses quality references such as journals, technical parameters, and standards	Limited sources	Verylimited sources
4.	Presentation &Communication	20	Presentation is clear, professional, and well-structured	Presentation needs improvement	Poorly presented
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	12	12			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE303	WATER RESOURCES ENGINEERING		SEMESTER				III	
Prerequisites			Category	ES(PC)	Credits			3
			Hours/ Semester	L	T	P	L	T
				45	0	0	45	90
COURSE OBJECTIVES								
1.	To understand the hydrological cycle and estimation of rainfall-runoff relationships.							
2.	To study the principles of irrigation engineering and irrigation scheduling							
3.	To analyze groundwater movement and well hydraulics.							
4.	To understand the design and operation of canals and hydraulic structures							
5.	To familiarize students with watershed management and sustainable water resource planning.							
UNIT - I SURFACE WATER HYDROLOGY 9								
Hydrologic cycle - Surface Water potential in India -Rain gauges - Types of rain gauges -Average rainfall over a basin by arithmetic mean, Thiessen polygon and Isohyetal method-Run off-Run off process- abstractions- Infiltration, evaporation, transpiration, interception and depression storage- Estimation of Run off by empirical formula and infiltration indices. Storm Hydrograph and Unit Hydrograph - Flood estimation by Dicken's formula.								
UNIT - II RESERVOIR PLANNING 9								
Importance of Reservoirs- Purpose of storage work- Large Reservoirs in India and Tamil Nadu -Types of reservoirs-Investigation for reservoir planning- Selection of site for a reservoir Zones of storage in reservoirs Single and multipurpose reservoir- Determination of capacity of reservoir- Reservoir sedimentation and their control - Reservoir losses Basics of flood routing.								
UNIT - III GROUND WATER HYDROLOGY 9								
History of Groundwater Development in the world and India-Occurrence of ground water- types of aquifers- storage coefficient -coefficient of transmissibility- Steady radial flow into a well located in unconfined and confined aquifers -description of various types of open and tube wells- Yield from an open well by constant level pumping test and recuperation test - Estimation of Yield (steady state condition)- Site selection for a tube well.								
UNIT - IV DISTRIBUTION SYSTEM 9								
classification of canals- canal alignment Kennedy's theory -Wood table -Lacey's theory -Design of canal cross sections - Comparisons of two theories - Use of Garret's diagram in channel design - Balancing depth of cutting - Design procedure for an irrigation channel- Longitudinal section of canal and schedule of area statistics - types of canal cross sections-component parts of a cross section-Construction and maintenance of canals-Canal lining-GIS application in distribution system.								
UNIT - V WATER LOGGING, DRAINAGE AND RIVER CONTROL 9								
Water logging-importance, Causes and effects of water logging-Remedial measures - Drainage - Advantages - Types of drainage system- Rivers and their behavior- Objectives- Classification and method of river training works - GIS application								
L:45, SL:45, Total:90 Hours								
Weightage:								
Continuous Assessment 40%								
End Semester Examinations 60%								

REFERENCE BOOKS:														
1.	Punmia B.C. and LalPande B.B., Irrigation and Water Power Engineering, Laxmi Publications, New Delhi.													
2.	Subramanya K., Engineering Hydrology, Tata McGraw Hill, New Delhi.													
3.	Modi P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House.													
4.	Garg S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers.													
5.	Raghunath H.M., Hydrology – Principles, Analysis and Design, New Age International Publishers.													
E-RESOURCES:														
1.	NPTEL – Water Resources Engineering Courses.													
2.	https://nptel.ac.in													
3.	https://archive.nptel.ac.in													
4.	Central Water Commission Resources – Link: https://cwc.gov.in													
5.	Central Water Commission Resources Link: https://cwc.gov.in													
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to											Mapping POs		Mapping PSOs	
CO1	Explain the concepts of hydrologic cycle, precipitation, runoff, groundwater occurrence, and reservoir planning and irrigation distribution systems.										-	-		
CO2	Apply hydrological and groundwater engineering principles to estimate rainfall, runoff, aquifer yield and reservoir capacity for water resources planning										PO1	PSO1		
CO3	Analyze reservoir storage requirements, canal systems, groundwater development and drainage problems using engineering principles										PO2, PO3	PSO1, PSO2		
CO4	Analyze and interpret water resources engineering problems using modern engineering tools and GIS applications										PO5	PSO2		
CO5	Study water resources management practices, canal distribution systems, groundwater development and reservoir operations through self-learning activities and present the findings considering societal and environmental impacts.										PO6, PO7, PO9, PO10	PSO2, PSO3		
CO6	Investigate contemporary issues related to water conservation, water logging, drainage and river training works through case studies/seminar activities and communicate sustainable solutions										PO6, PO7, PO9, PO10	PSO3		
The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	3	3	-	-	-	-	-	-	-	-	3	3	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	3	3	-	3	3	-	-	3	3
CO6	-	-	-	-	-	3	3	-	3	3	3	-	-	3

Activities:

1.	Field study / simulation on rainwater harvesting and irrigation systems (CO5)
2.	Case Study / Technical Seminar Presentation on watershed management and sustainable water resource planning (CO6)

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Problem identification and field study	20	Clearly identifies irrigation / recharge problem and field conditions	Problem identified with minor gaps	Limited understanding of field problem
2.	Technical analysis and calculations	30	Accurate calculations and technical interpretation	Minor errors in analysis	Incomplete calculations
3.	Sustainability and societal impact	20	Clearly explains environmental and societal impacts	Partial explanation provided	Limited discussion
4.	Report presentation	30	Report is clear, structured and technically sound	Report needs minor improvement	Poorly structured report
	Total	100			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of water resource concepts	20	Clearly explains watershed / water management concepts	Explanation needs improvement	Limited understanding
2.	Case study analysis and sustainability	30	Comprehensive analysis with sustainability measures	Moderate analysis	Poor explanation
3.	Evidence of self-learning	30	Uses journals, standards and multiple references	Limited sources used	Very limited sources
4.	Presentation and communication	20	Presentation is clear and professional	Presentation needs improvement	Poor presentation
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	12	12			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26ES301	MECHANICS OF SOLIDS		SEMESTER				III
Prerequisites		Category	ES(PC)	Credits			3
Engineering Mechanics		Hours/ Semester	L	T	P	SL	TH
			45	15	0	30	90
COURSE OBJECTIVES							
1.	To understand the fundamental concepts of stress, strain, and deformation of solids under various loading conditions.						
2.	To learn the behavior of beams and determine shear force and bending moment under different loading conditions.						
3.	To analyze stresses developed in structural members due to bending and shear forces.						
4.	To apply principles of equilibrium and mechanics to analyze plane trusses and thin cylinders/shells.						
5.	To evaluate torsional behavior and complex stress conditions in structural elements such as shafts						
UNIT - I	STRESS, STRAIN AND DEFORMATION OF SOLIDS						9
Stress and strain due to axial force – elastic limit – Hooke’s law – factor of safety – lateral strain – Poisson’s ratio – volumetric strain – changes in dimensions and volumes- shear stress – shear strain – relationship between elastic constants. Stepped bars – uniformly varying sections – composite bars – stresses due to temperature. Strain energy due to axial force- proof resilience and modulus of resilience							
UNIT - II	SHEAR FORCE AND BENDING MOMENT DIAGRAMS						9
Relationship between load, shear force and bending moment – shear force and bending moment diagrams for cantilever, simply supported and overhanging beams under concentrated loads, uniformly distributed loads, uniformly varying loads and concentrated moment – maximum bending moment and point of contra flexure.							
UNIT - III	STRESSES DUE TO BENDING AND SHEAR						9
Theory of simple bending and assumptions – analysis of beams for stresses – stresses distribution at a cross section due to bending moment and shear force for cantilever, simply supported and overhanging beams with different loading conditions.							
UNIT - IV	ANALYSIS OF PLANE TRUSS, THIN CYLINDERS/SHELLS						9
Stability and Equilibrium of plane frames-types of trusses-analysis of forces in truss members-method of joints and method of sections -thin cylinders and shells- under internal pressure-deformation of thin cylinders and shells							
UNIT - V	TORSION AND COMPLEX STRESSES (Two dimensions only)						9
Theory of torsion and assumptions – derivation of torsion formula – polar modulus – stresses in solid and hollow circular shafts – power transmitted by a shaft. State of stress at a point – normal and tangential stresses and their planes – principal stresses and their planes – plane of maximum shear stress – analytical method							
L:45, T:15, P:0, SL:30, Total: 90 Hours							
Weightage:							
Continuous Assessment 40%							
End Semester Examinations 60%							

REFERENCE BOOKS:	
1.	Bhavikatti S S strength of materials, Vikas Publishing House Pvt Ltd., New Delhi, Fourth edition 2013.
2.	Rajput RK, Strength of materials, S. Chand & Company Ltd, New Delhi, Seventh edition 2018.
3.	James M. Gere, Stephen P. Timoshenko, Mechanics of Materials, Stanley Thornes publisher 4th Edition, 1997.
4.	R. C. Hibbeler, Mechanics of Materials (SI Edition), Prentice Hall, Ninth Edition, 2018.
5.	Bansal R.K., Strength of materials, Laxmi Publications (P) Ltd., Fifth edition 2014.
6.	S. P. Timoshenko, "Strength of materials", third edition, Vols. 1 & 2, CBS Publishers, 2002.
7.	Punmia B C Jain and Jain AK, Strength of materials and theory of structures, vols. I and II, XI Edition, Laxmi Publications P Ltd, New Delhi, 13th Edition 2017.

E-RESOURCES:	
1.	NPTEL – Mechanics Of Solids https://nptel.ac.in/courses/105102090
2.	MIT Open Courseware https://ocw.mit.edu/courses/1-105-solid-mechanics-laboratory-fall-2003/
3.	YouTube https://www.youtube.com/watch?v=B9lyGZzb_6M&list=PLIHUrsYr8yHzft7ygw5THZo4aDcsxEadP

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Describe the fundamental concepts of stress, strain, deformation, shear force, bending moment, torsion, and complex stress conditions in structural elements.	--	--
CO2	Apply principles of mechanics to determine stresses, shear forces, bending moments, and torsional effects in structural members under various loading conditions.	PO1, PO2	PSO1, PSO2, PSO3
CO3	Analyze the behavior of beams, trusses, and thin cylinders/shells under different loading and support conditions.	PO1, PO2, PO4	PSO1, PSO2, PSO3
CO4	Evaluate stress distributions and structural response of members subjected to bending, shear, torsion, and combined loading conditions.	PO2, PO3	PSO1, PSO2, PSO3
CO5	Design structural elements such as beams, trusses, or shafts by applying principles of stress analysis and ensuring safe load-carrying capacity.	PO2, PO3, PO5, PO10	PSO1, PSO2, PSO3
CO6	Conduct and document a practical or field-based study to analyze structural behavior by evaluating loading conditions, stress distribution, and performance of structural elements.	PO2, PO4, PO8, PO9, PO11	PSO1, PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO2	3	3	–	–	–	–	–	–	–	–	–	3	3	1
CO3	3	3	–	2	–	–	–	–	–	–	–	3	3	1
CO4	–	3	2	–	–	–	–	–	–	–	–	3	3	1
CO5	–	3	2	–	2	–	–	–	–	1	–	3	3	2
CO6	–	2	–	3	–	–	–	2	2	–	2	3	2	3

Activities:					
1.	Basic Structural Design Activity (CO5) Design a simple structural element such as a beam or shaft by estimating loads and determining basic stresses, shear forces, and bending moments for safe performance.				
2.	Structural Behavior Investigation Activity (CO6) Conduct a practical or field-based study on structural elements to observe loading conditions, analyze stress distribution, and evaluate the performance of members under different types of loads.				
Rubrics for evaluation: CO5					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Problem Understanding	20	Clearly understands loading conditions, structural element, and problem requirements	Good understanding with minor gaps	Limited understanding of the problem
2.	Application of Concepts	30	Accurately applies stress, shear force, bending moment, and torsion concepts	Applies concepts with minor errors	Incorrect or limited application of concepts
3.	Design Calculations	30	Performs correct and systematic calculations ensuring safe structural performance	Minor errors in calculations	Incorrect or incomplete calculations
4.	Presentation & Documentation	20	Well-organized, clear, and professional presentation/report	Organized with minor issues	Poor clarity and documentation
	Total	100			
Rubrics for evaluation: CO6					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Observation & Data Collection	30	Accurately observes structural elements and records relevant loading and behavior data	Minor gaps in observation or data collection	Incomplete or improper observation
2.	Technical Understanding	20	Demonstrates strong understanding of structural behavior and stress distribution	Good understanding with minor gaps	Limited understanding of concepts
3.	Analysis & Interpretation	30	Clearly analyzes structural response and provides proper technical interpretation	Reasonable analysis with some justification	Inadequate or incorrect analysis

4.	Documentation & Communication	20	Clear, well-structured report with effective communication	Good documentation with minor issues	Poor documentation and unclear communication
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			6	1
CO2	24	24			47	3
CO3	12	12			16	2
CO4	12	12			11	2
CO5			40		10	2
CO6				40	10	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE304	ADVANCED SURVEYING AND BASIC GIS PRACTICAL				SEMESTER			III	
Prerequisites				Category	ES(PC)	Credits		2	
SURVEYING				Hours/ Semester	L	T	P	SL	TH
					-	-	60	-	60
COURSE OBJECTIVES									
1.	To familiarize students with traditional field equipment and key computation routines like Height of Collimation and Rise & Fall methods.								
2.	To determine unknown geographic and vertical parameters using dual-plane intersection procedures and tacheometric measurements.								
3.	To evaluate coordinates, total area boundaries, and earthwork cut-and-fill volumes using digital engineering instruments.								
4.	To develop practical layout skills for setting out structural baselines and horizontal structural curves in the field.								
5.	To enhance hands-on competence with global satellite positioning (DGPS) networks and introduce basic spatial data capture principles for GIS integration.								
LIST OF EXPERIMENTS									
1.	Study of Conventional Equipment for Surveying								
2.	Levelling - Height of Collimation and Rise & Fall Method								
3.	Heights and Distances of Inaccessible stations by Double plane method								
4.	Stadia Tacheometry								
5.	Tangential Tacheometry								
6.	Calculation of Area and Volume using Total Station								
7.	Setting out works Building using Total station								
8.	Setting out works - Simple curve (right/left-handed) Using Total Station								
9.	Determination of Coordinates using Differential Global Positioning System								
10.	Measurement of Radial Distance using Differential Global Positioning System								
Total:60 Hours									
Weightage: Continuous Assessment 60% End Semester Examinations 40%									
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to					Mapping POs		Mapping PSOs		
CO1	Perform field experiments using conventional surveying instruments to determine elevations and heights of accessible/inaccessible points.				PO1, PO2, PO5		PSO1, PSO2		
CO2	Conduct tacheometric configurations to evaluate spatial distances and vertical parameters across challenging terrains.				PO1, PO2, PO4, PO5		PSO1, PSO2		
CO3	Analyze data collected from Total Station instruments to solve area, volume, and alignment layout problems.				PO1, PO2, PO4, PO5		PSO1, PSO2		
CO4	Analyze satellite tracking points using DGPS setups to accurately establish regional coordinate controls and radial bases.				PO1, PO2, PO4, PO5		PSO1, PSO2		

C05	Prepare and present a laboratory-based technical seminar on recent advances in advanced surveying tools and basic GIS automation applications.	PO2, PO4, PO5, PO9, PO10	PSO1, PSO3
C06	Prepare and present a technical project report detailing real-world applications of modern geospatial tracking and GIS workflows within infrastructure networks.	PO2, PO4, PO9, PO10, PO11	PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01	3	2	-	-	2	-	-	-	-	-	-	3	2	-
C02	3	3	-	2	2	-	-	-	-	-	-	3	3	-
C03	2	3	-	3	2	-	-	-	-	-	-	3	3	2
C04	2	3	-	3	2	-	-	-	-	-	-	3	3	2
C05	-	2	-	2	3	-	-	-	2	3	-	2	-	2
C06	-	3	-	3	-	-	-	-	2	3	2	-	3	3

Activities:

1.	Technical Seminar (C05) Students shall present a seminar on recent advances in: - Automated Total Station internal processing frameworks. - Real-Time Kinetic (RTK) network protocols in DGPS tracking loops. - Drone Photogrammetry and LiDAR remote sensing tracking instruments. - Basic GIS application in municipal utility asset mapping vectors. - High-precision reference baseline layouts for structural alignment verification.
2.	Case Study and Technical Report on Surveying Applications (C06) Students shall prepare a technical report based on a real-world application of hydraulic machinery in: - Smart city utility framework tracking systems. - Highway alignment corridor selection and volumetric cut-and-fill mapping. - Catchment boundary and water storage basin modelling through basic GIS layouts. - Dense control network configuration mapping using continuous tracking DGPS frameworks. - Disaster vulnerability modelling and coastal boundary shifting records using remote drone sensors. The report shall include: - Introduction to the selected project site/system. - Type of modern surveying instrument/GIS software module utilized. - Field observation processing and calculation workflows. - Final coordinate mapping and spatial verification plots. - Field limitations, systematic error checks, and mitigation methods. - Modern tracking developments within the field. - Engineering conclusions and execution recommendations.

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Technical Knowledge	20	Demonstrates comprehensive understanding with accurate technical explanations	Demonstrates good understanding with minor omissions	Basic understanding with limited technical depth
2.	Content Organization	10	Well-structured and logically sequenced presentation	Mostly organized with minor gaps	Adequately organized
3.	Presentation Skills	10	Clear, confident, engaging delivery with effective communication	Good delivery with minor hesitation	Average communication skills
4.	Use of Visual Aids	05	Excellent use of diagrams, charts, animations, and multimedia	Good use of visual aids	Limited use of visual aids
5.	Response to Questions	05	Answers all Questions accurately and confidently	Answers most questions satisfactorily	Answers basic questions only
	Total	50			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection of Application	10	Relevant and comprehensive case selected	Appropriate case selected	Basic case selected
2.	Technical Content	20	Accurate and detailed technical explanation	Good technical explanation	Basic explanation
3.	Analysis & Interpretation	10	Critical analysis with meaningful observations	Adequate analysis	Limited analysis
4.	Report Organization	05	Well-structured and professional	Mostly organized	Basic organization
5.	Presentation & Documentation	05	Excellent presentation and documentation	Good presentation	Acceptable presentation
	Total	50			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
C01	20	-	20	2
C02	20	-	20	2
C03	20	-	20	2
C04	20	-	20	2
C05	10	50	10	2
C06	10	50	10	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE305		MATERIAL TESTING AND EVALUATION LABORATORY		SEMESTER			III	
Prerequisites			Category	ES(PC)	Credits			2
			Hours/ Semester	L	T	P	SL	TH
				-	-	60	-	60
COURSE OBJECTIVES								
1.	To find the strength properties of different construction materials like Steel.							
2.	To evaluate stiffness properties of springs.							
3.	To find the hardness properties of various metals.							
4.	To find the deflection behaviour of beams.							
5.	To find the quality of construction material							
LIST OF EXPERIMENTS								
1.	Tension test on mild steel specimen.							
2.	Deflection test on simply supported beam.							
3.	Deflection test on double cantilever beam.							
4.	Double shear test on mild steel rod.							
5.	Torsion test.							
6.	Test of springs i. Compression Spring, ii. Tension spring							
7.	Compression test on concrete cube.							
8.	Crushing test on bricks.							
9.	Hardness test on metals like mild steel, brass and aluminium.							
10.	Split tensile test on concrete.							
11.	Charpy Impact test.							
Total:60 Hours								
Weightage: Continuous Assessment 60% End Semester Examinations 40%								
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to				Mapping POs		Mapping PSOs		
CO1	Identify and explain the mechanical properties of materials and the standard procedures for testing steel, concrete, and bricks			-		-		
CO2	Perform tension, shear, and torsion tests to determine the fundamental engineering properties of metallic specimens			PO1, PO2, PO7, PO9		PSO1		
CO3	Determine the stiffness of various springs and analyze the deflection behavior of beams under different support conditions			PO1, PO2, PO7, PO9		PSO1		

CO4	Evaluate the hardness, impact strength, and compressive strength of materials to assess their quality for construction	PO1, PO2, PO7, PO9	PSO1
CO5	Study the comparative performance of various engineering materials through self-learning activities and present the findings while considering societal and environmental impact	PO6, PO9, PO1, PO11	-
CO6	Conduct a case study on material failure or selection for specific industrial applications through independent study and communicate the economic and safety implications	PO6, PO9, PO1, PO11	-

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	1	-	2	-	-	3	3	-
CO3	3	1	-	-	-	-	1	-	2	-	-	3	3	-
CO4	3	1	-	-	-	-	1	-	2	-	-	3	3	-
CO5	-	-	-	-	-	3	-	-	3	3	3	-	3	-
CO6	-	-	-	-	-	3	-	3	3	-	3	3	-	-

Activities:

1.	Comparative Material Analysis (CO5): A report comparing the experimental data of different material grades and justifying their use in specific societal infrastructures.
2.	Technical Case Study/Presentation (CO6): Independent study on a real-world structural failure related to material properties or a seminar on modern non-destructive testing (NDT) techniques.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Data Collection & Comparison	20	Data is clearly collected and compared across multiple materials.	Comparison is done, but some parameters are missing	Limited data comparison
2.	Societal & Environmental Impact	30	Comprehensive analysis of how material choice impacts society/ environment	Impact is discussed but lacks specific detail	Poorly explained impacts
3.	Interpretation of Results	30	Results are clearly interpreted and justified with evidence	Interpretation is present but has minor errors	Unclear interpretation
4.	Report Presentation	20	Report is clear, professional, and well-structured	Report is structured but needs improvement	Poorly structured report
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Material Failure/Selection	30	Clearly explains the technical reasons for material failure or selection	Explanation needs more technical depth	Limited understanding of the case
2.	Safety & Economic Considerations	30	Clearly discusses safety protocols and cost-benefit analysis	Safety/Economics discussed but lacks detail	Poorly explained consideration
3.	Evidence of Self-Learning	20	Extensive use of relevant journals, standards, and external source.	Limited use of external sources	Very limited sources
4.	Presentation & Communication	20	Presentation is clear, engaging, and well-structured	Presentation needs improvement in flow	Poorly structured presentation
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
CO1	20	20	20	2
CO2	20	20	20	2
CO3	20	20	20	2
CO4	20	20	20	2
CO5	10	10	10	2
CO6	10	10	10	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MCC02		ENVIRONMENTAL SCIENCE AND ENGINEERING			SEMESTER			III	
Prerequisites				Category	MC	Credits			3
				Hours/ Semester	L	T	P	SL	TH
					45	-	-	45	90
COURSE OBJECTIVES									
1.	To understand the fundamental concepts of ecology, biodiversity, environmental pollution, sustainable energy resources, climate change, and environmental sustainability relevant to engineering and society.								
2.	To acquire the ability to analyze environmental issues, pollution sources, biodiversity conservation strategies, and climate change mitigation measures using scientific principles.								
3.	To examine the interrelationships between ecosystems, energy resources, environmental management practices, and sustainable development goals.								
4.	To assess the suitability of sustainable technologies, renewable energy resources, environmental policies, and management strategies for addressing environmental challenges.								
5.	To develop practical and self-learning skills through environmental observations, case studies, field-based activities, and sustainability assessments, and to interpret findings for real-world applications.								
UNIT - I		ECOLOGY AND BIODIVERSITY:							9
Ecology– Definition, ecosystem – types – components (biotic and abiotic) – function– energy flow in ecosystem – components of forest, desert, river and ocean ecosystem –food chain and food web– ecological pyramid –ecological succession. Biodiversity – levels– values –biodiversity hot spots and hope spots in India – endangered and endemic species – threats and conservation of biodiversity.									
Activities									
1. Study of local ecosystem and identification of biotic and abiotic components. Documentation of local biodiversity and endangered species.									
2. Documentation of local biodiversity and endangered species.									
UNIT - II		ENVIRONMENTAL POLLUTION:							9
Air pollution –sources, effects, control measures – Water pollution–sources, effects, control measures – Noise pollution – sources, effects, control measures –Soil pollution – causes, effects and control measures – solid and electronic waste management – Environmental protection acts.									
Activities									
1. Survey of air, water, noise, and solid waste pollution sources in the locality. Preparation of waste segregation and management plan.									
2. Preparation of waste segregation and management plan.									
UNIT - III		SUSTAINABLE ENERGY RESOURCES:							9
Energy management and conservation– Need of new sources– Different types new energy sources– Applications of solar energy, wind energy, hydrogen energy, ocean energy and tidal energy– Concept, origin and power plants of geothermal energy.									
Activities									
1. Comparative study of renewable and non-renewable energy resources.									
2. Energy audit of classroom/home.									
UNIT IV		CLIMATE CHANGE AND MANAGEMENT:							9
Causes for climate change –global warming–greenhouse effect– acid rain–ozone layer depletion– carbon sequestration, carbon foot print, carbon credit, Kyoto protocol –green climate fund (GCF), climate investment fund (CIF) –intergovernmental panel on climate change (IPCC)–clean development mechanism (CDM) –Paris agreement.									
Activity									
Carbon footprint estimation of an individual or institution.									

UNIT - V		ENVIRONMENTAL SUSTAINANILITY AND PRACTICES:		9
Sustainability – concept, needs and challenges – economic, social, and environmental aspects of sustainability – transition from unsustainability to sustainability – sustainable development goals (SDGs)– targets, indicators, and intervention areas – zero waste and R concepts – environmental impact assessment (EIA) – sustainable habitat– green buildings, green materials, sustainable transport.				
Activity Sustainability assessment of campus/community.				
L:45, SL:45, Total:90 Hours				
Weightage: Continuous Assessment 40% End Semester Examinations 60%				
REFERENCE BOOKS:				
1.	Anubha Kaushik and C. P. Kaushik’s “Perspectives in Environmental Studies”, 6th Edition, New Age International Publishers ,2018.			
2.	Benny Joseph, ‘Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi 2016.			
3.	Gilbert M.Masters, ‘Introduction to Environmental Engineering and Science’, 2nd edition, Pearson Education, 2004.			
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.			
5.	Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, Oxford University Press, Third Edition, 2015.			
E-RESOURCES:				
1.	www.ePathshala.nic.in			
2.	www.onlinecourses.nptel.ac.in/			
3.	eGyanKosh – IGNOU Repository (http://egyankosh.ac.in)			
4.	https://www.unep.org			
5.	MIT OpenCourseWare (https://ocw.mit.edu)			
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to			Mapping POs	Mapping PSOs
CO1	Explain the principles of ecology, biodiversity, environmental pollution, sustainable energy resources, climate change, and environmental sustainability.		---	---
CO2	Apply environmental concepts and scientific principles to analyze ecosystem functions, pollution problems, biodiversity conservation, and sustainable energy utilization.		PO1	---
CO3	Analyze environmental challenges by correlating ecological processes, pollution impacts, climate change effects, and sustainability indicators.		PO2, PO7	---
CO4	Assess renewable energy technologies, climate management strategies, environmental policies, and sustainability practices for engineering applications.		PO6, PO7	---
CO5	Perform environmental observations, field studies, sustainability assessments, and activity-based investigations, and interpret the results using scientific methods.		PO8	---
CO6	Engage in self-learning activities related to environmental management, biodiversity conservation, renewable energy, climate action, and sustainable development and communicate the findings effectively.		PO9, PO11	---

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3													
CO3		3					3							
CO4						2	2							
CO5								2						
CO6									2		2			

Activities:

1.	Conduct field-based and activity-oriented studies related to ecosystems, biodiversity, environmental pollution, renewable energy resources, climate change impacts, carbon footprint assessment, waste management, and sustainability practices, and prepare reports based on observations and findings. (CO5) (Individual and Collaborative Team Work)
2.	i) A comprehensive environmental impact assessment study on environmental sustainability, public welfare, regulatory compliance, and ethical responsibilities. (CO4) (Independent study) ii) Participate in self-learning activities such as seminars, case studies, quizzes, presentations, and literature reviews on environmental conservation, sustainable energy technologies, climate agreements, environmental legislation, SDGs, green buildings, and sustainable transportation systems. (CO6) (Independent study)

Rubrics for evaluation: CO4

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Environmental Sustainability Assessment	10	Comprehensive evaluation of environmental impacts and sustainability measures with strong supporting evidence.	Adequate evaluation of major environmental impacts and sustainability aspects.	Limited or incomplete assessment of environmental sustainability.
2.	Public Welfare and Societal Impact Analysis	5	Thorough analysis of impacts on public health, safety, and community welfare with clear justification.	Identifies key societal impacts with moderate analysis.	Limited discussion of public welfare and societal impacts.
3.	Regulatory Compliance Evaluation	5	Clearly assesses compliance with relevant environmental laws, regulations, and standards.	Addresses major regulatory requirements with some gaps.	Minimal or inaccurate assessment of regulatory compliance.
	Total	20			

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Environmental Concepts	10	Demonstrates thorough understanding and accurate interpretation	Good understanding with minor gaps	Basic understanding
2.	Data Collection and Observation	10	Accurate, systematic, and comprehensive observations	Mostly accurate observations	Adequate observations
3.	Analysis and Interpretation	10	Excellent scientific analysis and interpretation	Good analysis with minor errors	Basic analysis
4.	Report / Presentation Quality	10	Clear, organized, and professional	Well organized with minor issues	Moderately organized
	Total	40			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Conceptual Clarity	10	Complete understanding and clarity	Good understanding	Moderate understanding
2.	Accuracy of Content	5	Scientifically accurate and comprehensive	Mostly accurate	Some inaccuracies
3.	Participation and Preparedness	5	Highly engaged and well prepared	Well prepared	Partially prepared
	Total	20			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	24	24			24	3
CO4				20	10	2
CO5			40		20	2
CO6				20	10	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MCS02		INNOVATION SPRINTS		SEMESTER			III
Prerequisites			Category	SD	Credits		0
			Hours/ Semester	L	T	P	SL
				0	0	15	15
COURSE OBJECTIVES							
1.	To understand the fundamentals of Design thinking and apply in ideating solutions for real world problems.						
2.	To solve challenges through problem curation, problem validation and customer discovery problems.						
UNIT - I		CHALLENGE CURATION					3
Introduction: Design Thinking Principles - Design Thinking Values - Design Thinking Methods - Challenge impact setting - Framing the design challenge.							
UNIT - II		CUSTOMER-CENTRIC INNOVATION					3
Understanding Customer needs - Empathy building techniques - gap analysis - adoption barriers - observations and insights - Translating Insights into Innovation Opportunities							
UNIT - III		IDEA GENERATION					3
Identifying pains & gains - crafting value proposition - Ideation - Divergent Thinking - Ideation methods- Rules of brainstorming-Managing risks - Concept of minimum usable prototypes - Generating solution concepts.							
UNIT - IV		PROTOTYPING					3
Prototyping concepts - Palm Pilot Experiment - Fake it before make it - Prototyping - The Law of Failure - Building a Prototype-Testing the Prototypes							
UNIT - V		PITCH & PRESENTATION					3
Science of Story telling - the blueprint for story telling - Pitch Script - Pitch Presentations - Best practices to creating a compelling pitch - communication fundamentals							
P:15, SL:15 Total:30 Hours							
Weightage:							
Continuous Assessment 100%							
REFERENCE BOOKS:							
1.	Tim Brown (2019), "Change by Design: How design thinking transforms organizations and inspires innovation"						
2.	Jan Chipchase& Simon Steinhardt (2013), "Hidden in Plain Sight: How to Create extraordinary Products for Tomorrow's Customers", Harper Business 2013						
3.	Christian Madsbjerg & Mikkel B. Rasmussen (2014), "The Moment of Clarity", Harvard Business Review Press						
4.	IdrisMootee (2013), Design Thinking for Strategic Innovation, Willey						
5.	Alexander Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want (Strategyzer) John Wiley & Sons, 2014						

E-RESOURCES:

- | | |
|----|---|
| 1. | Alberto Savoia, *The Pretotyping Manifesto*, 2009 |
| 2. | https://sites.google.com/a/pretotyping.org/www/the-pretotyping-manifesto |
| 3. | Jazz Factory, *All About Presentations*, http://blog.jazzfactory.in/ |
| 4. | Pretotyping Methodology, https://www.pretotyping.org/methodology.html) |

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Identify real-world problems	PO9, PO11	-
CO2	Apply the challenge curation techniques to real-world problems.	PO9, PO11	PSO1
CO3	Analyze the problems and generate solutions to address the challenges	PO9, PO10, PO11	PSO1
CO4	Build solutions using prototyping tools & techniques	PO9, PO11	PSO2
CO5	Develop an innovation pitch to effectively communicate the idea to solve the identified problem	PO8, PO9, PO11	PSO2
CO6	Demonstrate teamwork, leadership, and entrepreneurial skills in developing innovative solutions for real-world problems.	PO9, PO10, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PSO 01	PSO 02	PSO 03
C01	-	-	-	-	-	-	-	-	3	-	2	-	-	-
C02	-	-	-	-	-	-	-	-	3	-	3	3	-	-
C03	-	-	-	-	-	-	-	-	3	2	3	2	-	-
C04	-	-	-	-	-	-	-	-	2	-	2	-	3	-
C05	-	-	-	-	-	-	-	2	2	-	2	-	2	-
C06	-	-	-	-	-	-	-	-	3	3	3	-	-	3

Activities:

- | | |
|----|---|
| 1. | Activity 1: Problem Identification and Solution Ideation Sprint
Identify real-world problems through observations, surveys, and stakeholder interactions, understand user needs and challenges, analyze problems using simple design thinking tools, prepare a clear problem statement, generate multiple solution ideas through brainstorming, evaluate alternative solutions, select the most suitable solution, and document the problem analysis and proposed solution. |
| 2. | Activity 2: Prototype Development and Innovation Pitch Sprint
Prepare sketches or CAD models, develop a prototype or proof-of-concept model, test and validate the prototype, collect user feedback and improve the design, document the development process, prepare an innovation pitch and implementation plan, present the prototype before evaluators, and showcase teamwork, leadership, innovation, and entrepreneurial skills. |

Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Problem Presentation and Value Proposition	25	Clearly presents the problem, need, and value proposition with strong justification	Presents the problem and value proposition with minor gaps	Presents the problem with limited clarity and justification
2.	Content Organization and Pitch Structure	25	Pitch is well-structured, logical, and professionally organized	Organization is adequate with minor lapses	Organization lacks clarity and logical flow
3.	Communication and Presentation Skills	25	Delivers the pitch confidently with excellent verbal and non-verbal communication	Communicates effectively with minor hesitation	Communication lacks confidence and clarity
4.	Visual Aids and Response to Questions	25	Uses highly effective visual aids and responds accurately to questions	Uses adequate visual aids and answers most questions satisfactorily	Limited visual support and difficulty responding to questions
	Total	100			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Teamwork and Collaboration	25	Actively contributes, collaborates effectively, and supports team goals	Participates well with minor collaboration issues	Participates minimally with limited teamwork
2.	Leadership and Decision Making	25	Demonstrates strong leadership, initiative, and effective decision-making	Demonstrates leadership with occasional guidance required	Shows limited leadership and decision-making ability
3.	Entrepreneurial Thinking and Innovation	25	Demonstrates excellent entrepreneurial mindset and identifies implementation opportunities	Demonstrates good entrepreneurial awareness and innovation	Demonstrates basic understanding of innovation and entrepreneurship
4.	Project Management and Professional Responsibility	25	Effectively plans, organizes, and completes assigned tasks within deadlines	Manages tasks adequately with minor delays	Shows limited planning and project management skills
	Total	100			

26NCC02	NCC Course –II (Only for NCC Students)		SEMESTER				III	
Prerequisites			Category	-	Credits			2
			Hours/ Semester	L	T	P	SL	TH
				30	0	0	30	60
COURSE OBJECTIVES								
1.	To Maintain the unity and disciplines to the students.							
UNIT - I	SOCIAL SERVICE & COMMUNITY DEVELOPMENT							6
Basic of social service and its need – Rural Development Program – NGOs Roles and Contribution – Drug abuse and Trafficking – Civic Responsibilities – Causes & Prevention of AIDS/HIV – Counter Terrorism – Corruption – Social Evil – RTI & RTE – Traffic Control Organization – Anti-Drunken Driving.								
UNIT - II	GENERAL AWARENESS & ADVENTURE							6
General Knowledge – Logical & Analytical Reasoning – Modes of Entry to Army, CAPF, Police – SSB Procedure – Para Sailing – Slithering – Rock Climbing – Cycling and Trekking.								
UNIT - III	AERO ENGINES & NAVIGATION							6
Introduction to Aero Engines and its Types – Components of Aero Engines – Principles of Propulsion – Basic Terminology – Jet Engines – Brayton Cycle – Turbo Prop Engines and its Types – Requirements of Navigation – Lines on Earth – Maps and its Types – Symbols used in Maps – Scales of Maps – Map Reading Procedure and its Aids.								
UNIT - IV	AIRFRAME & METEOROLOGY							6
Aircraft Control – Primary and Secondary – Fuselage – Main Plane and Tail Plane – Ailerons, Elevators & Rudders – Landing Gear – Importance of METT in Aviation – Atmosphere – Clouds and Precipitation – Flying Hazards.								
UNIT - V	FLIGHT INSTRUMENTS & AEROMODELLING							6
Airspeed Indicator – Altimeter – Artificial Horizon – Radar and its Type – Instruments Battery Test – Compass – History of Aero Modelling – Basic Materials & Tools – Types of Aero Modelling – Flying/Building of Aero Models – General Safety Procedure.								
L:30, P:0, SL :30, Total:60 Hours								
REFERENCE BOOKS:								
1.	William H. McRaven, <i>The Hero Code: Lessons Learned from Lives Well Lived</i> , Grand Central Publishing, 2019.							
2.	S. K. Mangal, <i>Leadership and Personality Development</i> , PHI Learning Pvt. Ltd., 2018.							
3.	N. V. K. Raju, <i>Disaster Management and Preparedness</i> , CBS Publishers, 2019.							
4.	R. P. Saini, <i>Air Navigation and Aviation Meteorology</i> , CBS Publishers, 2017.							
5.	V. K. Sharma, <i>Fundamentals of Aviation and Air Navigation</i> , Himalaya Publishing House, 2018.							

E-RESOURCES:

1.	National Cadet Corps (NCC) https://indiancc.nic.in/
2.	Ministry of Defence, Government of India https://mod.gov.in/
3.	National Disaster Management Authority (NDMA) https://ndma.gov.in/
4.	Indian Air Force https://indianairforce.nic.in/

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Understand the importance of social service, community development, civic responsibilities, and national values.	PO6, PO8, PO11	PSO1
CO2	Apply general awareness, logical reasoning, and leadership skills in defence-oriented and adventure activities.	PO8, PO9, PO10	PSO1
CO3	Understand the principles of aero engines, propulsion systems, navigation, map reading, and related aviation concepts.	PO1, PO2, PO8	PSO2
CO4	Understand the structure, control systems, meteorological factors, and operational aspects of aircraft.	PO1, PO2, PO8	PSO2
CO5	Understand the working principles and applications of flight instruments, avionics systems, and aeromodelling techniques.	PO1, PO2, PO5, PO8	PSO2
CO6	Demonstrate discipline, leadership, teamwork, adventure spirit, and social responsibility through NCC training and community engagement activities.	PO8, PO9, PO10, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01	-	-	-	-	-	2	-	3	-	-	2	2	-	-
C02	-	-	-	-	-	-	-	3	3	2	-	2	-	-
C03	2	2	-	-	-	-	-	3	-	-	-	-	2	-
C04	2	2	-	-	-	-	-	3	-	-	-	-	2	-
C05	2	2	-	-	2	-	-	3	-	-	-	-	3	-
C06	-	-	-	-	-	-	-	3	3	3	2	-	-	3

Activities:

1.	Activity 1: Participate in community service and social awareness programmes to develop civic responsibility and social commitment.
2.	Activity 2: Participate in adventure activities such as trekking, cycling, rock climbing, and leadership camps to enhance teamwork, confidence, and decision-making skills.
3.	Activity 3: Participate in navigation, map-reading, aeromodelling, and aviation awareness programmes to gain practical knowledge of aerospace and defence-related concepts.

Rubrics for evaluation: C05					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Knowledge of Flight Instruments	25	Demonstrates comprehensive understanding of flight instruments and avionics systems	Demonstrates good understanding with minor gaps	Demonstrates basic understanding
2.	Technical Interpretation	25	Accurately explains instrument functions and aircraft applications	Explains concepts with minor errors	Limited explanation of concepts
3.	Aeromodelling Application	25	Effectively applies concepts in aeromodelling activities and projects	Adequately relates concepts to applications	Limited application of concepts
4.	Presentation and Communication	25	Presents ideas clearly and confidently	Communicates adequately with minor hesitation	Communication lacks clarity
	Total	100			
Rubrics for evaluation: C06					
Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1	Discipline and Commitment	25	Consistently demonstrates discipline, punctuality, and commitment	Demonstrates good discipline with minor lapses	Demonstrates basic discipline
2	Leadership and Teamwork	25	Effectively leads and collaborates with peers	Participates actively with minor limitations	Limited leadership and teamwork
3	Adventure Participation and Social Responsibility	25	Actively contributes to community service and social initiatives	Participates satisfactorily in service activities	Limited participation in service activities
4	Ethical Conduct and Communication	25	Demonstrates strong patriotic values and ethical behavior	Demonstrates good values and conduct	Demonstrates basic awareness of values and ethics
	Total	100			

26CE401	STRENGTH OF MATERIALS		SEMESTER				IV	
Prerequisites			Category	ES(PC)	Credits			3
Mechanics of solids and Engineering Mechanics			Hours/ Semester	L	T	P	SL	TH
				45	15	-	30	90
COURSE OBJECTIVES								
1.	To Study the determine the deformation in determinate beams and to know the basic concepts of analysis of indeterminate beams.							
2.	Provide the principles and equations, and necessary tools to analyse structural members under axial loads, shear force and bending moment.							
3.	Develop the understanding on the state of stresses and strains in engineering components as a result of different loading conditions							
4.	To know about unsymmetrical bending and shear centre							
5.	To analysis of simple and special structures to find internal forces / stresses using various theorems / theories							
UNIT - I	DEFLECTION OF DETERMINATE BEAMS							9
Deflection of beams- - Governing differential equation –Double integration method- Macaulay’s method Moment Area method -Strain energy and Dummy unit load approaches – Castigliano’s first and second theorems. Determinate of beams – simply supported beam – cantilever beam – overhanging beam.								
UNIT - II	STATICALLY INDETERMINATE BEAMS							9
Statically indeterminate equilibrium equation - Propped cantilever beams – Fixed beams – Continuous beams – Theorem of three moments – Calculation of reactions – Bending Moment and Shear Force diagrams								
UNIT - III	THEORY OF COLUMNS							9
Definition of column - Classification of columns– Short, medium and long columns – definition loads – types of load - Members subjected to axial Load – - Radius of gyration- Middle-third rule- Slenderness ratio – End conditions – Buckling load for columns- Euler’s theory – Assumptions and limitations – Rankin-Gordon formula – Empirical formula – Straight line formula – Columns subjected to eccentric loading- Design concepts as per IS codes.								
UNIT - IV	UNSYMMETRICAL BENDING AND SHEAR CENTRE							9
Definition – unsymmetrical bending - Stresses due to unsymmetrical bending of beams for symmetrical sections – Shear Centre - Definition – Shear centre for sections symmetrical about one axis – Moment of Inertia – Product of Inertia – Principal axes and Principal moment of Inertia – Deflection of beams due to unsymmetrical bending								
UNIT - V	THICK CYLINDERS AND THEORIES OF FAILURES							9
Definition – thick cylinders – stress in thick cylinder - Lamé’s equation - – Hoop stress and radial stress distribution – Compound cylinders – Wire wound cylinders - THEORIES OF FAILURE: Maximum principal stress theory – Maximum principal strain theory – Maximum shear stress theory - Maximum strain energy theory – Maximum shear strain energy theory – simple problems								
L: 45, T:15, SL:30, Total: 90 Hours								
Weightage:								
Continuous Assessment : 40%								
End Semester Examinations : 60%								

REFERENCE BOOKS:														
1.	R. Subramanian's Strength of Materials,3rd Edition (2016)' Oxford University Press.													
2.	Dr. R. K. Bansal "Strength of Materials" (Mechanics of Solids) - 7th Edition - 2026 Published by Laxmi Publications.													
3.	Strength of Materials (Mechanics of Solids) SI Units 26th Edition By RS Khurmi& N Khurmi – 2018 S. Chand Publishing.													
4.	D.K.SINGH "strength of materials", Fourth Edition 2021, Springer publisher .													
5.	Strength of Materials, 5th Edition " 2021 "by S SBhavikatti- Publisher "S Chand And Company Ltd"													
E-RESOURCES:														
1.	NPTEL – Strength of Materials Courses Video lectures, notes and assignments on beams, columns, elasticity and mechanics of materials - https://nptel.ac.in													
2.	MIT Open Course Ware – Mechanics of Materials https://ocw.mit.edu													
3.	MIT Open Course Ware – Solid Mechanics - https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004													
4.	Open Textbook - https://en.wikibooks.org/wiki/Strength_of_Materials													
5.	NPTEL Course Archive - https://onlinecourses-archive.nptel.ac.in													
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to											Mapping POs		Mapping PSOs	
CO1	Understand and analyze the fundamental concepts of structural mechanics such as beam deflection, indeterminate beams, columns, unsymmetrical bending, and thick cylinders using appropriate analytical methods.										PO1, PO2		PSO1	
CO2	Determine reactions, shear force, bending moment, and deflection in structural members using suitable analytical methods.										PO1, PO2		PSO1	
CO3	Evaluate the stability and strength of structural elements including beams and columns under different loading conditions using theoretical approaches.										PO1, PO2		PSO1	
CO4	Analyze stresses, shear centre, and principal stress parameters in structural components subjected to complex loading conditions.										PO1, PO2		PSO1	
CO5	Apply Lamé's theory and failure theories for analyzing thick cylinders and structural design problems.										PO1, PO2		PSO1	
CO6	Apply integrated structural mechanics principles to solve engineering problems involving beams, columns, bending, and failure theories.										PO1, PO2		PSO1	
The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	3	2										3		
CO2	3	3										3		
CO3	3	2	2									3		
CO4		3	3									2		
CO5			3		3									
CO6					3				3	3	3			3

Activities:

1.	Simulation – Solution to application-oriented problems using software ➤ Deflection analysis of simply supported and cantilever beams ➤ Analysis of fixed and continuous beams ➤ Buckling analysis of columns ➤ Unsymmetrical bending of beams ➤ Stress distribution in thick cylinders ➤ Failure analysis using theories of failure
2.	Case Study / Technical Seminar Presentation (Independent Study) ➤ Failure of columns in real structures ➤ Thick cylinder applications in pressure vessels ➤ Beam deflection in bridges and buildings ➤ Buckling failures in towers and transmission poles ➤ Engineering applications of shear centre ➤ Case studies on structural failures related to material strength

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Strength of Materials Concepts	20	Demonstrates thorough understanding of the selected topic with correct technical explanations	Demonstrates adequate understanding with minor inaccuracies	Limited understanding of the topic
2.	Application to Engineering Practice	30	Clearly relates concepts to real-world engineering structures and applications	Applications discussed with limited depth	Minimal or unclear practical relevance
3.	Evidence of Self-Learning and Literature Review	20	Uses quality references such as journals, standards, books and technical reports	Uses a moderate number of relevant references	Uses very few or unreliable references
4.	Presentation and Communication Skills	10	Presentation is well-organized, professional and effectively delivered	Presentation is understandable but needs improvement	Presentation lacks clarity and organization
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Strength of Materials Concepts	20	Clearly explains the selected topic with accurate engineering concepts, equations and applications	Explanation is generally correct with minor omissions	Limited understanding of concepts and applications
2.	Engineering Analysis and Design Considerations	30	Effectively discusses analysis, safety aspects, design implications and practical relevance	Analysis is adequate but lacks depth in design considerations	Limited analysis and poor discussion of engineering relevance
3.	Evidence of self-learning	30	Uses relevant textbooks, IS codes, journals, research papers and technical resources	Uses a moderate number of relevant references	Uses very limited references with insufficient study
4.	Presentation and Communication Skills	20	Presentation is clear, well-structured and professionally delivered with effective visuals	Presentation is understandable but needs improvement in organization or delivery	Presentation is poorly organized and difficult to follow
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12	-	-	12	3
CO2	24	24			24	3
CO3	-	-			12	2
CO4	12	12			12	3
CO5	-		40		20	2
CO6	12	12		40	20	3
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE402	STEEL STRUCTURAL ELEMENTS (Use of IS800–2007& Steel tables are permitted)		SEMESTER				IV	
Prerequisites			Category	ES(PC)	Credits			3
Strength of Materials & Structural Analysis			Hours/ Semester	L	T	P	SL	TH
				45	15	-	30	90
COURSE OBJECTIVES								
1.	To study the basic concepts and methodology of design of steel structural elements							
2.	To analyse and design of simple bolted and welded connections							
3.	To adopt a suitable method and loading patterns for different steel structural elements.							
4.	To analyse the basic structural elements like tension, compression and beam elements.							
5.	To design the basic structural elements like tension, compression and beam elements as per codal specifications.							
UNIT - I		INTRODUCTION						9
Structural systems - Mechanical Properties of steel - Various uses of steel in civil engineering - Advantages and Disadvantages of steel structures - various loads and their combinations - Design considerations - Limit state method of design - failure criteria of steel - rolled steel sections and specifications - Elastic modulus, concept of allowable stress design and ultimate load method - Limit State Design - strength and serviceability - Partial safety factors - load factor - working loads and ultimate loads - Other properties, durability - fatigue - fire protection								
UNIT - II		CONNECTIONS						9
Bolted Connections : Introduction - terms used in bolted connections - Behaviour of bolted joints - Design of axially loaded joints with ordinary black bolts and High strength friction grip(HSFG) bolts - Efficiency of joints.Welded Connections : Introduction - Welding Process - Advantages of welding - Types and properties of welds - Types of welded joints - Weld symbols and specifications - Effective areas of welds - Design of welds - Analysis and design of simple joints.								
UNIT - III		TENSION MEMBERS						9
Introduction - Types of tension members - slenderness ratio - behaviour of axially loaded tension members - Net area - Net effective sections for angles and Tee in tension - failure modes of tension members - Factors affecting the strength of tension members - Concepts of shear lag - Design of axially loaded tension members with bolted and welded connections - Use of lug angles								
UNIT - IV		COMPRESSION MEMBERS						9
Introduction - Behaviour of compression members - types - rolled steel sections used for compression members - current codal provision for compression members design - slenderness ratio - Effective length of compression members - Design of compression members using single angle section - Design of built-up compression members with lacing and batten - Design of simple slab and gusseted base								
UNIT - V		BEAMS						9
Introduction - sections used for beams - types of beams - classification of sections- factors affecting lateral stability and behaviour of simple rolled steel beams - simple and compound sections - calculation of plastic section modulus of sections - behaviour of web under shear - shear check - deflection check - bearing strength of web - buckling strength of web - web buckling - Design of laterally supported and laterally unsupported rolled steel beams								
L:45, T:15, SL:30, Total:90 Hours								

Continuous Assessment : 40%

End Semester Examinations : 60%

1.	Duggal S.K., Limit State Design of Steel Structures, Tata Mc-Graw Hill Publishing Company, New Delhi, 3rd Edition, 2025 Print.
2.	Subramanian N, Design of Steel Structures, Latest Edition, Oxford University Press, Delhi
3.	Bhavikatti S S, Design of Steel Structures by Limit State Method, I.K International Pvt. Ltd., New Delhi, 2016.
4.	Jayagopal L. S, 'Structural Steel Design', Vikas Publications, 2016.
5.	Teaching Resources for Structural Steel Design- Vol I & II, INSDAG, Kolkata.

1.	https://nptel.ac.in/courses/105105162
2.	<u>IS 800 (2007): General Construction In Steel - Code of Practice</u>
3.	<u>SP 6-1 (1964): ISI Handbook for Structural Engineers -Part- 1 Structural Steel Sections</u>
4.	<u>https://edurev.in/v/186574</u>
5.	Civil Engineering videos lectures Best Civil Engineering Courses

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01												1		
C02		2											2	
C03			2										2	
C04				2									2	
C05				3	3									3
C06										3	3			3

Activities:

1.	Analyse and Design of steel elements like simple truss, beams and columns - practical problem (CO5)
2.	Case Study on truss, beams and columns using software (CO6).

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Model the steel structural elements with suitable loading, material and end conditions as per codal specifications	25	Model/Free body diagram with suitable loading etc as per codal specification	Partially completed	Poor model
2.	Analyse and interpret the data	25	Well presented final analysis output with accurate results	Partially completed	Poor presentation
3.	Design the elements	25	Selections of suitable steel sections and proper completion of design	Partially completed	Poor presentation
4.	Report presentation and Detailing	25	Well-structured report with detailed step by step procedure, detailing with proper scaling and labelling	Satisfactory report with minor deficiencies	Poorly organized report with inadequate conclusions
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Model the steel structural elements with suitable loading, material and end conditions as per codal specifications	25	Model/Free body diagram with suitable loading etc as per codal specification	Partially completed	Poor model
2.	Analyse and interpret the data	25	Well presented final analysis output with accurate results	Partially completed	Poor presentation
3.	Design the elements	25	Selections of suitable steel sections and proper completion of design	Partially completed	Poor presentation

4.	Report with Detailing	25	Well-structured report with detailed step by step procedure, detailing with proper scaling and labelling	Satisfactory report with minor deficiencies	Incomplete report
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12	-	-	12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5	-		40		20	2
CO6	12	12		40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE403	MECHANICS OF SOILS		SEMESTER				IV	
Prerequisites			Category	ES(PC)	Credits			3
Mechanics of Fluids			Hours/ Semester	L	T	P	SL	TH
				45	-	-	45	90
COURSE OBJECTIVES								
1.	To acquire knowledge on the basic and Engineering properties of soils							
2.	To understand stress distribution due to self-weight of soils and also due to externally applied loads							
3.	To study flow through soil and to gain knowledge about flow net diagrams							
4.	To get idea about the Engineering behaviour of soils such as compaction, consolidation of soils							
5.	To know the different methods for finding shear strength of soils							
UNIT - I	BASIC PROPERTIES OF SOILS							9
Soil formation– Soil problems in Engineering–Physical properties of soil– Phase relations– Index properties of soil– Grain size distribution – Atterberg’s limits – Classification of soils – BIS classification – Field identification.								
UNIT - II	STRESSES IN SOILS							9
Soilwater–Static pressure in water-Effective stress concepts in soils–Capillary phenomenon–Vertical stress distribution in soils – Boussinesq equation – Vertical stress distribution diagrams -Line load – Uniformly loaded areas – Newmark’s Influence Chart – Construction and Use –Approximate methods – Isobars – Westergaard’s Analysis-Contact Pressure.								
UNIT - III	PERMEABILITY AND SEEPAGE							9
One dimensional flow through soil – Permeability – Darcy’s Law – field and laboratory test- flow through stratified soil – Factors affecting permeability of soil. Seepagepressure–Quicksandcondition– Twodimensionalflow–Laplaceequation–Electricalanalogy–Flownet– Methods of construction, properties and applications – earth dam – Phreatic line.								
UNIT - IV	COMPACTION AND CONSOLIDATION							9
Compaction – laboratory tests – Standard Proctor’s Compaction test – Modified Proctor’s Compaction – Moisture density relation – factors affecting compaction – Field compaction methods – Compaction control. Consolidation – Components of settlement – Laboratory test – Terzaghi’s One Dimensional Consolidation – Definition – Normallyconsolidatedclay–OverConsolidatedclay–UnderConsolidatedclay–e-logprelationship–Boundarycondition – Time factor – Time rate of consolidation -√t and log t methods- Factors influencing compression behavior of soils.								
UNIT - V	SHEAR STRENGTH							9
Shear strength of soil – importance and use – Mohr – Coulomb’s theory – Laboratory test – Direct shear test – Triaxial Compression test – Types of Triaxial test based on drainage conditions –Unconfined Compression Test – Vane Shear test – Factors affecting the Shear Strength.								
L:45, SL:45, Total:90 Hours								
Weightage: Continuous Assessment : 40% End Semester Examinations : 60%								

REFERENCE BOOKS:

1.	Punmia B.C Soil Mechanics and Foundations, Laxmi Publications Pvt. Ltd., NewDelhi,2017.
2.	AroraK.R.,Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, NewDelhi ,2009.
3.	Venkataramaiah,C., Geotechnical Engineering, NewAge International Publishers, NewDelhi,2017
4.	Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, NewAge International Publishers (P)Ltd., NewDelhi, 2016.
5.	BrajaM.Das, Fundamentals of Geotechnical Engineering, Thomson Asia Pvt. Ltd, Singapore, 2005

E-RESOURCES:

1.	https://www.geoengineer.org/education/online-lecture-notes-on-soil-mechanics
2.	https://nptel.ac.in/courses/105105168
3.	https://onlinecourses.nptel.ac.in/noc25_ce02/preview
4.	https://koha.iitbbs.ac.in/bib/1179
5.	https://study.madeeasy.in/ce/soil-mechanics-and-foundation-engineering

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the formation, classification, index properties, and engineering behavior of soils for geotechnical applications.	-	-
CO2	Apply the principles of soil stress distribution, effective stress, capillary action, and contact pressure in soil systems.	PO1, PO2, PO3, PO4	PSO1, PSO2
CO3	Analyze permeability, seepage characteristics, flow nets, and groundwater flow through soils and earth structures.	PO1, PO2, PO3 PO4, PO5, PO6	PSO1, PSO2
CO4	Evaluate the compaction and consolidation behavior of soils and determine settlement characteristics of foundation soils.	PO1, PO2, PO3, PO4, PO5, PO6	PSO1, PSO2
CO5	Perform laboratory and analytical evaluation of soil shear strength using direct shear, triaxial, unconfined compression, and vane shear tests.	PO1, PO2, PO3, PO4, PO5	PSO1, PSO3
CO6	Investigate geotechnical engineering problems through self-learning activities, case studies, and technical presentations considering safety, societal, and economic aspects.	PO2, PO4, PO5 PO6, PO7, PO8, PO9, PO10, PO11	PSO1, PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3	3	2	2								3	2	
CO3	2	3	2	3	2	2						3	2	
CO4	2	3	2	3	2	2						3	2	
CO5	3	3	2	3	3							3	2	
CO6		2		2	2	3	3	3	3	2	3	2	2	3

Activities:

1.	Laboratory Demonstration and Analysis: Determine Atterberg Limits, Grain Size Distribution, and Soil Classification for a given soil sample and prepare a technical report. (CO5)
2.	Technical Seminar / Self-Learning Activity: Present a recent geotechnical engineering failure or successful soil stabilization project, considering safety, environmental, and economic aspects. (CO6) (Independent study)

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Experimental Procedure & Data Collection	30	Procedure followed accurately and observations recorded correctly	Minor errors in procedure or observations	Significant errors in procedure and data collection
2.	Analysis & Soil Classification	30	Calculations and classification are accurate and justified	Minor errors in calculations/classification	Incorrect or incomplete analysis
3.	Interpretation of Results	20	Results clearly interpreted with engineering significance	Interpretation adequate but lacks depth	Limited or unclear interpretation
4.	Report presentation	20	Well-structured report with tables, graphs, and conclusions	Report satisfactory with minor deficiencies	Poorly organized report
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Technical Understanding of Topic	25	Demonstrates thorough understanding with correct technical explanations	Adequate understanding with minor gaps	Limited understanding of topic
2.	Evidence of Self-Learning	25	Uses recent journals, codes, standards, and multiple sources	Uses a few relevant sources	Very limited references
3.	Safety, Environmental & Economic Considerations	25	Comprehensive discussion with practical insights	Discussion present but lacks depth	Minimal discussion
4.	Presentation & Communication Skills	25	Clear, confident, and well-organized presentation	Acceptable presentation with minor issues	Poor organization and communication
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
C01	12	12			12	2
C02	24	24			24	3
C03	12	24			12	2
C04	12	12			12	2
C05			40		20	2
C06				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE404	APPLIED HYDRAULICS AND FLUID MACHINERY	SEMESTER				IV	
Prerequisites		Category	ES(PC)	Credits			3
Mechanics of Fluids		Hours/ Semester	L	T	P	SL	TH
			45	-	-	45	90
COURSE OBJECTIVES							
1.	To understand the principles, types and characteristics of flow in open channels.						
2.	To study of uniform and varied flow conditions, flow profiles and hydraulic jump in open channels.						
3.	To study of momentum principles, jet impact, force exerted by jets and jet propulsion systems.						
4.	To learn the working, performance and governing of hydraulic turbines.						
5.	To study the operation, classification and performance characteristics of different types of pumps.						
UNIT - I	OPEN CHANNEL FLOW						9
Open channel flow – Types and regimes of flow – Velocity Distribution – Wide open channel – Specific energy – Critical flow and its computation. Uniform flow – Velocity measurement – Manning’s and Chezy’s formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections							
UNIT - II	VARIED FLOW						9
Dynamic equation of Gradually Varied Flow – Assumptions – Draw down and Back water curves - Characteristics of flow profiles — Profile determination – Graphical integration, direct step and standard step method - Hydraulic jump – Types – Energy dissipation							
UNIT - III	MOMENTUM PRINCIPLE						9
Impulse Momentum equation – Application of linear momentum principle – Impact of jet – force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases – angular momentum principle –construction of velocity Triangle – Jet propulsion							
UNIT - IV	TURBINES						9
Classification – working principles of Pelton Wheel, Francis and Kaplan turbines – Velocity triangles – efficiencies– Draft tube - theory and types – Specific speed –Governing of Turbines.							
UNIT - V	PUMPS						9
Classification - Centrifugal pump – working principle –velocity triangle - Minimum speed to start the pump– Multistage pumps – Specific speed - performance curves – Reciprocating Pump– components and working – slip - indicator diagram - Air vessel – working principle of Jet pump, Submersible pump and Gear pump, Air lift Pump.							
L:45, SL:45, Total:90 Hours							
Weightage:							
Continuous Assessment : 40%							
End Semester Examinations : 60%							

REFERENCE BOOKS:			
1.	Bansal R.K., Fluid Mechanics and Hydraulic Machines, 11 th Edition, Laxmi Publications(P) Ltd, New Delhi, 2023		
2.	Ramamrutham S., Fluid Mechanics and Hydraulics and Fluid Machines, Dhanpat Rai and Sons, Delhi, 10th Edition, 2022		
3.	Rama Durgaiah D., Fluid Mechanics and Machinery, New Age International Publishers, New Delhi, Revised Edition,2021		
4.	Rajput R.K., A textbook of Fluid Mechanics in SI Units, S. Chand and Company, 11 th Edition, New Delhi, 2021		
5.	Subramanya K., Flow in Open channels, 5 th Edition, Tata McGraw-Hill Publishing Company, 2022.		
E-RESOURCES:			
1.	NPTEL Video Lectures – Hydraulic Engineering / Fluid Mechanics Link: https://nptel.ac.in		
2.	Virtual Labs – Fluid Mechanics Laboratory Link: https://www.vlab.co.in		
3.	MIT OpenCourseWare – Fluid Mechanics / Hydraulics Resources Link: https://ocw.mit.edu		
4.	LearnChemE Interactive Simulations Link: https://learncheme.com		
5.	SWAYAM Online Courses Link: https://swayam.gov.in		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Explain the fundamental concepts of open channel flow, varied flow, momentum principle, hydraulic turbines and pumps including their classifications, characteristics and working principles.	–	–
CO2	Apply hydraulic principles and empirical relations to determine flow characteristics in open channels, varied flow profiles, jet forces, turbine performance and pump operating parameters.	PO1, PO2, PO3, PO4, PO5, PO11	PSO1, PSO2
CO3	Analyze the behavior of open channel flows, hydraulic jumps, jet interactions, turbine systems and pumping systems using energy, momentum and velocity triangle concepts.	PO1, PO2, PO3, PO4, PO5, PO11,	PSO1, PSO2
CO4	Evaluate the performance, efficiency and suitability of hydraulic turbines, pumps and channel flow systems for engineering applications based on design and operational requirements.	PO1, PO2, PO3, PO4, PO5, PO6, PO10, PO11,	PSO1, PSO2, PSO3
CO5	Analyze open channel flow behavior, varied flow profiles and momentum principles through self learning activities.	PO2, PO5, PO9, PO11,	PSO1, PSO2, PSO3
CO6	Evaluate the working principles, performance characteristics and applications of hydraulic turbines and pumps through self learning activities.	PO2, PO3, PO5, PO9, PO11,	PSO1, PSO2, PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2	3	3	2	2	2						1	3	2	
CO3	2	3	2	3	2						1	2	3	
CO4	2	2	3	2	2	2				2	1	3	3	1
CO5		2							1		3	1	2	3
CO6		2			2				1		3	1	2	3

Activities:

1.	Velocity Triangle Introduction Activity (Basic Concept) (CO5) Students shall draw and interpret simple velocity triangles for all possible hydraulics components and explain the relationship between absolute velocity, relative velocity.
2.	"Engineer the Best Turbine or pump" Decision Challenge (CO6) Students are given different site conditions (high head–low discharge, medium head, low head–high discharge). They must choose a suitable turbine or pump and justify their selection.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding of Concept	20	Clearly explains absolute, relative, and plate velocity with correct physics meaning	Minor conceptual errors but overall understanding is good	Partial understanding with confusion in definitions
2.	Accuracy of Velocity Triangle Drawing	20	Neat, correct, properly labeled velocity triangle with correct direction of vectors	Minor errors in labeling or direction	Basic diagram with missing labels or unclear representation
3.	Relationship Explanation (V, Vr, u)	30	Correctly explains vector relationship ($V = V_r + u$) with clarity	Slight errors in explanation but mostly correct	Weak explanation with incomplete relationship
4.	Application to Jet Impact	20	Clearly relates concept to jet striking plate and force change	Basic connection to jet impact explained	partial application
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection of Suitable Turbine/Pump	20	Correctly selects suitable turbine/pump for all site conditions	Mostly correct selection with minor errors	Partially correct selection
2.	Technical Justification	30	Provides clear justification based on head, discharge, efficiency, and working characteristics	Good explanation with minor gaps	Limited technical explanation
3.	Application of Hydraulic Engineering Concepts	30	Accurately applies hydraulic concepts to support decisions	Applies concepts with minor inaccuracies	Basic understanding of concepts
4.	Presentation and Decision-Making Ability	20	Logical, well-organized explanation with strong engineering reasoning	Organized explanation with adequate reasoning	Basic presentation with limited reasoning
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Test I	Test II	Activity I	Activity II	Percentage allocation	Mapping Strength
CO1	12	12			12	2
CO2	24	24			24	3
CO3	12	12			12	2
CO4	12	12			12	2
CO5			40		20	2
CO6				40	20	2
Total	60	60	40	40	100	

Note: Strength = 3 (if percentage >20%);

Strength =2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE405	COMPUTER AIDED BUILDING DRAWING		SEMESTER				IV	
Prerequisites			Category	ES(PC)	Credits			2
			Hours/ Semester	L	T	P	SL	TH
				-	-	60	-	60
COURSE OBJECTIVES								
1.	To introduce the students to draft the plan, elevation and sectional views of buildings in according with development and control rules satisfying orientation and functional requirements as per national building code.							
2.	At the end of this course the student should be able to draft the building drawings manually							
3.	At the end of this course the student should be able to draft the building drawings by using software							
4.	Understand the plan and elevation of buildings according to Indian standards.							
5.	At the end of this course the student should be able to draft the perspective view of building manually and by using software							
LIST OF EXPERIMENTS								
1.Part-A (Manual drawing)								
Building drawing in accordance with development and control rules satisfying orientation and functional requirements for the following: (20 hours)								
1	Residential buildings with load bearing walls (RCC roof).							
2	RCC framed structures.							
3	Office buildings (RCC roof).							
4	Industrial Buildings-North light roof truss.							
5	Perspective view for small buildings							
2.Part-B (Cadd Drawing)								
Fundamental Commands of Drafting Software to Draft the building Drawings and Building drawing in accordance with development and control rules satisfying orientation and functional requirements using computer aided software for the following :(25 Hours)								
1	Drawing Commands (Basic Commands, Modify Commands, Layers in AutoCAD)							
2	Residential buildings with load bearing walls (RCC roof)							
3	RCC framed structures							
4	Office buildings (RCC roof)							
5	Industrial Buildings-North light roof truss.							
6	Perspective view for small buildings							
P:60, Total: 60 Hours								
Weightage:								
Continuous Assessment : 60%								
End Semester Examinations : 40%								

REFERENCE BOOKS:														
1.	"Computer Aided Civil Engineering Drawing" published by Khanna Publishing House, India. Author by Sharma & Singh- 1st Edition, 2026													
2.	Building Planning and Drawing – N. Kumaraswamy & A. Kameswara Rao (9th Ed., 2023).													
3.	Civil Engineering Drawing and House Planning – B.P. Verma (13th Ed., 2023)													
4.	Building Design and Civil Engineering Drawing – T.S. Balagopal & T.S. Prabhu													
5.	Building Drawing by the author "M. G. Shah "Latest McGraw-Hill reprints (2020–2025)													
E-RESOURCES:														
1.	Residential Building Planning & Drawing - https://www.youtube.com/@nptelhrd/videos													
2.	RCC Framed Structures – Basics - https://www.youtube.com/@Ekeeda/videos													
3.	Office Building Planning - https://www.youtube.com/@CivilEngineeringAcademy/videos													
4.	Industrial Buildings and Roof Trusses - https://www.youtube.com/@Ekeeda/videos													
5.	Perspective Drawing for Buildings - https://www.youtube.com/@30by40/videos													
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to											Mapping POs		Mapping PSOs	
CO1	Interpret development control rules, building bye-laws, orientation principles, and space requirements for building planning.										PO1, PO2		PSO1	
CO2	Prepare detailed drawings of residential buildings with load-bearing walls and RCC roof incorporating functional and planning requirements.										PO1, PO3, PO5		PSO1, PSO2	
CO3	Develop structural drawings of RCC framed buildings following standard drawing practices and codes.										PO1, PO3, PO5		PSO1, PSO2	
CO4	Design and draft office building plans, elevations, and sections satisfying functional requirements and development regulations.										PO2, PO3, PO5		PSO1, PSO2	
CO5	Prepare drawings of industrial buildings incorporating north-light roof trusses and appropriate industrial planning concepts.										PO1, PO3, PO5		PSO1, PSO2	
CO6	Generate perspective views of small buildings and present building drawings using conventional drafting and CAD techniques.										PO3, PO5, PO10		PSO2, PSO3	
The Course Articulation Matrix (CAM) for defined Cos														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1	3	3										3		
CO2	2		3		2							2	3	
CO3	3		3		2							2	2	
CO4	-	2	2		3							3	3	
CO5	2		3		2							2	2	
CO6			3		2					3			2	3

Activities:

1.	Preparation of manual building drawings – Prepare plan, elevation and sectional drawings for residential, RCC framed and office buildings as per functional requirements and development/control rules.
2.	AutoCAD-based building drawing – Practice basic and modify commands, layers and other drafting tools in AutoCAD and prepare computer-aided drawings of residential, RCC framed, office and industrial buildings.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Basic AutoCAD Commands	30	Uses basic drawing commands accurately and independently	Uses basic drawing commands accurately and independently	Uses basic commands with considerable assistance
2.	Modify Commands	20	Uses modify commands accurately and efficiently	Uses modify commands correctly with minor errors	Uses limited modify commands with assistance
3.	Layer Management	25	Creates, manages and applies layers appropriately with correct properties	Creates and applies layers with minor errors	Uses layers with considerable assistance
4.	Drawing Accuracy	25	Produces accurate and precise drawings with proper dimensions and geometry	Drawing is mostly accurate with minor errors	Drawing contains noticeable errors
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Building Plan Preparation	30	Prepares a complete and accurate building plan satisfying functional requirements	Prepares a mostly complete plan with minor errors	Prepares a basic plan with significant assistance
2.	Elevation and Section	10	Produces accurate elevation and section with proper representation and details	Produces correct elevation and section with minor errors	Produces basic elevation and section with noticeable errors
3.	Application of Building Rules	30	Correctly applies development, control, orientation and functional requirements	Applies most requirements with minor omissions	Applies requirements partially with assistance

4.	CAD Drawing Accuracy and Detailing	30	Drawing is precise, properly dimensioned, layered and detailed	Drawing is mostly accurate with minor detailing errors	Drawing has several accuracy and detailing errors
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
CO1	10	10	10	2
CO2	10	10	10	2
CO3	20	20	20	2
CO4	20	20	20	2
CO5	20	20	20	2
CO6	20	20	20	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26CE406	APPLIED HYDRAULICS AND MACHINERY LABORATORY				SEMESTER				IV	
Prerequisites					Category	ES(PC)	Credits			2
					Hours/ Semester	L	T	P	SL	TH
						-	-	60	-	60
COURSE OBJECTIVES										
1.	To familiarize students with flow measurement devices and hydraulic coefficients.									
2.	To determine hydraulic parameters through laboratory experiments.									
3.	To evaluate the performance characteristics of turbines and pumps.									
4.	To develop skills in conducting experiments, recording observations, and interpreting results.									
5.	To enhance technical report writing and laboratory documentation skills.									
LIST OF EXPERIMENTS										
1.	Determination of coefficient of discharge of flow through orifice.									
2.	Determination of coefficient of discharge of flow through mouthpiece.									
3.	Determination of coefficient of discharge of flow over notches.									
4.	Determination of coefficient of discharge of Venturimeter.									
5.	Determination of coefficient of discharge of Orificemeter.									
6.	Determination of friction factor in pipes.									
7.	Determination of minor losses in pipes.									
8.	Performance test on Pelton Wheel Turbine.									
9.	Performance test on Francis Turbine.									
10.	Determination of efficiency and performance characteristics of Double Acting Reciprocating Pump.									
11.	Determination of efficiency and performance characteristics of Centrifugal Pump.									
12.	Determination of efficiency and performance characteristics of Jet Pump.									
13.	Study on performance characteristics of Self-Priming Pump.									
14.	Determination of efficiency and performance characteristics of Gear Oil Pump.									
P:60, Total:60 Hours										
Weightage: Continuous Assessment : 60% End Semester Examinations : 40%										

COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Perform experiments related to flow measurement devices and determine hydraulic coefficients.	--	--
CO2	Evaluate friction losses and minor losses occurring in pipe flow systems.	PO1, PO2, PO4, PO5	PSO1, PSO2
CO3	Analyze the performance characteristics of hydraulic turbines under varying operating conditions.	PO1, PO2, PO4, PO5	PSO1, PSO2
CO4	Analyze the efficiency and operating characteristics of pumps used in hydraulic systems.	PO1, PO2, PO4, PO5	PSO1, PSO2
CO5	Prepare and present a laboratory-based technical seminar on recent developments in hydraulic machines and fluid flow measurement devices.	PO2, PO4, PO5, PO9, PO10	PSO3
CO6	Prepare and present a technical report on real-world applications of hydraulic machinery and fluid flow systems in civil and water resources engineering.	PO2, PO4, PO9, PO10, PO11	PSO3

Activities:

1.	Technical Seminar (CO5) Students shall present a seminar on recent advances in: - Hydraulic turbines - Pumping systems - Flow measuring devices - Water resource applications - Energy-efficient hydraulic machinery
2.	Case Study and Technical Report on Hydraulic Machinery Applications (CO6) Students shall prepare a technical report based on a real-world application of hydraulic machinery in: - Hydroelectric power plants - Irrigation pumping stations - Water supply schemes - Industrial pumping systems - Flood control and drainage projects - Municipal water distribution system The report shall include: - Introduction to the selected system - Type of hydraulic machinery used - Working principle - Performance characteristics - Advantages and limitations - Recent technological developments - Conclusions and recommendations

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Technical Knowledge	20	Demonstrates Comprehensive understanding with accurate technical explanations	Demonstrates good understanding with minor omissions	Basic understanding with limited technical depth

2.	Content Organization	10	Well-structured and logically sequenced presentation	Mostly organized with minor gaps	Adequately organized
3.	Presentation Skills	10	Clear, confident, engaging delivery with effective communication	Good delivery with minor hesitation	Average communication skills
4.	Use of Visual Aids	05	Excellent use of diagrams, charts, animations, and multimedia	Good use of visual aids	Limited use of visual aids
5.	Response to Questions	05	Answers all Questions accurately and confidently	Answers most questions satisfactorily	Answers basic questions only
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Selection of Application	10	Relevant and comprehensive case selected	Appropriate case selected	Basic case selected
2.	Technical Content	20	Accurate and detailed technical explanation	Good technical explanation	Basic explanation
3.	Analysis & Interpretation	10	Critical analysis with meaningful observations	Adequate analysis	Limited analysis
4.	Report Organization	05	Well-structured and professional	Mostly organized	Basic organization
5.	Presentation & Documentation	05	Excellent presentation and documentation	Good presentation	Acceptable presentation
	Total	100			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
CO1	20	-	20	
CO2	20	-	20	2
CO3	20	-	20	2
CO4	20	-	20	2
CO5	10	50	10	2
CO6	10	50	10	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26ENC03	Placement and Soft Skill Laboratory B.E (Common to all Branches)		SEMESTER				IV	
Prerequisites			Category	HM	Credits			2
1. Basic Knowledge in reading skill and Writing skill 2. Basic ability in listening skill and speaking skill			Hours/ Semester	L	T	P	SL	TH
				-	-	45	15	60
COURSE OBJECTIVES								
1.	To develop learners' overall employability communication skills in writing, speaking, verbal ability, and reasoning.							
2.	To strengthen learners' professional writing competence for letters, emails, resumes, and reports.							
3.	To enhance learners' oral communication and group interaction skills for presentations, discussions, and workplace contexts.							
4.	To build learners' soft skills, confidence, and interview readiness for successful career entry.							
5.	To improve learners' verbal and logical abilities to support effective communication and problem-solving							
UNIT - I		WRITING SKILLS						9
Letter seeking permission to go on industrial visit, Letter of invitation, Resume and cover letter, Job application, E-mail writing, Report writing - progress in project work								
UNIT - II		SPEAKING SKILLS						9
Welcome address and vote of thanks, Analysing and presenting business articles, Power point presentation, Presenting the visuals effectively, Group discussion, Participating in group discussions, Understanding group dynamics, Brain-storming the topics								
UNIT - III		SOFT SKILLS						9
Employability and career skills, Self-introduction, Introducing oneself to the audience, introducing the topic, Interview skills, Interview etiquette, Dress code, Body language, Attending job interviews								
UNIT - IV		VERBAL ABILITIES						9
Error Spotting, Listening Comprehension, Reading comprehension, Rearranging Jumbled sentences, Vocabulary								
UNIT - V		REASONING ABILITIES						9
Series completion, Analogy, Classification, Coding-Decoding, Blood relations, Seating Arrangements, Directional Sense, Venn Diagram, Logical reasoning, Statements and Conclusions								
L: 45, SL:15, Total: 60 Hours								
Weightage: Continuous Assessment : 60% End Semester Examinations : 40%								
REFERENCE BOOKS:								
1.	Pease, Allan, and Barbara Pease. <i>The Definitive Book of Body Language</i> . Bantam Books, 2017.							
2.	Pillai, Sabeena, and Agna Fernandez. <i>Soft Skills and Employability Skills</i> . Cambridge University Press, 2018.							
3.	Aggarwal, R. S. <i>A Modern Approach to Verbal and Non-Verbal Reasoning</i> . S. Chand Publishing, 2018.							
4.	Mitra, Barun K. <i>Personality Development and Soft Skills</i> . Oxford University Press, 2016.							
5.	Thorpe, Edgar, and Showick Thorpe. <i>Winning at Interviews</i> . Pearson Education, 2015.							

E-RESOURCES:

- | | |
|----|---|
| 1. | https://www.indiabix.com/ |
| 2. | https://www.placementpreparation.io/ |
| 3. | https://www.edx.org/ |
| 4. | https://www.cambridgeenglish.org/ |
| 5. | https://www.coursera.org/ |

COURSE OUTCOMES (COs) /	Mapping	Mapping
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At the end of the course, the students will have the ability to

POs

PSOs

CO1	Apply effective writing skills to produce professional documents such as letters, resumes, cover letters, emails, and project reports.	PO9, PO11	
CO2	Demonstrate oral communication skills by participating in presentations, group discussions, brainstorming sessions, and delivering structured talks using appropriate language and presentation techniques.	PO8, PO9, PO11	PSO3
CO3	Apply verbal ability skills to enhance language accuracy and comprehension through error spotting, vocabulary usage, reading comprehension, listening comprehension, and sentence rearrangement.	PO9, PO11	
CO4	Solve logical and analytical problems using reasoning abilities such as series completion, analogy, classification, coding-decoding, seating arrangements, blood relations, and data interpretation.	PO9, PO11	
CO5	Develop employability and workplace readiness skills by practicing self-introduction, interview techniques, interview etiquette, professional dress code, and body language.	PO9, PO11	
CO6	Integrate communication, analytical, and interpersonal skills to function effectively in academic and professional environments by demonstrating overall competence in written, spoken, verbal, and reasoning tasks.	PO9, PO10, PO11	PSO3

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
C01									3		2			
C02								2	3		2			2
C03									3		2			
C04									3		2			
C05									3		2			
C06									3	2	2			2

Activities:

1.	CO1: Apply effective writing skills to produce professional documents such as letters, resumes, cover letters, emails, and project reports. (i) Cover Letter and Resume: Draft a resume and cover letter for a job advertisement (ii) Letter Writing: Write formal letter for an internship, industrial visit, workshop, or training programme; Write a letter to invite a chief guest, industry expert, or alumni for a college event.
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	(iii) Email Writing: Write an email applying for an internship in a company; Send an email requesting registration for a workshop, seminar, or conference.
2.	CO2: Demonstrate oral communication skills by participating in presentations, group discussions, brainstorming sessions, and delivering structured talks using appropriate language and presentation techniques. (i) Self-Introduction: Professional self-introduction activity for placement preparation. (ii) Group Discussion: Group discussion on current social, technical, or business issues. (iii) Welcome Address, Vote of Thanks: Conduct a mock seminar where students deliver welcome addresses and vote of thanks. (iv) Power Point Presentation: Prepare and deliver a PowerPoint presentation on a technical, business, or general-interest topic using appropriate visual aids, effective slide design, and clear oral communication.
3.	CO3: Apply verbal ability skills to enhance language accuracy and comprehension through error spotting, vocabulary usage, reading comprehension, listening comprehension, and sentence rearrangement. (i) Jumbled Sentences: Sentence reconstruction activity to improve coherence and logical sequencing. (ii) Reading Comprehension: Analyze newspaper articles, business reports, or technical passages and answer comprehension questions. (iii) Error Spotting: Identify and correct errors related to tenses, articles, prepositions, and subject-verb agreement.
4	CO4: Solve logical and analytical problems using reasoning abilities such as series completion, analogy, classification, coding-decoding, seating arrangements, blood relations, and data interpretation. (i) Series Completion: Pattern recognition and numerical reasoning exercises. (ii) Analogy: Verbal and logical analogy exercises. (iii) Coding-Decoding: Coding-decoding problem-solving exercises in teams (iv) Blood Relations: Family tree analysis and relationship mapping tasks. (v) Seating Arrangements: Puzzle-solving activities involving linear and circular arrangements. (vi) Logical Reasoning: Aptitude test simulations for placement preparation.
5	CO5: Develop employability and workplace readiness skills by practicing self-introduction, interview techniques, interview etiquette, professional dress code, and body language. (i) Self-Introduction, Job Interview: Resume-based interview practice and feedback sessions; Mock interview sessions with HR and technical rounds; Professional etiquette workshop focusing on dress code, body language, and workplace behaviour.
6	CO6: Integrate communication, analytical, and interpersonal skills to function effectively in academic and professional environments by demonstrating overall competence in written, spoken, verbal, and reasoning tasks.

	(i) Placement: Campus recruitment simulation involving aptitude test, group discussion, and personal interview. (ii) Presentation of Business Article: Team-based analysis and presentation of a business or technical article. (iii) Welcome Address, Vote of Thanks: Organize and manage a mock conference or seminar, assigning roles to students. (iv) Welcome Address, Vote of Thanks: Portfolio preparation documenting written tasks, presentations, interview performance, and reasoning exercises.
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Rubrics for evaluation: C05

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Professional Etiquette	2.5	Highly professional behaviour	Generally professional	Limited professionalism
2.	Interview Skills	2.5	Confident and effective responses	Adequate responses	Weak responses
3.	Body Language	2.5	Excellent body language	Adequate body language	Poor body language
4.	Workplace Readiness	2.5	Highly workplace-ready	Reasonably prepared	Needs improvement
	Total	10			

Rubrics for evaluation: C06

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Communication Skills	2.5	Highly effective communication	Effective communication	Limited effectiveness
2.	Analytical Skills	2.5	Strong analytical ability	Adequate analytical ability	Weak reasoning ability
3.	Teamwork Skills	2.5	Excellent teamwork and leadership	Good teamwork	Limited teamwork
4.	Professional Competence	2.5	Demonstrates overall competence	Demonstrates adequate competence	Requires improvement
	Total	10			

The Internal Assessment Matrix (IAM) for the defined COs:

CO	Laboratory Component		Percentage allocation	Mapping Strength
	Evaluation of Student Work, Observation of Record and Model Test	Activities		
C01	20	20	20	2
C02	20	20	20	2
C03	20	20	20	2
C04	20	20	20	2
C05	10	10	10	2
C06	10	10	10	2
Total	100	100	100	

Note: Strength = 3 (if percentage >20%);

Strength = 2 (if percentage 10% to 20%); Strength = 1 (if percentage <10%);

26MCC03	UNIVERSAL HUMAN VALUES B.E. (Common to All Branches)		SEMESTER				IV
Prerequisites		Category	MC	Credits			3
Basic awareness of human values, personal behaviour, family relationships, social responsibility, and ethical conduct in daily life. Familiarity with the ideas of self-reflection, harmony, happiness, prosperity, and responsible living will be helpful.		Hours/ Semester	L	T	P	SL	TH
			45	-	-	45	90
COURSE OBJECTIVES							
1.	To understand the need, purpose, basic guidelines, content, and process of value education through self-exploration and natural acceptance.						
2.	To develop awareness of continuous happiness, prosperity, right understanding, relationship, and physical facility as the basic human aspirations.						
3.	To understand harmony in the human being by studying the co-existence of the sentient 'I' and the material 'Body', along with Sanyam, health, and prosperity.						
4.	To understand harmony in family and society through human relationships, trust, respect, justice, fearlessness, prosperity, and universal harmonious order.						
5.	To realize harmony in nature and existence and apply holistic understanding of human values to professional ethics, ethical human conduct, sustainable development, and responsible professional practice.						
UNIT - I	Introduction to Universal Human Values and Human Aspirations						9
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education. Purpose and motivation for the course, recapitulation from Universal Human Values-I. Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations- understanding and living in harmony at various levels.							
UNIT - II	Harmony in the Human Being: Self and Body						9
Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health							
UNIT - III	Harmony in Family and Society: Human Relationships and Social Order						9
Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship Understanding values in human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society Undivided Society, Universal Order- from family to world family.							

UNIT - IV	Harmony in Nature and Existence	9	
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence. Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space. Holistic perception of harmony at all levels of existence.			
UNIT - V	Professional Ethics and Universal Human Order	9	
Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics, Strategy for transition from the present state to Universal Human Order.			
L: 45, SL:45, Total:90 Hours			
Weightage: Continuous Assessment : 40% End Semester Examinations : 60%			
REFERENCE BOOKS:			
1.	"Human Values and Professional Ethics", R R Gaur., R Sangal., G P Bagaria, Excel Books, New Delhi, 2010		
2.	"Human Values", A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.		
3.	"The Story of Stuff"., Annie Leonard, 2007 documentary.		
4.	"The Story of My Experiments with Truth"., Mohandas Karamchand Gandhi		
5.	"Small is Beautiful" - E. F Schumacher.		
E-RESOURCES:			
1.	AICTE, "Universal Human Values," All India Council for Technical Education, https://www.aicte.gov.in/bureaus/universal-human-values-cell		
2.	UHV Foundation, "Universal Human Values and Professional Ethics," https://uhv.org.in		
3.	Value Education Cell, "Universal Human Values Resources," https://fdp-si.aicte-india.org		
4.	SWAYAM, "Human Values and Professional Ethics," Ministry of Education, Government of India, https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg125		
5.	Universal Human Values Foundation https://uhv.org.in/		
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to		Mapping POs	Mapping PSOs
CO1	Remember and understand the basic concepts, purpose, need, process, and guidelines of value education, including self-exploration, natural acceptance, continuous happiness, prosperity, right understanding, relationship, and physical facility.	--	--
CO2	Apply the principles of self-exploration, natural acceptance, right understanding, relationship, and physical facility to assess human aspirations and improve harmony in personal life.	PO6	--
CO3	Analyse harmony in the human being by understanding the co-existence of the sentient 'I' and the material 'Body', the needs of self and body, Sanyam, health, and prosperity.	PO7	--
CO4	Examine harmony in family and society by understanding values in human relationships, justice, trust, respect, fearlessness, prosperity, co-existence, and universal harmonious order.	PO8	--

CO5	Evaluate harmony in nature and existence by understanding interconnectedness, mutual fulfilment, recyclability, self-regulation, and holistic perception of coexistence at all levels.	PO6	--
CO6	Integrate holistic understanding of human values, harmony, and ethical conduct to professional practice by considering societal needs, responsible decision-making, and sustainable human development.	PO11	--

The Course Articulation Matrix (CAM) for defined Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 01	PSO 02	PSO 03
CO1														
CO2						2								
CO3							2							
CO4								1						
CO5						3								
CO6											3			

Activities:

1.	Students shall prepare a short reflective assignment on harmony in nature, interconnectedness, mutual fulfilment, recyclability, self-regulation, and coexistence at different levels of existence. This activity helps students understand the importance of sustainable living and holistic harmony.
2.	Students shall analyse a real-life case study related to professional ethics, responsible decision-making, societal needs, or sustainable human development. This activity develops the ability to apply human values, ethical conduct, and holistic understanding in professional and social life.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Understanding harmony in nature	10	Clearly explains harmony, interconnectedness, and mutual fulfilment in nature	Explains the concept with minor gaps	Shows limited understanding
2.	Reflection on coexistence	10	Provides meaningful reflection on coexistence, recyclability, and self-regulation	Reflection is relevant but needs more depth	Reflection is basic or unclear
3.	Practical relevance	10	Relates harmony in nature to sustainable living and human responsibility effectively	Relates the concept with limited examples	Practical relevance is weak
4.	Presentation of assignment	10	Assignment is well-organized, clear, and neatly presented	Assignment is organized but needs improvement	Assignment is incomplete or poorly presented
	Total	40			

26MCS03		DESIGN SPRINTS			SEMESTER			IV	
Prerequisites				Category	SD	Credits		0	
				Hours/ Semester	L	T	P	SL	TH
					0	0	15	15	30
COURSE OBJECTIVES									
1.	Develop key skill areas essential for a product designer from the perspective of design, its inherent complexity, and support them with tools and techniques for rapid prototyping.								
2.	Enable the participants to visualize and understand the user experience effectively.								
3.	Learn the roles and responsibilities of a designer in creating and shaping user experiences.								
4.	Understand how existing products and systems function through the principles of system thinking.								
5.	Select and apply various tools, techniques, and practices to support rapid prototyping and product development.								
UNIT - I		DESIGN FUNDAMENTALS							3
Introduction to Visual Design, History and Modernism, Design Thinking methodology, seven elements of design, principles of design, principles of good design, designing a product and a service.									
UNIT - II		SYSTEM THINKING AND REVERSE ENGINEERING							3
System Thinking for Engineering Problem Solving, Understanding Systems, Examples and understandings, Complex Systems, Reverse Engineering Methodology, Identify building blocks/Components - Re-Engineering a complex system									
UNIT - III		USER INTERFACE & USER EXPERIENCE							3
Introduction to UI/UX, Human-Computer interface, user-centered Design Principles, User research techniques, UX Design workflow, Information Architecture, UI Components, need for UI prototyping, Wireframes.									
UNIT - IV		MECHANICAL PROTOTYPING							3
Need for prototyping - Domains in prototyping - Difference between actual manufacturing and prototyping - Rapid prototyping methods - Tools used in different domains - Introduction - Working with Fusion 360 - 3D Modeling - 3D Printing and classification - Laser Cutting and engraving - RD Works - Additive manufacturing.									
UNIT - V		ELECTRONIC & SOFTWARE PROTOTYPING							3
Introduction to Lumped Circuits - Electronic Prototyping - Tinker CAD - Designing in KI CAD - PCB design - Source code management and version control - GitHub - GitHub Actions - GitBash - Continuous Integration - Platform as service - Heroku - Build Packs.									
P:15, SL:15, Total:30 Hours									
Weightage:									
Continuous Assessment 100%									

REFERENCE BOOKS:														
1.	Thinking in Systems – Donella Meadows, 2015.													
2.	Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development – Frank W. Liou, 2007.													
3.	Rapid Prototyping Technology: Selection and Application – Cooper K. G., 2001.													
4.	Introduction to Systems Thinking – https://thesystemsthinker.com/wp-content/uploads/2016/03/Introduction-to-Systems-Thinking-IMS013Epk.pdf													
5.	Ultimate Guide to Prototyping Tools for Hardware and Product Design – https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-design/													
E-RESOURCES:														
1.	Introduction to Systems Thinking https://thesystemsthinker.com/wp-content/uploads/2016/03/Introduction-to-Systems-Thinking-IMS013Epk.pdf													
2.	Ultimate Guide to Prototyping Tools for Hardware and Product Design https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-design/													
3.	KiCad Documentation https://docs.kicad-pcb.org/													
4.	Tinkercad Circuits Learning Resources https://www.tinkercad.com/learn/circuits													
5.	GitHub Actions Documentation https://docs.github.com/en/actions													
6.	GitHub Actions Guides https://docs.github.com/en/free-pro-team@latest/actions/guides													
COURSE OUTCOMES (COs) / At the end of the course, the students will have the ability to										Mapping POs		Mapping PSOs		
CO1	Understand the elements and principles of product and service design.									PO9, PO11		-		
CO2	Apply system thinking concepts in reverse engineering.									PO2, PO9		PSO1		
CO3	Apply user research techniques to meet the UX needs of a customer and design a visual prototype.									PO5, PO9, PO10		PSO1		
CO4	Develop prototyping models using the tools from mechanical prototyping methods.									PO3, PO5, PO9		PSO2		
CO5	Develop prototyping models using the tools from electrical and software prototyping methods.									PO3, PO5, PO9		PSO2		
CO6	Demonstrate design thinking, problem-solving, teamwork, and innovation skills in developing user-centric product prototypes.									PO8, PO9, PO10, PO11		PSO3		
The Course Articulation Matrix (CAM) for defined Cos														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO01	PSO02	PSO03
CO1		-	-	-	-	-	-	-	3	-	2	-	-	-
CO2	-	3	-	-	-	-	-	-	3	-	-	3	-	-
CO3	-	-	-	-	3	-	-	-	3	2	-	2	-	-
CO4	-	-	3	-	3	-	-	-	2	-	-	-	3	-
CO5	-	-	3	-	3	-	-	-	2	-	-	-	3	-
CO6	-	-	-	-	-	-	-	3	3	2	2	-	-	3

Activities:

1.	Activity 1: Design Research and Concept Development Sprint Observe and analyze existing products and systems, identify user needs through surveys and interviews, apply design principles, system thinking, and reverse engineering concepts, develop user personas, journey maps, sketches, and wireframes, generate and evaluate design alternatives, select suitable solutions, document findings, and present the proposed design concept.
2.	Activity 2: Prototype Development and Design Sprint Showcase Create CAD models and prototypes, integrate mechanical, electronic, and software components, conduct testing and validation activities, evaluate performance, collect feedback and refine the prototype, document development and testing processes, demonstrate the developed prototype, present project outcomes, and showcase innovation, teamwork, and problem-solving skills.

Rubrics for evaluation: CO5

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Prototype Design and Development	25	Develops a complete and functional electronic/software prototype meeting all requirements	Develops a functional prototype with minor limitations	Develops a basic prototype with significant limitations
2.	Application of Tools and Technologies	25	Effectively utilizes prototyping tools, software platforms, and design techniques	Utilizes tools appropriately with minor errors	Demonstrates limited proficiency in using tools and technologies
3.	Testing, Validation, and Documentation	25	Performs comprehensive testing, validation, and provides detailed documentation	Performs adequate testing and documentation with minor gaps	Limited testing and incomplete documentation
4.	Innovation, Presentation, and Demonstration	25	Demonstrates innovative features and presents the prototype effectively with clear explanations	Demonstrates useful features and presents satisfactorily	Limited innovation and ineffective presentation of the prototype
	Total	100			

Rubrics for evaluation: CO6

Sl. No.	Criterion	Marks	Excellent (3)	Good (2)	Satisfactory (1)
1.	Design Thinking and Problem Solving	25	Demonstrates a thorough understanding of user needs and develops innovative solutions effectively	Demonstrates good understanding with minor gaps in problem-solving	Demonstrates basic understanding with limited problem-solving ability

2.	Teamwork and Collaboration	25	Actively contributes, collaborates effectively, and supports team objectives	Participates well with minor collaboration issues	Participates minimally with limited teamwork
3.	Innovation and Creativity	25	Demonstrates highly innovative ideas and creative approaches in product development	Demonstrates good innovation with moderate creativity	Demonstrates limited innovation and creativity
4.	Prototype Demonstration and Communication	25	Clearly demonstrates the prototype and communicates ideas confidently and effectively	Demonstrates the prototype adequately with minor communication issues	Demonstrates limited communication skills and ineffective prototype presentation
	Total	100			