



MRK INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
KATTUMANNARKOIL-608 301, CUDDALORE DISTRICT, TAMILNADU, INDIA

CHOICE BASED CREDIT SYSTEM

Programme: B.E., Mechanical Engineering

Regulations: 2026

Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)

BS – Basic Science (Mathematics, Physics, Chemistry)

ES – Engineering Science (General (GE), Programme Core (PC), Programme Elective (PE) & Emerging Technology (ET))

SD – Skill Development

SL – Self-Learning

CDP – Capstone Design Project

OE – Open Elective

L – Laboratory Course

T – Theory Course

LIT – Laboratory Integrated Theory

MC – Mandatory Course

PW – Project Work

IPW – Internship cum Project Work

DIC – Department Introductory Course

TCP – Total Contact Period(s)

Program Outcomes

- 1. Engineering Knowledge:** Apply math, science and engineering fundamentals to complex problems.
- 2. Problem Analysis:** Identify and analyze complex problems using research and sustainability principles
- 3. Design Solutions:** Design systems and processes considering health, safety, cost, culture, and environment.
- 4. Investigations:** Use experiments, modelling, and data analysis to reach valid conclusions.
- 5. Engineering Tools:** Apply modern tools for modelling and problem-solving, recognizing their limits.
- 6. Society & Environment:** Assess societal, legal, and environmental impacts of engineering solutions.
- 7. Ethics:** Commit to ethics, human values, diversity, and legal compliance.
- 8. Teamwork:** Work effectively as an individual and in multidisciplinary teams.
- 9. Communication:** Communicate clearly in reports, presentations and documentation across diverse groups.
- 10. Management & Finance:** Apply management and economic principles in projects and teamwork.
- 11. Lifelong Learning:** Engage in continuous learning, adapt to new technologies, and think critically.

Program Specific Outcomes:

PSO1 Design and develop efficient Mechanical systems in real time applications

PSO2 Utilize modern techniques and tools for addressing engineering challenges in the fields of Mechanical Engineering and providing sustainable innovation solutions.

PSO3 Demonstrate research aptitude, work in multidisciplinary teams and implement ethical practices.



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CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

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

Semester - II							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26MAC02	Linear Algebra	T	3-1-0	4	4	BS
2	26PHC07	Physics for Mechanical Engineering	T	3-0-0	3	3	BS
3	26GEC01	Environmental Science and Sustainability	T	2-0-0	2	2	ES(GE)
4	26MEC03	Engineering Mechanics	T	3-1-0	4	4	ES(GE)
5	26EEC01	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES(PC)
6	26CSC03	Problem Solving using Python Programming	LIT	3-0-2	5	4	ES(PC)
7	26ENC02	Communicative English Laboratory	L	0-0-4	4	2	HUM
8		NCC / NSS / NSO/ YRC #1	-	-	-	-	-
Total Credits					25	22	

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



Semester - III							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26MAC05	Transforms, Partial Differential Equations and Numerical Methods	T	3-1-0	4	4	BS
2	26ME301	Engineering Thermodynamics	T	3-1-0	4	4	ES(PC)
3	26ME302	Material Science and Metallurgy	T	3-0-0	3	3	ES(PC)
4	26ME303	Power Plant Engineering	T	3-0-0	3	3	ES(PC)
5	26ME304	Fluid Mechanics and Machinery	LIT	3-0-2	5	4	ES(PC)
6	26ME305	Basic Manufacturing Processes	LIT	3-0-2	5	4	ES(PC)
7	26SDC01	Foundation Aptitude and Verbal ability Skills	-	0-0-2	2	1	SD
8		Mandatory Course - I §	T	1-0-0	1	-	MC
Total Credits					27	23	

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

Semester - IV							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26ME401	Thermal Engineering	T	3-0-0	3	3	ES(PC)
2	26ME402	Kinematics of Machinery	T	3-0-0	3	3	ES(PC)
3	26ME403	Additive Manufacturing: Advanced Processes and Applications	T	3-1-0	4	4	ES(PC)
4	26ME404	Industry 4.0 and Smart Manufacturing	T	3-0-0	3	3	ES(ET)
5	26ME405	Advanced Manufacturing Processes	LIT	3-0-2	5	4	ES(PC)
6	26ME406	Strength of Materials for Mechanical Engineering	LIT	3-0-2	5	4	ES(PC)
7	26ME407	Thermal Engineering Laboratory	L	0-0-4	4	2	ES(PC)
8	26SDC02	Professional and Corporate Communication Skills	L	0-0-2	2	1	SD
9		Mandatory Course - II §	T	1-0-0	1	-	MC
10		NCC / NSS / NSO/ YRC #2	-	-	-	-	-
Total Credits					30	24	

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

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



Semester - V							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26ME501	Design of Machine Elements	T	3-0-0	3	3	ES(PC)
2	26ME502	Renewable Energy Systems	T	3-0-0	3	3	ES(PC)
3	26ME503	Introduction to AI and ML	T	3-0-0	3	3	ES(PC)
4		Programme Elective - I	T	3-0-0	3	3	ES(PE)
5		Open Elective	T	3-0-0	3	3	ES(ET)
6	26ME504	Metrology and Measurements	LIT	3-0-2	5	4	ES(PC)
7	26ME505	Heat and Mass Transfer	LIT	3-0-2	5	4	ES(PC)
8	26ME506	CAD/CAM Laboratory	L	0-0-3	3	2	ES(PC)
9		Mandatory Course - III ^s	T	1-0-0	1	-	MC
10	26IP501	Summer Internship*	-	-	-	1	IPW
11	26SDC03	Advanced Aptitude and Logical Reasoning Skills	-	0-0-2	2	1	SD
Total Credits					31	27	

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

*Two weeks Summer Internship carries one credit and it will be done during IV semester summer vacation and same will be evaluated in V semester.

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

Semester - VI							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26ME601	Automobile Engineering	T	3-0-0	3	3	ES(PC)
2	26ME602	Design of Transmission System	T	3-0-0	3	3	ES(PC)
3		Programme Elective - II	T	3-0-0	3	3	ES(PE)
4		Programme Elective - III	T	3-0-0	3	3	ES(PE)
5	26ME603	Optimization Techniques	T	3-0-0	3	3	ES(ET)
6	26ME604	Dynamics of Machinery	LIT	3-0-2	5	4	ES(PC)
7	26ME605	Finite Element Analysis and Simulation	LIT	3-0-2	5	4	ES(PC)
8	26SDC04	Technical Interview and Advanced Competitive Examination Skills	-	0-0-2	2	1	SD
9		Mandatory Course - IV ^s	T	1-0-0	1	-	MC
10		Self-Learning Course	-	-	-	-	SL
11		NCC / NSS / NSO/ YRC	-	-	-	-	-
Total Credits					28	24	

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

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

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

Semester - VII							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26GEC02	Principles of Management	T	3-0-0	3	3	ES(GE)
2	26ME701	Process Planning and Cost Estimation	T	3-0-0	3	3	ES(PC)
3		Programme Elective - IV	T	3-0-0	3	3	ES(PE)
4		Programme Elective - V	T	3-0-0	3	3	ES(PE)
5	26HSC05	Professional Ethics and Human Values	T	2-0-0	2	2	HUM
6	26ME702	Mechatronics and Automation	LIT	3-0-2	5	4	ES(PC)
7	26SDC05	Professional Employability and Technical Communication Skills	-	0-0-2	2	1	SD
8		Mandatory Course - V \$	T	1-0-0	1	-	MC
9	26ME703	Design and Fabrication Project	PW	0-0-4	4	2	SD
10	26IP701	Summer Internship*	-	-	-	1	IPW
Total Credits					26	22	

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

*Two weeks Summer Internship carries one credit and it will be done during VI semester summer vacation and same will be evaluated in VII semester.

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



Semester - VIII							
Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26ME801	Project Work / Internship cum Project Work	PW / IPW	0-0-16	16	8	SD
Total Credits					16	8	

PROGRAMME ELECTIVE COURSES – STREAMS

Thermal	Manufacturing	Design	Materials	Industrial & Systems Engineering
Refrigeration & HVAC Systems	Digital Manufacturing	Computer Aided Design and Prototyping	Advanced Material and Smart Composite	Industrial Management
Battery Technology	Robotic Systems	Tool Design	Fundamentals of Nanomaterials	Lean Manufacturing
Gas Dynamics and Jet Propulsion	Industrial IoT	Tribological Design	Nano Technology and Surface Engineering	Supply Chain Analysis
Vehicle Technology	Welding Engineering	Mechanical Vibrations	Materials for Electronics	Quality Engineering
Computational Fluid Dynamics	Design for Manufacturing and Assembly	Digital Twin	Materials Characterization	Life Cycle Assessment
Power Generation Technologies	Additive Manufacturing	Electric Vehicle Design	Mechanical Behaviour of Materials	Total Quality Management
Energy Conservation and Management	Precision Manufacturing	Integrated Product Design and Development	Smart Materials and Emerging Technologies	Value Engineering
Advanced Internal Combustion Engineering	Non-Traditional Machining Processes	Ergonomics in Design	Non Destructive Testing Techniques	Product Life Cycle Management
Nuclear Engineering	Computer Integrated Manufacturing	Reverse Engineering	Synthesis of Metal Matrix Composites	Industrial Safety
Industrial Heating Systems	Green Manufacturing	Computational Modelling and Simulation	Biomaterials	Maintenance Engineering



PROGRAMME ELECTIVE COURSES : VERTICALS**VERTICAL 1 : THERMAL ENGINEERING**

1	26ME001	Refrigeration & HVAC Systems	T	3-0-0	3	3	ES(PE)
2	26ME002	Battery Technology	T	3-0-0	3	3	ES(PE)
3	26ME003	Gas Dynamics and Jet Propulsion	T	3-0-0	3	3	ES(PE)
4	26ME004	Vehicle Technology	T	3-0-0	3	3	ES(PE)
5	26ME005	Computational Fluid Dynamics	T	3-0-0	3	3	ES(PE)
6	26ME006	Power Generation Technologies	T	3-0-0	3	3	ES(PE)
7	26ME007	Energy Conservation and Management	T	3-0-0	3	3	ES(PE)
8	26ME008	Advanced Internal Combustion Engineering	T	3-0-0	3	3	ES(PE)
9	26ME009	Nuclear Engineering	T	3-0-0	3	3	ES(PE)
10	26ME010	Industrial Heating Systems	T	3-0-0	3	3	ES(PE)

VERTICAL 2 : MANUFACTURING ENGINEERING

1	26ME011	Digital Manufacturing	T	3-0-0	3	3	ES(PE)
2	26ME012	Robotic Systems	T	3-0-0	3	3	ES(PE)
3	26ME013	Industrial IoT	T	3-0-0	3	3	ES(PE)
4	26ME014	Welding Engineering	T	3-0-0	3	3	ES(PE)
5	26ME015	Design for Manufacturing and Assembly	T	3-0-0	3	3	ES(PE)
6	26ME016	Additive Manufacturing	T	3-0-0	3	3	ES(PE)
7	26ME017	Precision Manufacturing	T	3-0-0	3	3	ES(PE)
8	26ME018	Non-Traditional Machining Processes	T	3-0-0	3	3	ES(PE)
9	26ME019	Computer Integrated Manufacturing	T	3-0-0	3	3	ES(PE)
10	26ME020	Green Manufacturing	T	3-0-0	3	3	ES(PE)

VERTICAL 3 : DESIGN

1	26ME021	Computer Aided Design and Prototyping	T	3-0-0	3	3	ES(PE)
2	26ME022	Tool Design	T	3-0-0	3	3	ES(PE)
3	26ME023	Tribological Design	T	3-0-0	3	3	ES(PE)
4	26ME024	Mechanical Vibrations	T	3-0-0	3	3	ES(PE)
5	26ME025	Digital Twin	T	3-0-0	3	3	ES(PE)
6	26ME026	Electric Vehicle Design	T	3-0-0	3	3	ES(PE)
7	26ME027	Integrated Product Design and Development	T	3-0-0	3	3	ES(PE)
8	26ME028	Ergonomics in Design	T	3-0-0	3	3	ES(PE)
9	26ME029	Reverse Engineering	T	3-0-0	3	3	ES(PE)
10	26ME030	Computational Modelling and Simulation	T	3-0-0	3	3	ES(PE)



VERTICAL 4 : MATERIAL SCIENCE

1	26ME031	Advanced Material and Smart Composite	T	3-0-0	3	3	ES(PE)
2	26ME032	Fundamentals of Nanomaterials	T	3-0-0	3	3	ES(PE)
3	26ME033	Nano Technology and Surface Engineering	T	3-0-0	3	3	ES(PE)
4	26ME034	Materials for Electronics	T	3-0-0	3	3	ES(PE)
5	26ME035	Materials Characterization	T	3-0-0	3	3	ES(PE)
6	26ME036	Mechanical Behaviour of Materials	T	3-0-0	3	3	ES(PE)
7	26ME037	Smart Materials and Emerging Technologies	T	3-0-0	3	3	ES(PE)
8	26ME038	Non Destructive Testing Techniques	T	3-0-0	3	3	ES(PE)
9	26ME039	Synthesis of Metal Matrix Composites	T	3-0-0	3	3	ES(PE)
10	26ME040	Biomaterials	T	3-0-0	3	3	ES(PE)

VERTICAL 5 : INDUSTRIAL AND SYSTEMS ENGINEERING

1	26ME041	Industrial Management	T	3-0-0	3	3	ES(PE)
2	26ME042	Lean Manufacturing	T	3-0-0	3	3	ES(PE)
3	26ME043	Supply Chain Analysis	T	3-0-0	3	3	ES(PE)
4	26ME044	Quality Engineering	T	3-0-0	3	3	ES(PE)
5	26ME045	Life Cycle Assessment	T	3-0-0	3	3	ES(PE)
6	26ME046	Total Quality Management	T	3-0-0	3	3	ES(PE)
7	26ME047	Value Engineering	T	3-0-0	3	3	ES(PE)
8	26ME048	Product Life Cycle Management	T	3-0-0	3	3	ES(PE)
9	26ME049	Industrial Safety	T	3-0-0	3	3	ES(PE)
10	26ME050	Maintenance Engineering	T	3-0-0	3	3	ES(PE)

**Open Electives
(EMERGING TECHNOLOGIES)**

Sl.No	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1.	26OE901	AI-Driven Decision Support Systems	T	3-0-0	3	3	OE
2.	26OE902	Emerging Technologies for Digital Transformation	T	3-0-0	3	3	OE
3.	26OE903	Future Technologies for Intelligent Industries	T	3-0-0	3	3	OE
4.	26OE904	Climate Change and Infrastructure Resilience	T	3-0-0	3	3	OE
5.	26OE905	Environmental Sustainability and Resource Management	T	3-0-0	3	3	OE
6.	26OE906	Green Building Technologies	T	3-0-0	3	3	OE
7.	26OE907	Battery Technologies and Management Systems	T	3-0-0	3	3	OE
8.	26OE908	Energy Management and Conservation	T	3-0-0	3	3	OE
9.	26OE909	Renewable Energy Technologies	T	3-0-0	3	3	OE
10.	26OE910	Smart Grid Technologies	T	3-0-0	3	3	OE
11.	26OE911	IoT-Enabled Healthcare Technologies	T	3-0-0	3	3	OE

12.	26OE912	Wearable Health Technologies	T	3-0-0	3	3	OE
13.	26OE913	Biomedical Signal & Image Processing	T	3-0-0	3	3	OE
14.	26OE914	Mobile Communication	T	3-0-0	3	3	OE
15.	26OE915	Systems on Chip with IoT applications	T	3-0-0	3	3	OE
16.	26OE916	Opto Nano Electronics	T	3-0-0	3	3	OE
17.	26OE917	Mechatronics and Smart Systems	T	3-0-0	3	3	OE
18.	26OE918	Finite Element Analysis for Engineers	T	3-0-0	3	3	OE
19.	26OE919	Energy Audit and Energy Management	T	3-0-0	3	3	OE
20.	26OE920	Industrial Safety	T	3-0-0	3	3	OE

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

Semester wise Credit Distribution

Course Category	Code	I	II	III	IV	V	VI	VII	VIII	Total Credits	% Share
Basic Science	BS	12	7	4	-	-	-	-	-	23	13.0
Humanities	HUM	4	2	-	-	-	-	2	-	8	4.5
Engineering Science (General)	ES(GE)	4	6	-	-	-	-	3	-	13	7.3
Programme Core	PC	5	7	18	20	19	14	7	-	90	50.8
Programme Elective	PE	-	-	-	-	3	6	6	-	15	8.5
Emerging Technology	ET	-	-	-	3	3	3	-	-	9	5.1
Skill Development	SD	2	-	1	1	1	1	3	8	17	9.6
Internship cum Project Work	IPW	-	-	-	-	1	-	1	-	2	1.1
Self-Learning / Industry Oriented Course	SL	-	-	-	-	-	-	-	-	-	0
Total Credits	-	27	22	23	27	24	22	8		177	100

Semester – I



26HSC01	தமிழர் மரபும் தொழில் நுட்பமும் / Tamils Heritage and Technologies	L	T	P	C
		1	0	0	1
Course Objectives: - தமிழ்மொழி, திராவிட மொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பாட்டு மரபுகளை அறிந்து விளக்குதல். - தமிழர்களின் நாட்டுப்புறக் கலைகள், விளையாட்டுகள், தெய்வ வழிபாடு மற்றும் கைவினை மரபுகளை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல். - தமிழர்களின் பாரம்பரிய கட்டிடக்கலை, சிற்பக்கலை மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிந்து அவற்றின் சிறப்புகளை விளக்குதல். - பண்டைய தமிழர்களின் கப்பல் கட்டுதல், உலோகத் தொழில்நுட்பம், மணிகள் தயாரித்தல் மற்றும் வாணிபத் தொழில்நுட்பங்களை அறிந்து விளக்குதல். - தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள், கால்நடைப் பராமரிப்பு மற்றும் கடல்சார் அறிவியல் தொழில்நுட்பங்களை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.					
அலகு I	மொழி மற்றும் இலக்கிய மரபுகள்				3
இந்திய மொழிக் குடும்பங்கள், திராவிட மொழி வகைகள், முச்சங்க வரலாறு, சங்க இலக்கியத்தில் அறச்சிந்தனைகள், சங்க இலக்கியமும் பண்பாட்டு மரபுகளும், தமிழ் ஒரு செம்மொழி, திருக்குறளில் மேலாண்மைக் கருத்துகள், சங்ககாலத்தில் கல்வி, சங்ககால நகரங்களும் துறைமுகங்களும், பெரியபுராணம், நாயன்மார்கள் மற்றும் ஆழ்வார்களின் பக்திநெறி					
அலகு II	நாட்டுப்புறக் கலைகளின் மரபுகள்				3
நாட்டுப்புறக் கலையின் தோற்றம் மற்றும் வளர்ச்சி, தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், புலியாட்டம், தமிழர்களின் விளையாட்டுகள், நாட்டுப்புறத் தெய்வங்களின் வகைகள், சிற்பக்கலை, நடுகல் வழிபாடு, கைவினைப் பொருட்கள், இசைக்கருவிகளின் வகைகள்.					
அலகு III	தமிழர்களின் கட்டிடத் தொழில்நுட்பம்				3
சங்க காலத்தில் நெசவு மற்றும் பாணைத் தொழில்நுட்பம், சங்ககாலத்தில் கட்டுமானங்கள், வீட்டு பொருட்களின் வடிவமைப்பு, சங்ககாலத்தில் கட்டுமான பொருட்கள், சிலப்பதிகாரத்தில் மேடை அமைப்பு, மாமல்லபுரம் சிற்பங்களும் கோவில்களும் சோழர் கால பெருங்கோயில்கள், வழிபாட்டுத்தலங்கள், மீனாட்சி அம்மன் ஆலயம், செட்டிநாட்டு கட்டிடக் கலை, திருமலை நாயக்கர் மஹால்.					
அலகு IV	உற்பத்தித் தொழில்நுட்பம்				3
கப்பல் கட்டும் கலை, இரும்பு தொழிற்சாலை, செம்பு மற்றும் தங்க நாணயங்கள் அச்சடித்தல், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், கல்மணிகள் சிலப்பதிகாரத்தில் மணிகளின் வகைகள், தொல்லியல் சான்றுகள், சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி.					
அலகு V	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்				3
அணை ஏரி குளங்கள் மதகு அமைப்பு சோழர் கால குழுழி தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, வேளாண்மை சார்ந்த செயல்பாடுகள், பெருங்கடல் குறித்த பண்டைய அறிவு, முத்துக்குளித்தல், அறிவுசார் சமூகம், கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி. அறிவியல் தமிழின் வளர்ச்சி, கணித்தமிழ் வளர்ச்சி.					
TOTAL : 15 PERIODS					



Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).
Text Books:
1. மா. இராசமாணிக்கனார், தமிழர் நாகரிகமும் பண்பாடும், சைவசித்தாந்த நூற்பதிப்புக் கழகம், சென்னை.
2. கே. கே. பிள்ளை, தமிழக வரலாறு – மக்களும் பண்பாடும், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை.
References:
1. ந. சுப்பிரமணியன், தமிழக வரலாறு, தமிழ்நாட்டுப் பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம், சென்னை.
2. இரா. நாகசாமி, தமிழகத் தொல்லியல், தமிழ்நாடு அரசு தொல்லியல் துறை, சென்னை.
3. குடவாயில் பாலசுப்ரமணியன், தமிழர் கட்டிடக்கலை, தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.
4. கா. சிவத்தம்பி, தமிழின் சமூக வரலாறு, நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை.
5. தமிழ்ப் பல்கலைக்கழகம், தமிழர் தொழில்நுட்பம், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.
E-resources:
1. https://www.tamilvu.org/
2. https://www.projectmadurai.org/
3. https://www.tnarch.gov.in/

CO	CO Description	PO	PSO
CO1	தமிழ்மொழி, திராவிட மொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பாட்டு மரபுகளை அறிந்து விளக்குதல்.	PO1(2) PO2(2)	PSO3(2)
CO2	தமிழர்களின் நாட்டுப்புறக் கலைகள், விளையாட்டுகள், தெய்வ வழிபாடு மற்றும் கைவினை மரபுகளை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.	PO1 (2), PO7 (3), PO8 (3)	PSO1(1), PSO3 (2)
CO3	தமிழர்களின் பாரம்பரிய கட்டிடக்கலை, சிற்பக்கலை மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிந்து அவற்றின் சிறப்புகளை விளக்குதல்.	PO1 (3), PO2 (3)	PSO2 (2), PSO3 (2)
CO4	பண்டைய தமிழர்களின் கப்பல் கட்டுதல், உலோகத் தொழில்நுட்பம், மணிகள் தயாரித்தல் மற்றும் வாணிபத் தொழில்நுட்பங்களை அறிந்து விளக்குதல்.	PO1 (2), PO2 (2), PO3 (2), PO7 (3)	PSO2 (2), PSO3 (2)
CO5	தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள், கால்நடைப் பராமரிப்பு மற்றும் கடல்சார் அறிவியல் தொழில்நுட்பங்களை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.	PO2 (3), PO5 (3), PO6 (3)	PSO1 (2), PSO2 (2), PSO3 (3)

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



26HSC01	Tamil Heritage and Technologies	L	T	P	C
		1	0	0	1
Course Objectives:					
- Identify and explain the Tamil language, Dravidian languages, Sangam literature, and cultural heritage of the Tamils. - Identify and explain the importance of folk arts, traditional games, folk deities, and handicraft traditions of the Tamils. - Study and explain the significance of traditional architecture, sculpture, and construction technologies of the Tamils. - Explain the shipbuilding, metallurgical, bead-making, and trade technologies practiced by the ancient Tamils. - Explain the importance of agriculture, irrigation systems, animal husbandry, and maritime knowledge and technologies of the Tamils.					
Unit I	Language and Literary Heritage				3
Indian language families, varieties of Dravidian languages, history of Muthamizh, ethical thoughts in Sangam literature, Sangam literature and cultural traditions, Tamil as a classical language, management concepts in Thirukkural, education during the Sangam period, Sangam-age cities and ports, Periyapuram, and the devotional traditions of Nayanmars and Alvars.					
Unit II	Traditions of Folk Arts				3
Origin and development of folk arts, Therukoothu, Karagattam, Villupattu, Kaniyan Koothu,Oyilattam, Tholpavai Koothu, Silambattam, Puliyattam, traditional games of the Tamils, types of folk deities, sculpture, hero-stone worship, handicrafts, and types of musical instruments.					
Unit III	Architectural Technology of the Tamils				3
Weaving and pottery technology during the Sangam period, construction practices during the Sangam period, design of household articles, construction materials used during the Sangam period, stage arrangement described in Silappathikaram, sculptures and temples of Mamallapuram, great temples of the Chola period, places of worship, Meenakshi Amman Temple, Chettinad architecture, and Thirumalai Nayak Palace.					
Unit IV	Manufacturing Technology				3
Shipbuilding technology, iron industry, production and minting of copper and gold coins, glass beads, terracotta beads, conch-shell beads, stone beads, varieties of beads mentioned in Silappathikaram, archaeological evidences, and export and import during the Sangam period.					
Unit V	Agriculture and Irrigation Technology				3
Dams, lakes and ponds, sluice structures, significance of the <i>Kumizhi Thooppu</i> during the Chola period, animal husbandry, agriculture-related activities, ancient knowledge of the ocean, pearl diving, knowledge-based society, achievements of the Cholas in overseas countries, development of scientific Tamil, and development of computational Tamil.					
TOTAL : 15 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. K. K. Pillay, A Social History of the Tamils, University of Madras, Chennai. 2. R. Nagaswamy, Tamil Nadu: An Archaeological Perspective, Tamil Nadu State Department of Archaeology, Chennai.					



References:

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

E-resources:

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

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

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



26ENC01	English for Engineers	L	T	P	C
		3	0	0	3
Course Objectives:					
• Develop vocabulary and grammatical competence by strengthening students’ knowledge and appropriate usage in different contexts. • Facilitate reading and comprehension skills through the effective use in academic and professional texts. • Improve oral communication and presentation skills to strengthen content and context • Enhance effective listening skills by familiarizing students with different accents, dialects, varieties of English • Enable students to write professional correspondence and ethical writing practices.					
Unit I	Vocabulary and Grammar				9
Academic Word List (AWL) - Foreign Words - Semantics - synonyms, antonyms, one-word substitution - Phrasal verbs - Phrases and idioms - Misspelt words; Parts of Speech - Subject-verb agreement - Tenses - Articles - Voices - Reported speech – Modals- Sentence structure					
Suggested Activities: Gap fills exercises, Cloze Test, Error Detection and Spell Bee.					
Unit II	Reading and Comprehension				9
Four Types of Reading Techniques - Scanning, Skimming, Intensive reading, Extensive reading - Fiction and Non-fiction texts -Difference, features, strategies, comprehension - Strategies for reading general and professional content - Identifying transitions in a text - Note making - Interpreting charts and data; Academic reading - PQRS, SQ3R - Critical reading - Effective use of resources - Index, table of contents and glossary					
Suggested Activities: Reading - newspaper and digital articles, Reading comprehension, note making and summarizing.					
Unit III	Speaking				9
Importance of oral communication - Phonetics - Pronunciation, Stress and Intonation; Speaking in different contexts - verbal and non-verbal behavior; Presentation Skills - Types of Presentations - informative, persuasive, business - effective slide presentation - delivering a presentation; Classroom participation – Group Discussions, Debates, Group activities					
Suggested Activities: Just a Minute (JAM) Video recording, Situational role plays, Usage of Apps.					
Unit IV	Listening				9
Listening - Types - Purpose - Barriers - Strategies for effective listening in various contexts - Note-taking as a tool for effective listening - Dialects, accents, and slang - Dialectical Varieties - English in India,					
Suggested Activities: Listening and Repeating, Note-taking					
Unit V	Writing				9
Importance of written communication - Letter writing and e-mail - Reporting/Reports - Introduction to abstracts and articles - Difference between abstract and executive summary; Summarizing - Paraphrasing - Synthesizing - Editing and Proofreading - Plagiarism - Referencing online and offline resources.					
Suggested Activities: Picture and poster description, Brainstorming and Mind Mapping.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, New Delhi, 2022.					
2. M. Ashraf Rizvi, Effective Technical Communication, 2nd Edition, McGraw Hill Education, New Delhi, 2018.					



References:

1. Department of Humanities and Social Sciences, Anna University, *English for Engineers and Technologists* (Combined edition, Vol. 1 and 2), Orient Blackswan, Chennai, 2006.
2. Nitin Bhatnagar and Mamta Bhatnagar, *Communicative English for Engineers and Professionals*,
3. Pearson Education, 2010. Board of Editors, *Vibrant English*, Orient Blackswan, Chennai, 2013.
4. William Strunk Jr. & E.B. White, *The Elements of Style*, 4th Edition, Pearson, 1999.
5. David F. Beer and David McMurrey, *Guide to Writing as an Engineer*, 5th Edition, John Wiley, New York, 2021.

E-resources:

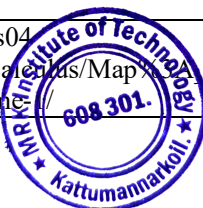
1. <https://learnenglish.britishcouncil.org/>
2. <https://www.bbc.co.uk/learningenglish>
3. <https://learnenglish.britishcouncil.org/skills/speaking>
4. <https://learnenglish.britishcouncil.org/skills/listening>
5. <https://owl.purdue.edu/>

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

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



26MAC01	Applied Calculus and Matrices	L	T	P	C
		3	1	0	4
Course Objectives: - To provide technical competence of modelling engineering problems using calculus. - To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.					
Unit I	Differential Calculus				12
Functions, graph of functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem. Suggested Activities: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Unit II	Functions of Several Variables				12
Partial derivatives, Total derivative, Taylor's series formula for functions of two variables, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers. Suggested Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Unit III	Integral Calculus				12
Fundamental theorem of Calculus, Indefinite integrals and Improper integrals, Evaluation of double integrals, Change of order of integration, Evaluation of triple integrals. Suggested Activities: Definite and Indefinite Integrals, Determination of double and triple integrals, Solving of Competitive Examination questions (Ex. GATE).					
Unit IV	Matrices				12
Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigen vectors (without proof) Cayley–Hamilton Theorem, Applications of Cayley–Hamilton Theorem. Suggested Activities: Compute Eigen values and Eigen vectors, verify the Cayley–Hamilton theorem, and perform matrix computations using open-source software..					
Unit V	Orthogonal Transformations and Quadratic Forms				12
Diagonalization of matrices by orthogonal transformation – Quadratic forms – Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Suggested Activities: Perform orthogonal diagonalization, reduce quadratic forms to canonical form, determine the nature of quadratic forms, and visualize quadratic forms using open-source software					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. Grewal, B. S. (2025). Higher Engineering Mathematics (45th Ed.). Khanna Publishers, New Delhi. . 2. Ramana, B. V. (2024). Higher Engineering Mathematics. McGraw Hill Education (India) Private Limited.					
References: 1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons. 2. Waner, S., & Costenoble, S. (2024). Applied Calculus (8th Edition). Cengage Learning.. 3. Stroud, K. A., & Booth, D. J. (2020). Engineering Mathematics (8th Edition). Red Globe Press.. 4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2022). Thomas' Calculus: Early Transcendentals (15th Edition). Pearson. 5. Anton, H., Rorres, C., & Kaul, A. (2021). Elementary Linear Algebra: Applications Version (12th Edition). John Wiley & Sons.					
E-resources: 1. https://onlinecourses.nptel.ac.in/noc17_hs04 2. https://math.libretexts.org/Bookshelves/Calculus/Map%201%3A_Calculus__Early_Transcendentals_(Stewart)/ 3. https://openstax.org/books/calculus-volume1					



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

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



26PHC01	Engineering Physics	L	T	P	C
		3	0	2	4
Course Objective:					
• To impart essential physics concepts and demonstrate their relevance to diverse engineering applications.					
Unit I	Fundamental & Properties of Matter				9
Concept – Force, Mass & Weight, Velocity & Acceleration, Momentum & Impulse, Elasticity – Cantilever-Young’s modulus (non-uniform bending), Viscosity- Stokes method - Surface tension - Drop weight method – bimetallic Strip-Thermal Stress-Expansion joints and examples					
Suggested Activities: Virtual demonstration of thermal stress.					
Unit II	Thermodynamics				9
Thermal conductivity – Modes of heat transfer- Conductivity of bad conductor Lee’s disc method – Conductivity of good conductor Forbes’ Method. Conductivity of semiconductor- laws of Thermodynamics – Entropy- Carnot’s cycle as heat engine and refrigerator.					
Suggested Activities: Virtual demonstration of four-stroke engine					
Unit III	Optics				9
Fiber Optics: Structure of fiber, fiber optics, communication fiber sensor, Displacement sensor, and pressure sensor & temperature sensor- Interference: constructive and destructive interference -Air Wedge- Determination of thin wire. Michelson’s Interferometer - Determination of thin film					
Suggested Activities: Demonstration of optical fiber communication and study of fiber optic sensors					
Unit IV	Quantum Physics				9
Concept – DE Broglie wave equation – Dual nature of matter waves - Properties of matter waves, Schrodinger Time dependent wave equation and Time independent wave equation, Particle in one dimensional box, Photo electric effect - Experimental verification of photo electric effect.					
Suggested Activities: Demonstration and analysis of the photoelectric effect and quantum phenomena					
Unit V	Laser and its Application				9
Properties- Einstein Co-Efficient A and B, Ratio of stimulated and spontaneous emission construction, working. Solid laser (Nd-YAG Laser), Gas laser (CO ₂), Dye laser, Diode laser (hetero junction and homo junction laser) Advantage industrial and medical application.					
Suggested Activities: Demonstration of laser characteristics and study of industrial and medical applications of lasers.					
TOTAL (Theory): 45 PERIODS					
List of Experiments:					
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia					
2. Non-uniform bending - Determination of Young’s modulus					
3. Uniform bending –Determination of young’s modulus					
4. Determination of band gap of semiconductor using post office box					
5. Air wedge - Determination of thickness of a thin sheet/wire					
6. Photoelectric effect-verification of electron flow					
7. Laser- Determination of the wavelength of the laser using grating					
TOTAL (Lab.): 30 PERIODS					
TOTAL: 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.					
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).					
Text Books:					
1. M. N. Avadhanulu and P. G. Kshirsagar, A Text Book of Engineering Physics, 11th Edition, 2019, S.Chand Publishing, New Delhi.					
2. R. K. Gaur and S. L. Gupta, Engineering Physics, 11th Edition, 2017, Dhanpat Rai Publications, New Delhi.					



References:

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

E-resources:

1. Barrier penetration problem and Quantum tunnelling: <https://archive.nptel.ac.in/courses/115/104/115104096/>
2. EM waves and wireless channelling: https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>
4. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOWA
6. Dipole Antenna_ <https://www.youtube.com/watch?v=4xF1Fq2wB1I>

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

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



26CYC01	Engineering Chemistry	L	T	P	C
		3	0	2	4
Course Objectives:					
- Understand the fundamental principles and technological requirements of water treatment. - Acquire knowledge of the basics of polymers, including their preparation, properties, and applications. - Gain familiarity with renewable and non-renewable energy resources and various energy storage devices used in engineering applications. - Understand the mechanisms of metal corrosion and the methods used for its prevention and protection in engineering applications. - Develop an understanding of nanomaterials, their properties, and their applications.					
Unit I	Water Technology				9
Introduction-sources and impurities in water-soft and hard water- water quality parameters. Types of hardness. Determination of hardness by EDTA method. Domestic water treatment. Boiler feed water –requisites, scale and sludge formation in boilers-caustic embrittlement- boiler corrosion- treatment of boiler feed water. Internal conditioning (carbonate, phosphate, and calgon conditioning), external conditioning – ion exchange process, zeolite process Brackish water –water purification by reverse osmosis. Suggested Activities: Coagulation of water sample using Alum.					
Unit II	Polymer Chemistry				9
Introduction - occurrence, definitions – functionality - degree of polymerization-, molecular weight - number and weight average method. Types of polymerizations - addition, condensation and copolymerization. Mechanism of polymerization (Free radical). Preparation, properties and applications of nylon 66, Poly Urethane, poly isoprene and Vulcanization of rubber, TEFLON, PET. Suggested Activities: Preparation of Biodegradable Polymer/Polymer Demonstration.					
Unit III	Energy Resources and Storage Devices				9
Nonrenewable energy - nuclear energy, nuclear reaction and its types; Nuclear power plant and its working (light water nuclear power plant & breeder reactor).Renewable energy and its sources - photo voltaic cells-working of photovoltaic cell, recent advances in solar cell materials; Geothermal Energy and Different type of geothermal power plants Batteries and fuel cells: types of batteries - lead storage battery, lithium battery, fuel cell - H ₂ -O ₂ fuel cell-applications. Suggested Activities: Performance Study of a Solar Cell.					
Unit IV	Corrosion and its Control				9
Introduction, types of corrosion - chemical and electrochemical corrosion, mechanism, pilling - bedworth rule, types of electrochemical corrosion – galvanic corrosion, pitting corrosion, crevice corrosion, corrosion on wire fence and pipeline corrosion, factors influencing rate of corrosion. Corrosion control methods – sacrificial anode and impressed cathodic current. Protective coatings – paints: constituents and functions. Suggested Activities: Demonstration of Corrosion and Its Prevention					
Unit V	Nano Chemistry				9
Basics- distinction between molecules, nanoparticles and bulk materials; size dependent properties. Nanoparticles: nanocluster, nanorod, nanotube (CNT) and nanowires. Synthesis: Top down process- chemical vapour deposition, electro deposition. Electro spinning method. Bottom up process- precipitation, sol-gel, solvothermal - properties and applications of nanomaterials in various fields. Suggested Activities: Synthesis/Demonstration of Nanomaterials					
TOTAL (Theory) : 45 PERIODS					



List of Experiments: 1. Determination of Total, Temporary and Permanent hardness of water by EDTA Method. 2. Estimation of Alkalinity in water sample. 3. Determination of HCl using NaOH by pH metry 4. Estimation of Ferrous iron by Potentiometric titration. 5. Estimation of HCl using NaOH by Conductometric titration 6. Estimation of Dissolved Oxygen content in water by Winkler's method 7. Determination of Chloride in water by Argentometric method 8. Estimation of copper content of the given solution by Iodometry. 9. Estimation of TDS of a water sample by gravimetry. 10. Determination of strength of acids in a mixture of acids using conductivity meter. TOTAL (Lab.): 30 PERIODS TOTAL: 75 PERIODS			
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.			
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).			
Text Books:			
1. Dr.S.Mageswari, Dr.K.Balachandran, Dr.G.Vijayakumar, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., First Edition-2024. 2. O.G.Palanna, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., Second Edition -2017			
References:			
1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Text book of Quantitative Chemical Analysis, 6th Edition (2000). 2. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., 2025. 3. Arun Bahl, B.S. Bahl, G.D. Tuli, "Essentials of Physical Chemistry" Published by S. Chand & Company Ltd., 2014 4. Sashi Chawla, Dhanpat Rai & Co. Pvt. Ltd., "Engineering Chemistry" Fifth Edition - 2017. 5. Dr.S.Vairam, Dr.Suba Ramesh, "Engineering Chemistry" First Edition, Wiley Publication, Reprint-2016.			
E-resources:			
1. https://nptel.ac.in/courses/ 2. https://swayam.gov.in/ 3. https://www.chemguide.co.uk/			

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

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



26MEC01	Engineering Graphics	L	T	P	C
		3	1	0	4
Course Objectives:					
• The learning objectives of this course is to develop in students, the engineering graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.					
Unit I	Plane Curves	12			
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.					
Suggested Activities: Virtual Demonstration of Conics and Cycloids.					
Unit II	Projection of Points, Lines and Plane Surface	12			
Orthographic projection- Principal planes - First angle projection - projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.					
Suggested Activities: Virtual Demonstration of lines and Planes.					
Unit III	Projection of Solids and Freehand Sketching	12			
Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to both the principal planes by rotating object method.					
Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three-Dimensional objects — Layout of views-Freehand sketching of multiple views from pictorial views of objects.					
Suggested Activities: Development of models of various solids and virtual demonstration of sectioning, CAD modelling of 2D objects.					
Unit IV	Projection of Sectioned Solids and Development of Surfaces	12			
Sectioning of simple solids like prisms, pyramids, cylinder, and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.					
Suggested Activities: Virtual Demonstration of Sectioned Solid Objects and Development of Surface.					
Unit V	Isometric and Perspective Projections	12			
Principles of isometric projections — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids, cone and cylinders by visual ray method.					
Suggested Activities: Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. N. D. Bhatt and V. M. Panchal, Engineering Drawing, 53rd Edition, Charotar Publishing House, Anand, 2019.					
2. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International Publishers, New Delhi, 2018.					
References:					
1. K. B. Yogeshwaran, Dr. V. Ramasamy, Dr. K. Anandavelu, B. Veluchamy and Dr. C. K. Dhinakarraj, Engineering Graphics, Vishnu Prints Media, Edition 2022					
2. Natarajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.					
3. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.					
4. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill, 2 nd Edition, 2019.					
5. Gopalakrishna K.R., “Engineering Drawing” (Volume combined), Subhas Publications, Bangalore, 27 th Edition, 2017.					
E-resources:					
1. https://nptel.ac.in/courses/105104148					
2. Swayam-NPTEL https://share.google/dYJ5sZn42o5smx1QV					
3. https://share.google/7q2Qit46JPm5z49Qf					

CO	CO Description	PO	PSO
CO1	Draw Conic curves, Cycloids and Involute	PO1(3), PO2(2), PO3(2)	PSO1(2), PSO2(2)
CO2	Draw orthographic projections of Points, Lines and Planes	PO1(3), PO2(3)	PSO1(3), PSO2(2)
CO3	Draw orthographic projections and free hand sketches of Solids	PO1(3), PO2(3), PO3(3)	PSO1(3), PSO2(3), PSO3(1)
CO4	Draw sectional views of the objects and development of Surfaces	PO3(3), PO5(3)	PSO1(3), PSO2(3), PSO3(1)
CO5	Draw isometric and perspective views of simple solids	PO2(3), PO5(3)	PSO1(3), PSO2(3), PSO3(2)

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



26CSC01	Programming Language: C	L	T	P	C
		3	0	0	3
Course Objectives: - To equip engineering students with the foundational knowledge and practical skills in ‘C’ programming to analyses and solve computational problems effectively. - To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
Unit I	Introduction to C& Problem Solving				9
Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudo code, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Operators, Input/output Functions, Built-in Functions.					
Suggested Activities: Solve GATE-style MCQs on algorithms, flowcharts, pseudocode, Interactive and Script mode, Comments, Indentation. Practice GATE-style questions on data types, variables, operators, input/output, built-in functions, indentation, and error identification.					
Unit II	Control Structures & Functions				9
If, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements. Function Declaration, Definition and Calling, Function Parameters and Return Types, Call by Value and Call by Reference, Recursive Functions, Scope and Lifetime of Variables, Header files and Modular Programming.					
Suggested Activities: Solve GATE-style MCQs on if, if-else, nested if, switch-case, loops, nested loops, and jump statements with output prediction. Practice GATE-style questions on parameters, return types, recursion, scope, lifetime and call by value/reference.					
Unit III	Arrays, Strings & Pointers				9
One-dimensional and Multi-dimensional Arrays, Array operations and traversals, String Handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and Arrays, Pointers to function, Dynamic memory allocation.					
Suggested Activities: Solve GATE-style MCQs on one-dimensional and multi-dimensional arrays, array operations, traversals, and string handling with output prediction. Practice GATE-style questions on pointer arithmetic, pointers and arrays function pointers, and dynamic memory allocation.					
Unit IV	Structures & Unions				9
Defining and using structures, Array of structures, Sorting an array of structures, Difference between structures and unions, Pointers to structures, Unions and their uses, Unions with pointers, Enumerations.					
Suggested Activities: Analyze GATE-style MCQs on structures, arrays of structures, sorting, and pointers to structures. Attempt GATE-style questions on structures vs. unions, unions with pointers, their applications, and enumerations.					
Unit V	File operations & Standard Libraries				9
Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations .Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.					
Suggested Activities: Interpret GATE-style MCQs on file operations and binary files, file pointers, and error handling. Evaluate GATE-style questions on standard libraries, user-defined header files, libraries, and their applications.					
TOTAL (Theory) : 45 PERIODS					



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

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

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



26MEC02	Makerspace Laboratory	L	T	P	C
		0	0	4	2
Course Objectives:					
• To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques. • To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators.					
List of Suggested Activities:					
(A). Dis-assembly & Assembly Practices i. Tools and its handling techniques. ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine. iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators. iv. Dis-assembly and assembly of a Bicycle.					
(B). Welding Practices i. Welding Procedure, Selection & Safety Measures. ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes. iii. Hands-on session of preparing base material & Joint groove for welding. iv. Hands-on session of MAW, GMAW, GTAW on Carbon Steel & Stainless Steel plates /pipes for fabrication of a simple part.					
(C). Electrical Wiring Practices i. Electrical Installation tools, equipment & safety measures. ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box. iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells. iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.					
(D). Electronics Components / Equipment Practices i. Electronic components, equipment & safety measures. ii. Dis-assembly and assembly of Computers. iii. Hands-on session of Soldering Practices in a Printed Circuit Board. iv. Hands-on session of Bridge Rectifier, Op-Amp and Trans impedance amplifier. v. Hands-on session of integration of sensors and actuators with a Microcontroller. vi. Demonstration of Programmable Logic Control Circuit.					
(E). Contemporary Systems i. Demonstration of Solid Modelling of components. ii. Demonstration of Assembly Modelling of components. iii. Fabrication of simple components / parts using 3D Printers. iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books:					
1. S. K. Hajra Choudhury, A. K. Hajra Choudhury and S. K. Bhattacharya, Elements of Workshop Technology – Volume I: Manufacturing Processes, 17th Revised & Enlarged Edition, Media Promoters & Publishers, Mumbai. 2. R. S. Khurmi and J. K. Gupta, A Textbook of Workshop Technology – Manufacturing Processes, 16th Edition, 2019. S. Chand Publishing, New Delhi.					



References:

1. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, 4th Edition, 2017, McGraw Hill Education, New Delhi.
2. S. Kalpakjian and S. R. Schmid, Manufacturing Engineering and Technology, 9th Edition, 2025, Pearson Education, New Delhi.
3. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology – Volume I, S. Chand Publishing, New Delhi. 2024 Edition.
4. David P. Leach, Electrical and Electronic Technology, McGraw Hill Education, New Delhi.
5. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 7th Edition, 2019, Wiley, New Delhi.

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

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



26CSC02	Programming in C Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: • To familiarize with C programming constructs. • To develop programs in C using basic constructs. • To develop programs in C using arrays. • To develop applications in C using strings, pointers, functions. • To develop applications in C using structures. • To develop applications in C using file processing.					
Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed. 1. Create Problem Analysis Charts, Flowcharts and Pseudo code for simple C programs 2. I/O statements, operators, expressions. 3. Decision-making constructs: if-else, go to, switch-case, break-continue. 4. Loops: for, while, do-while. 5. Arrays: 1D and 2D, Multi-dimensional arrays, traversal. 6. Strings: operations. 7. Functions: call, return, passing parameters by (value, reference), passing arrays to function. 8. Recursion. 9. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers 10. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions. 11. Files: reading and writing data in text and binary files, File pointers, file operations, random access and processor directives. 12. Use of standard and user-defined libraries in solving problems.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books: 1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall. 2. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill Education, New Delhi.					
References: 1. Thareja, R. (2021). Programming in C . Oxford University Press. 2. Balagurusamy, E. (2019). Programming in ANSI C. McGraw Hill Education. 3. Kanetkar, Y. (2020). Let us C. BPB Publications. 4. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress. 5. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C (4th Edition). Cengage.					
E-resources: 1. Learn-C.org - https://www.learn-c.org/ 2. Geeks for Geeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/ 3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/ 4.“Introduction to C Programming”, Swayam MOOC Course, https://onlinecourses.swayam2.ac.in/imb25_mg71/					



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

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



26HSC02	Physical Education	L	T	P	C
		-	-	-	-
Course Objectives: • To impart the fundamentals of physical education for the development of students' physical, mental, and social well-being. • To instil a lifelong appreciation for physical activity, develop a positive attitude, and foster the values of teamwork and sportsmanship.					
Introduction to physical education: Exercise for good posture – conditioning and calisthenics before starting physical activities – jogging, bending, twisting, standing, sitting, and relaxation exercises – training in basic first-aid practices.					
Participation of athletic events: Rules and regulations of important athletic events – sprints, jumps, throws, and hurdles.					
Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.					
Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.					
TOTAL: 30 PERIODS					
References:					
1. Ajmer Singh, Essentials of physical education. Kalyani Publishers, 7th Revised Edition, 2025. 2. Kamlesh, M.L. (2006). Psychology in physical education and sport (3 rd Edition). Metropolitan Book Co. 3. S.K. Mangal & Shubhra Mangal: Sports Psychology: Concepts and Applications, 1st Edition, "Psychology of Sports Performance" 2024, Routledge India.					
E-resources:					
1. https://www.who.int/health-topics/physical-activity					

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

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



Semester – II



26MAC02	Linear Algebra	L	T	P	C
		3	1	0	4
Course Objectives:					
- To impart foundational knowledge in linear algebra essential for analyzing and solving problems in engineering applications. - The Objectives of the course are to equip students with the ability to formulate and solve various types of Ordinary Differential Equations for solving differential equations encountered in engineering problems.					
Unit I	Vector Spaces	12			
Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension.					
Suggested Activities: Open-Source software, exercises to test linear dependence and independence using rank, solving Competitive Examination questions					
Unit II	Inner Product Spaces	12			
Inner product, Norms, Cauchy, Schwarz inequality, Gram Schmidt orthogonalization, Simple problems (up to $\mathbb{R}^3$).					
Suggested Activities: Open-Source software, exercises to compute inner products and vector norms, solving Competitive Examination questions.					
Unit III	Matrix Decomposition	12			
QR decomposition (Gram- Schmidt method and House holder method), Singular Value Decomposition (SVD), Least squares solutions, simple problems (up to 3×3 matrices).					
Suggested Activities: Open-Source software, exercises to check if a matrix is positive definite, solving Competitive Examination questions.					
Unit IV	First order Ordinary Differential Equations	12			
Basic concepts of ordinary differential equations, Formation of first order differential equations from physical problems, First order and first-degree ODE: Variables separable, Exact equations, Leibnitz's equation, Bernoulli's equation.					
Suggested Activities: Application and Visualization of the first order ODE using open-source software and solving Competitive Examination questions.					
Unit V	Higher order Ordinary Differential Equations	12			
Formation of second order differential equations from physical problems Linear equations of second and higher order with constant coefficients, Euler's linear equations, Method of variation of parameters.					
Suggested Activities: Solving ordinary differential equations using open-source software and solving of Competitive Examination questions.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). Linear algebra. Pearson. 2. Boyce, W. E., DiPrima, R. C., & Meade, D. B. (2022). Elementary differential equations and boundary value problems (12th Edition). Wiley.					
References:					
1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2026. 2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). Linear algebra and its applications with MATLAB. Pearson. 3. Bronson, R., Costa, G. B., Saccoman, J. T., & Gross. D (2023). Linear algebra: Algorithms, applications, and techniques (4th Edition). 4. Lay, D. C., Lay, S. R., & McDonald, J. J. (2021). Linear algebra and its applications (6th Edition). Pearson 5. Kreyszig, E. (2025). Advanced engineering mathematics (11th Edition). Wiley.					
E-resources:					
1. https://math.libretexts.org/Bookshelves/Linear_Algebra/Book%3A_Linear_Algebra_(Schilling_Nachtergaele_and_Lankham)/09%3A_Inner_product_spaces 2. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/ 3. https://archive.nptel.ac.in/content/syllabus/2016/111107033.pdf					

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

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



26PHC07	Physics for Mechanical Engineering	L	T	P	C
		3	0	0	3
Course Objectives:					
• To impart fundamental knowledge of rigid body dynamics, crystalline physics and functional materials • To provide analytical abilities for evaluating physical phenomena in mechanical engineering applications.					
Unit I	Crystalline Physics	9			
Crystal Structure-Crystal lattice - unit cell-lattice Parameter-Crystal system and Bravais lattice structure and Packing fraction of SC, BCC, FCC, crystalline and Non Crystalline material with example, Crystalline planes - Miller indices-procedure and example. Interplanar distance between two successive planes.					
Suggested Activities: Demonstration of crystal structures (SC, BCC and FCC) using 3D models and determination of Miller indices for selected crystal planes.					
Unit II	Inertia And Dynamics of Rigid Body	9			
Concept-inertia- center of mass - rigid body- rotational kinetic energy and momentum of inertia – parallel and perpendicular axis theorem- moment of inertia of disc, solid cylinder, hollow cylinder, solid sphere and hollow sphere and Gear function.					
Suggested Activities: Demonstration of moment of inertia of a gear and study of its rotational motion.					
Unit III	Properties of Magnetic Material	9			
Classification –Dia, para, and Ferro. Bohr magnetron – origin of ferromagnetism – Domain theory – Anti-Ferro – Ferro magnetism – Properties, Hard and soft magnetic material-principles of magnetic recording-Magnetic hard disc (GMR Sensor). Quantum interference devices.					
Suggested Activities: Experimental demonstration of magnetic susceptibility using Quincke’s method and classification of magnetic materials.					
Unit IV	Optical Material	9			
Classification of Optical material, - Optical process in semiconductor, Optical absorption and emission-Scattering, effect- Optical process in conductor and insulator –LED-Solar cell –Optical process in organic semiconductor (OLED)-laser diode (Hetero and homo)-Excitonic states.					
Suggested Activities: Experimental study of LED and solar cell characteristics and their optical applications.					
Unit V	Functional Material	9			
Composite-fiber reinforced plastics (FRP), Fiber reinforced metal (FRM) Metallic glass-quenching process, application, Shape memory alloy (SMA)-Process of application-crystalline and non-crystalline material – Ceramics-properties -isostatic pressing methods- applications					
Suggested Activities: Demonstration of shape memory effect in SMA and study of applications of functional materials such as FRP, FRM, metallic glass and ceramics.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. A. J. Dekker, Solid State Physics, Edition 2014 Macmillan India Limited, New Delhi.					
2. S. O. Pillai, Solid State Physics, 10th Edition, New Age International Publishers, New Delhi, 2020.					
References:					
1. V. Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.					
2. Mathur, D. S. (2008). Elements of properties of matter. S. Chand.					
3. S.O. Kasap, Principles of Electronic Materials and Devices, Mc-Graw Hill, 2018.					
4. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, Mc-Graw Hill India (2019)					
5. Donald R. Askeland & Wendelin J. Wright, The Science and Engineering of Materials, 7 th Edition, Cengage Learning.					
E-resources:					
1. Crystalline physics: https://ocw.mit.edu/courses/3-091sc-introduction-to-solid-state-chemistry-fall-2010/pages/crystalline-materials/15-introduction-to-x-ray-diffraction/					
2. Moment of Inertia: https://youtu.be/fDJeVR0w					
3. Magnetic Susceptibility – https://em-amrt.iitb.ac.in/exp/quinckes-method					
4. LED Characteristics - https://youtu.be/IgapceVjXs					

CO	CO Description	PO	PSO
CO1	Understand crystal structures and packing in material	PO1(3), PO2(2), PO3(1)	PSO2(1)
CO2	Apply concepts of inertia in mechanical system	PO1(3), PO2(2), PO4(1)	PSO2(1), PSO1(2)
CO3	Explain magnetic material and their properties	PO1(3), PO2(2), PO5(1)	PSO2(1), PSO1(2)
CO4	Understand optical materials and semiconductor optical process	PO1(3), PO2(2), PO6(1)	PSO2(1)
CO5	Describe new material, composites and shape memory alloys with application	PO1(3), PO3(2), PO5(1)	PSO2(1), PSO1(2)

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



26GEC01	Environmental Science and Sustainability	L	T	P	C
		2	0	0	2
Course Objectives: • To understand environment, ecosystems, biodiversity, and conservation. • To understand sustainability, SDGs, and environmental issues. • To learn sustainable practices, circular economy, and green engineering. • To understand pollution, prevention, control, and waste management. • To learn energy conservation and renewable energy sources					
Unit I	Environment and Biodiversity	6			
Nature and scope of environmental education, natural resources, Ecosystem Structure, characteristics and functions of ecosystem. Biodiversity, definition, conservation of biodiversity (in-situ and Ex-situ). Suggested Activities: Know Your Campus Biodiversity & Campus Biodiversity Survey.					
Unit II	Social Issues and Sustainability	6			
Sustainability, Definition, Sustainable development Goals, Environmental issues - global warming and Ozone depletion ,Climate change, Acid rain, Carbon foot print-Possible solutions to Environmental issues. Suggested Activities: Sustainability Action Challenge & Sustainability Action Plan.					
Unit III	Sustainability Practices	6			
Zero waste and R-concept-circular economy, material life cycle assessment, Sustainable habitat - Sustainable transports, Sustainable urbanization, Green Engineering, Green buildings, Green materials- GRIHA- IGBC Green & Net Zero Buildings Rating System. Suggested Activities: Unsustainable Campus Challenge – “From Waste to Resource Green Campus” solution.					
Unit IV	Environmental Pollution and Its Control	6			
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts. Suggested Activities: Environmental Pollution Audit and Control Plan, Prepare a Pollution Control Chart.					
Unit V	Renewable Sources of Energy	6			
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources. Concept, origin and power plants of geothermal energy. Suggested Activities: Comparative Study of Renewable Energy Sources, Design a Renewable Energy Syllabus.					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%)					
Text Books: 1. Anubha Kaushik and C. P. Kaushik’s “Perspectives in Environmental Studies”, 6th Edition, New Age International Publishers, 2018. 2. G. Tyler Miller and Scott E. Spoolman, Environmental Science, 15th Edition, Cengage Learning, Boston.					
References: 1. Benny Joseph, ‘Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi, 2016. 2. Gilbert M.Masters, ‘Introduction to Environmental Engineering and Science’, 3rd Edition, Pearson Education, 2023. 3. P. Meenakshi – Elements of Environmental Science and Engineering, 2nd Edition, latest print 2023, PHI Learning 4. Jay H. Withgott & Matthew Laposata – Essential Environment: The Science Behind the Stories, 7th Edition, Pearson. 5. Cunningham and cooper-“Environmental Science, Jaico”, The current Cunningham environmental-science text is 16th Edition, 2026, McGraw Hill					
E-resources: 1. https://nptel.ac.in/courses/103107215 2. https://nptel.ac.in/courses/103107216 3. https://nptel.ac.in/courses/103107218					





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

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



26MEC03	Engineering Mechanics	L	T	P	C
		3	1	0	4
Course Objectives:					
- Understand modern methods of force and equilibrium analysis. - Apply vector and computational techniques to analyze engineering systems. - Analyze distributed loads, friction, and contact forces in engineering applications. - Understand and apply the principles of dynamics, momentum, work, and energy. - Use CAE (Computer-Aided Engineering) and simulation tools to solve engineering mechanics problems.					
Unit I	Force Systems and Engineering Statics	12			
Fundamentals of engineering mechanics and units-Force systems, vector representation and resultants-Force resolution using rectangular components and unit vectors-Free-body diagrams and equilibrium of particles-2D and 3D force analysis using computational tools					
Suggested Activities: Assignments and Quiz on resultant forces, Solving of GATE questions.					
Unit II	Rigid Body Equilibrium and Mechanical Systems	12			
Moments, couples and equivalent force systems-Vector and scalar products in force analysis-Equilibrium of rigid bodies in 2D and 3D-Support reactions and connections-Force-couple systems in mechanical and structural applications					
Suggested Activities: Virtual demonstration of rigid bodies, Solving of GATE questions.					
Unit III	Distributed Loads and Section Properties	12			
Centroids and centre of gravity of engineering components-Composite and irregular sections-Distributed loading on beams and structural members-Area and mass moments of inertia-Parallel-axis theorem and radius of gyration-Application to structural and machine-component design					
Suggested Activities: Virtual Simulation of Moment of Inertia, Principal Axes Determination, Solving of GATE questions.					
Unit IV	Friction and Contact Mechanics	12			
Dry friction and friction coefficients-Wedge, ladder and wheel friction-Rolling resistance and contact forces-Friction in machine elements and mechanisms-Engineering applications in robotics, automation and mobility systems.					
Suggested Activities: Virtual Demonstration of Friction in belts and pulleys, Solving of GATE questions.					
Unit V	Particle Dynamics and Energy Methods	12			
Rectilinear and curvilinear motion-Newton's laws and equations of motion-Work-energy and impulse-momentum methods-Kinetic energy and impact analysis-Applications to machines, vehicles, robotics and dynamic systems.					
Suggested Activities: Assignments using programming tools to calculate the motion parameters of particles and present the results in graphical form.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education, 13th Edition, 2026.					
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 15th edition, Prentice Hall, 2022.					



References:

1. Russell C. Hibbeler, Engineering Mechanics: Statics & Dynamics, SI Edition, 15th Edition, Pearson, 2025/2026.
2. J. L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, 7th Edition, Wiley, 2012.
3. J. L. Meriam and L. G. Kraige, Engineering Mechanics: Dynamics, 7th Edition, Wiley, 2012.
4. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, Oxford University Press, New Delhi, 2011.
5. S. S. Bhavikatti and K. G. Rajashekarappa, Engineering Mechanics, New Age International Publishers, New Delhi, 10th Edition 2026.

E-resources:

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

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

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



26EEEC01	Basic Electrical and Electronics Engineering	L	T	P	C
		3	0	0	3
Course Objectives:					
• To impart foundational knowledge in principles and applications of electrical and electronics engineering.					
Unit I	DC Fundamentals	9			
Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Series parallel combination of R, L and C components, Voltage Divider and Current Divider Rules.					
Suggested Activities: Virtual Demonstration of electrical laws & circuits, Hands-on Bread boarding, Solving GATE questions.					
Unit II	AC Fundamentals	9			
Faraday's Laws of Electro-magnetic Induction, Definition of Self and Mutual Inductances, Generation of sinusoidal voltage, Instantaneous & RMS values of sinusoidal signals, Introduction to 3-phase systems, Electrical Safety, Fuses and Earthing.					
Suggested Activities: Virtual Demonstration of electromagnetic induction, Measurement of instantaneous and RMS values of AC signals, Solving GATE questions.					
Unit III	Electric Machines	9			
DC Machines, Transformers, Star and delta Connections, Three phase Induction motors, Synchronous Generators, Single Phase Induction Motors, Stepper Motor, Universal Motor and BLDC motor.					
Suggested Activities: Virtual demonstration of step-up and step-down transformers, Virtual working models of Universal and BLDC motors, Solving GATE questions.					
Unit IV	Analog and Digital Electronics	9			
Semiconductor Devices: PN junction diodes, Zener Diode, Voltage regulator, BJT & FET Transistors, Timers, Operational Amplifiers.					
Digital Electronics: Boolean algebra, Basic and Universal Gates, adders, multiplexers, demultiplexers and flip-flops.					
Suggested Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Online logic gate simulators, Solving GATE questions.					
Unit V	Microcontrollers	9			
Microcontrollers: Introduction, Architecture, Memory organization, I/O ports, timer, Serial port, Interrupt, Comparison of family 8051, Potential Applications.					
Suggested Activities: Physical demonstration of a microcontroller and online simulation of microcontroller.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Quiz (10%), Assignments (20%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%)					
Text Books:					
1. A textbook of electrical technology, Theraja, B. L. S.Chand & Company,24th edition,2024.					
2. Basic Electrical and Electronics Engineering ,D.P. Kothari and I.J. Nagrath, Tata McGraw Hill Education, 2nd edition, 2020.					
References:					
1. A Textbook of Applied Electronics ,R.S. Sedha, S. Chand & Co. 3 rd edition,2008.					
2. Thomas L. Floyd ,Digital Fundamentals , Pearson Education,11 th edition,2025.					
3. The 8051 Microcontroller and Embedded Systems ,Muhammad Ali Mazidi, 2 nd edition,2007					
4. Basic Electrical and Electronics Engineering by S.K. Bhattacharya published by Pearson India Second Edition published in July 2017.					
5. Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku is published by McGraw-Hill Education in 2021					
E-resources:					
1. https://archive.nptel.ac.in/courses/108/106/108106172/					
2. Circuit Simulator – https://www.falstad.com/circuit/					



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

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



26CSC03	Problem Solving using Python Programming	L	T	P	C
		3	0	2	4
Course Objectives: - To equip engineering students with the foundational knowledge and practical skills in Python programming to analyse and solve computational problems effectively. - To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
Unit I	Introduction to Python Programming	9			
Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error Messages, Variables, Reserved Words, Data Types, Arithmetic Operators and Expressions, Built-in Functions, Importing from Packages.					
Suggested Activities: Interpret GATE-style MCQs on pseudocode, interactive/script mode, indentation, comments, errors, variables, reserved words, and data types. Evaluate GATE-style questions on arithmetic operators, expressions and importing functions from packages.					
Unit II	Control Structures and Functions	9			
If, if-else, Nested if, Multi-way if-elif Statements, while Loop, for Loop, Nested Loops, pass Statements. Functions: Hiding Redundancy and Complexity, Parameters, Arguments and Return Values, Formal and Actual Arguments, Named Arguments, Recursive Functions, Lambda Functions.					
Suggested Activities: Practice GATE-style MCQs on Control Statements, while, for, nested loops, and pass statements. Analyze GATE-style questions on parameters, arguments, return values, formal/actual and named arguments, recursion, and lambda functions.					
Unit III	Strings and Collections	9			
String Comparison, Formatting, Slicing, Splitting, Stripping. Collections: Lists, Tuples, Sets and Dictionaries, Basic List Operators, Searching and Sorting Lists, Dictionary Literals, Adding and Removing Keys, Accessing and Replacing Values.					
Suggested Activities: Evaluate GATE-style MCQs on string comparison, formatting, slicing, splitting, stripping, lists, tuples, sets, and dictionaries. Interpret GATE-style questions on list operators, searching, sorting, dictionary operations, keys, and value manipulation.					
Unit IV	File Operations and Data Processing	9			
Creating, Opening, Reading, Writing, Appending and Closing Files, Manipulating Directories, OS and Sys Modules, Reading and Writing Text and Numbers, Creating and Reading Formatted Files such as CSV and Tab-Separated Files.					
Suggested Activities: Examine GATE-style MCQs on creating, opening, reading, writing, appending, closing files, directories, and OS/Sys modules. Interpret GATE-style questions on reading/writing text, numbers, CSV files, and tab-separated files.					
Unit V	Python Modules, Packages and Project	9			
Packages: Built-in Modules, User-Defined Modules, NumPy, SciPy, Pandas and Scikit-learn.					
Suggested Activities: Assess GATE-style MCQs on built-in modules, user-defined modules, and their applications. Examine GATE-style questions on NumPy, SciPy, Pandas, and Scikit-learn.					
TOTAL (Theory) : 45 PERIODS					
List of Experiments: - Problem Analysis Chart, Flowchart and Pseudocode Practices. (Minimum Three) - Usage of Conditional Logics in Programs. (Minimum Three) - Usage of Functions in Programs. (Minimum Three) - String Manipulation and Operations on Lists, Tuples, Sets and Dictionaries. (Minimum Three) - Opening, Closing, Reading and Writing Formatted Files and Sorting Data. (Minimum Three) - Usage of Modules and Packages to Solve Engineering Problems. (Minimum Three) - Project: Development of Python-based applications using appropriate programming concepts, modules and packages. (Minimum Two Projects)					
TOTAL (Lab.): 30 PERIODS					
TOTAL: 75 PERIODS					

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%
Assessment Methodology: Quiz (10%), Assignment (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%)
Text Books:
1. Thareja, R. (2023). Python Programming: Using Problem Solving Approach (2nd edition). Oxford University Press.
2. Liang, Y. D. (2017). Introduction to Programming Using Python (1st edition). Pearson Education.
References:
1. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming (2nd edition). No Starch Press.
2. Brown, M. C. (2018). Python: The complete reference (4th edition). McGraw Hill Publishers.
3. Guttag, J. V. (2016). Introduction to computation and programming using Python: With applications to understanding data (2nd edition). MIT Press.
4. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython. Shroff/O'Reilly.
5. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2016.
E-resources:
1. Official Python Documentation – https://docs.python.org/3/
2. Python Tutorials – https://www.w3schools.com/python/
3. NumPy – https://numpy.org/doc/
4. SciPy – https://scipy.org/
5. Google's Python class – https://developers.google.com/edu/python/

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

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



26ENC02	Communicative English Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: - To make students proficient and confident communicators in English across a variety of contexts. - To enable learners to comprehend both spoken English in diverse settings. - To develop students' ability in the nuances Reading English. - To enhance the ability of different formal and technical writings. - To prepare learners to tackle situations and seek employment with assurance in the modern globalized world.					
List of Suggested Activities					
LISTENING SKILL a) Listening Comprehension b) Listening Native Speakers and Repeat c) Listening to Pod casts d) Experiencing Listening Technical Reports e) Listening Barriers SPEAKING SKILL a) Phonetics b) Pronunciation c) Accent d) Intonation e) Stress f) Pause g) Nuances READING SKILL a) General and Technical Comprehension b) Experiencing Intensive reading, c) Extensive reading d) Skimming and Scanning e) Practice on Terminologies f) Synonyms and Antonyms from technical subjects WRITING SKILL a) Common Errors b) Paragraphs and Essays c) Writing Technical Reports d) Business Letters, Emails, Notices e) Agenda and Minutes of Meeting PERSONALITY DEVELOPMENT a) SWOT Analysis b) Digital Presentation c) Role Play d) Dialogue and Conversation e) TED Talks – Extempore					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%).					
Text Books:					
1. Dutt, Kiranmai, et al. A Course in Communication Skills. Cambridge University Press, 2008. 2. Green, David. Contemporary English Grammar: Structures & Composition. Trinity Press, 2018.					



References:

1. Narayanaswami, V. R. Strengthen Your Writing. Orient Blackswan, 2009.
2. Nicholls, Anne. Mastering Public Speaking. Jaico Publication, 1999.
3. Raman, Meenakshi. Principles and Practice in Technical Communication. Oxford University Thomson, 3rd Edition, 2022
4. A.J. and A.V. Martinet. A Practical English Grammar. Oxford University Press.
5. Murphy, Raymond. Essential English Grammar. 2nd edition, Cambridge University Press, 2022.

E-resources:

1. <https://www.shortform.com/summaries>
2. <https://www.skillsyouneed.com/rhubarb.html>
3. Sway am-NPTEL Business English Communication Portal

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

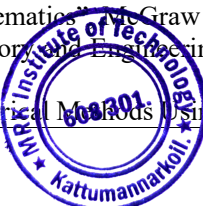
(1) = Low; (2) = Medium; (3) = High



Semester – III



26MAC05	Transforms, Partial Differential Equations and Numerical Methods	L	T	P	C
		3	1	0	4
Course Objectives: The course aims to provide students with a comprehensive understanding of advanced mathematical and numerical techniques and their applications in engineering and scientific problems. The course objectives are: • Understand the basic concepts and applications of partial differential equations. • Apply Fourier series for representing and analysing periodic functions. • Use Z-transforms and difference equations to solve discrete problems. • Apply numerical methods to solve algebraic and linear system equations. • Use numerical techniques for differentiation, integration, and differential equations.					
Unit I	Partial Differential Equations	12			
Formation of partial differential equations, Lagrange’s linear equation. Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types. Suggested Activities: Application and Visualization of the first order PDE using open-source software and solving Competitive Examination questions.					
Unit II	Fourier Series	12			
Dirichlets conditions, General Fourier series, Odd and even functions, Half range sine series, Half range cosine series, Harmonic analysis. Suggested Activities: solving Fourier coefficients. Using open-source software and solving of Competitive Examination questions and solving Competitive Examination questions.					
Unit III	Z-Transforms and Difference Equations	12			
Z-transforms, Elementary properties, Inverse Z-transform (using partial fraction) Convolution theorem, Formation of difference equations, Solution of difference equations using Z- transform. Suggested Activities: Students are given different numerical sequences. They find their Z-transforms and inverse Z-transforms then use them to solve simple difference equations and solving Competitive Examination questions.					
Unit IV	Solution of Equations and Eigenvalue Problems	12			
Solution of algebraic and transcendental equations, Fixed point iteration method, Newton Raphson method, Solution of linear system of equations, Gauss elimination method Iterative methods of Gauss Jacobi and Gauss Seidel. Suggested Activities: Students solve the same nonlinear equation using Fixed Point Iteration and Newton–Raphson Method . They record the number of iterations and compare accuracy and solving Competitive Examination questions.					
Unit V	Numerical Differentiation and Integration	12			
Approximation of derivatives using interpolation polynomials, Numerical integration using Trapezoidal, Simpsons 1/3 rule, Single step methods, Taylors series method ,Euler’s method, Modified Euler’s. Suggested Activities: Students evaluate a definite integral using the Trapezoidal Rule and Simpson’s 1/3 Rule. They compare the results with the exact value and calculate the error and solving Competitive Examination questions.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Erwin Kreyszig, Advanced Engineering Mathematics, (11th ed.), John Wiley & Sons, USA, 2025. 2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 45 th Edition, 2026.					
References:					
1. Steven C. Chapra and Raymond P. Canale. Numerical Methods for Engineers (8th ed.). McGraw-Hill Education, 2021. 2. William E. Boyce and Richard C. DiPrima, “Elementary Differential Equations and Boundary Value Problems”, Wiley, 11th Edition, 2017. 3. B.V. Ramana, “Higher Engineering Mathematics”, McGraw Hill Education, New Delhi, 4th Edition, 2017. 4. Amiya K. Jana, Numerical Methods: Theory and Engineering Applications. Cambridge University Press, 1st edition, 2024. 5. Lindfield, George, and John Penny. Numerical Methods Using MATLAB. 5th edition Elsevier, 2025.					



E-resources:

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

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

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



26ME301	Engineering Thermodynamics	L	T	P	C
		3	1	0	4
Course Objectives:					
- This course introduces the fundamental principles and laws of thermodynamics related to energy, heat transfer, work transfer and properties of pure substances. - It develops the ability to analyze thermodynamic systems using the First and Second Laws, and to evaluate system performance using entropy, exergy, and property relations.					
Unit I	Basic Concepts	12			
Continuum and macroscopic approach; thermodynamic systems; thermodynamic properties and equilibrium state of a system, state postulate for simple compressible substances, state diagrams, paths and processes on state diagrams, ideal gas equation of state; concept of temperature, zeroth law of thermodynamics, thermodynamic temperature scale					
Suggested Activities: Identify and report closed and open thermodynamic systems from daily life. Fabricate a transparent plunger–cylinder setup to demonstrate an adiabatic process. Demonstrate Boyle’s law and Charles’s law.					
Unit II	First Law of Thermodynamics	12			
Concept of energy and its various forms, concepts of heat, work and different modes of work; reversible and irreversible processes, concept of moving boundary work; first law applied to elementary processes, closed systems and control volumes, steady and unsteady flow analysis.					
Suggested Activities: Develop a program to compute moving boundary work for different polytropic processes and plot P–V diagrams.					
Unit III	Second Law of Thermodynamics	12			
Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; perpetual motion machines, Carnot cycle and Carnot theorems; Clausius inequality and concept of entropy; the principle of increase of entropy, T-s diagrams; second law analysis of control volume; exergy analysis of closed and open systems; basics of third law of thermodynamics.					
Suggested Activities: Develop a program to generate P–v and T–s diagrams for a Carnot cycle and evaluate heat transfer, work, and efficiency.					
Develop a program to analyze energy balance, exergy balance, exergy destruction, and second-law efficiency of steady-flow systems.					
Unit IV	Properties of Pure Substances	12			
Pure substances and their phases; Phase-change processes of pure substances, property diagrams for phase-change processes; Gibbs phase rule, thermodynamic property tables and charts; real gases and van der Waals equation of state; compressibility factor, principle of corresponding states, generalized compressibility chart.					
Suggested Activities: Develop a program to generate T–v, P–v, and P–T diagrams for water using thermodynamic property correlations.					
Develop a program to evaluate the ideal-gas approximation error for water vapour under varying conditions.					
Unit V	Thermodynamic Relations	12			
Reciprocity and cyclic relation, Helmholtz and Gibbs functions, Maxwell relations; Clapeyron and Clapeyron–Clausius equations; volume expansivity, isothermal and adiabatic compressibility, Mayer relation; Joule-Thomson coefficient.					
Suggested Activities: Develop a program to numerically verify a Maxwell relation using thermodynamic property data.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. P. K. Nag, Engineering Thermodynamics, 7th Edition, McGraw Hill, New Delhi, 2025.					
2. Yunus A. Çengel and Michael A. Boles, Thermodynamics: An Engineering Approach, McGraw Hill Education, 2025					



References:

1. R. K. Rajput, Engineering Thermodynamics, Laxmi Publications, New Delhi.
2. J. P. Holman, Thermodynamics, McGraw Hill Education. 4th Edition.
3. V. Ganesan, Thermodynamics, McGraw Hill Education, New Delhi.
4. R. S. Khurmi and J. K. Gupta, A Textbook of Refrigeration and Air Conditioning, S. Chand & Company. 5th Edition.
5. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey, Fundamentals of Engineering Thermodynamics, Wiley, 9th Edition.

E-resources:

1. <https://nptel.ac.in/courses/112105220>
2. <https://nptel.ac.in/courses/112105123>
3. <https://nptel.ac.in/courses/112106310>
4. <https://nptel.ac.in/courses/112106320>

CO	CO Description	PO	PSO
CO1	Explain the basic concepts of thermodynamic systems, properties, equilibrium, state postulate, processes, ideal gas equation, temperature, and the Zeroth Law of Thermodynamics.	PO1(3), PO2(2)	-
CO2	Apply the First Law of Thermodynamics to closed systems and control volumes, and analyze heat, work, energy transfer, and steady/unsteady flow processes	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze heat engines, refrigerators, heat pumps, Carnot cycles, entropy, exergy, and irreversibilities using the Second Law of Thermodynamics.	PO1 (2), PO2 (2), PO4 (2)	PSO1 (3), PSO2 (2)
CO4	Evaluate the properties and phase-change behavior of pure substances using property diagrams, thermodynamic tables, charts, Gibbs phase rule, and equations of state for real gases.	PO2 (2), PO3 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO5	Apply thermodynamic relations, Maxwell relations, Clapeyron and Clapeyron–Clausius equations, Mayer relation, and Joule–Thomson coefficient to analyze thermodynamic properties and processes.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)

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



26ME302	Material Science and Metallurgy	L	T	P	C
		3	0	0	3

Course Objectives:					
- Understand the fundamentals of alloys, phase diagrams, the Iron–Iron Carbon diagram, and classification of steels. - Study isothermal transformation, continuous cooling diagrams, and various heat treatment processes. - Understand the effects of alloying elements on ferrous and non-ferrous metals. - Familiarize students with the properties and applications of non-metallic materials. - Develop knowledge of various methods used for testing the mechanical properties of materials.					
Unit I	Constitution of Alloys and Phase Diagrams				9
Stress and strain diagram for Engineering materials, Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – Iron Carbide equilibrium diagram. Classification of steel and cast-Iron microstructure, properties and application.					
Suggested Activities: Study of phase diagrams and microstructures.					
Unit II	Heat Treatment				10
Definition – Full annealing, stress relief, recrystallisation and spheroidising –normalizing, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram – continuous cooling Transformation (CCT) diagram – Austempering, Martempering – Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening – Thermo- mechanical treatments- Powder Metallurgy: production of metal powders, powder characteristics, mixing and blending, compaction, sintering, secondary operations, advantages, limitations and applications-elementary ideas on sintering.					
Suggested Activities: Demonstration of heat treatment and hardenability test.					
Unit III	Ferrous and Non-Ferrous Metals				8
Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V, Ti & W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications overview of materials standards.					
Suggested Activities: Alloy identification and material selection exercise					
Unit IV	Non-Metallic Materials				9
Polymers – types of polymers, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers – Urea and Phenol formaldehydes –Nylon, Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON – intermetallic - Composites- Matrix and reinforcement Materials applications of Composites - Nano composites.					
Suggested Activities: Classification of polymers, ceramics, and composites.					
Unit V	Mechanical Properties and Deformation Mechanisms				9
Mechanisms of plastic deformation, slip and twinning – Types of fracture – fracture mechanics- Griffith’s theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms.					
Suggested Activities: Demonstration of tensile, hardness, and impact tests.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Kenneth G.Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 9th edition, 2018					
2. Sydney H.Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 2004					



References:

1. A. Alavudeen, N. Venkateshwaran, and J. T. Winowlin Jappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2. Amandeep Singh Wadhwa, and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3. G.S. Upadhyay and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd, New Delhi, 2020.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd. 6th edition, 2015 Latest Print 2023.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, 2nd edition Re print 2019.

E-resources:

1. <https://nptel.ac.in/courses/113106098>

CO	CO Description	PO	PSO
CO1	Explain alloys and phase diagram, Iron-Iron Carbon diagram and steel classification.	PO1 (1)	PSO1 (3)
CO2	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.	PO2 (1) PO3 (3)	PSO1 (3) PSO2 (2)
CO3	Clarify the effect of alloying elements on ferrous and non-ferrous metals.	PO1 (3) PO3 (3)	PSO1 (3) PSO2 (3)
CO4	Summarize the properties and applications of non-metallic materials.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Explain the testing of mechanical properties.	PO1 (3) PO2 (2) PO3 (3)	PSO1 (3) PSO2 (3)

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



26ME303	Power Plant Engineering	L	T	P	C
		3	0	0	3
Course Objectives:					
• To study the coal based thermal power plants. • To study the diesel, gas turbine and combined cycle power plants. • To learn the basic of nuclear engineering and power plants. • To learn the power from renewable energy • To study energy, economic and environmental issues of power plants.					
Unit I	Coal Based Thermal Power Plants	9			
Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants - Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.					
Suggested Activities: Prepare a Thermal Power Plant Layout and identify major components.					
Unit II	Diesel, Gas Turbine and Combined Cycle Power Plants	9			
Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.					
Suggested Activities: Compare Otto, Diesel and Brayton Cycles and study combined-cycle operation.					
Unit III	Nuclear Power Plant	9			
Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANADA Deuterium Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.					
Suggested Activities: Prepare a Nuclear Reactor Comparison Chart and study safety features.					
Unit IV	Power From Renewable Energy	9			
Hydro Electric Power Plants - Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geothermal, Biogas and Fuel Cell power systems.					
Suggested Activities: Prepare a Renewable Energy Model covering solar, wind and hydro systems.					
Unit V	Energy, Economic and Environmental Issues of Power Plants	9			
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.					
Suggested Activities: Conduct a Power Plant Economic and Environmental Impact Study.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. P. K. Nag, Power Plant Engineering, 4th Edition, McGraw Hill Education, New Delhi, 2016/2017.					
2. A Textbook of Power Plant Engineering by R.K. Rajput 1 January 2016					
References:					
1. EI-Wakil. M.M., "Power Plant Technology", Tata McGraw - Hill Publishing Company Ltd., 2010.					
2. Thomas C. Elliott, Kao Chen and Robert C. Swane kamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw - Hill, 1998.					
3. Power Plant Engineering by B. Vijaya Ramnath C. Elanchezhian, L. Saravanakumar November 2010.					
4. Power Plant Engineering, As per AICTE: Theory and Practice by Dipak Kumar Mandal, Somnath Chakrabarti, et al. 1 st Edition 2019					
5. Godfrey Boyle, “Renewable Energy”, Open University, Oxford University Press in association with the Open University, 3 rd Edition 2012.					
E-resources:					
1. https://nptel.ac.in/courses/112107291					



CO	CO Description	PO	PSO
C01	Explain the layout, construction and working of the components inside a thermal power plant. energy production	PO1(1)	PSO1(3)
C02	Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants	PO2(1), PO3(3)	PSO1(3), PSO2(2)
C03	Explain the layout, construction and working of the components inside nuclear power plants	PO1(3), PO3(3)	PSO1(3), PSO2(3)
C04	Explain the layout, construction and working of the components inside Renewable energy power plants	PO3(3), PO5(3)	PSO1(3), PSO2(3)
C05	Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical	PO1(3), PO2(2), PO3(3)	PSO1(3), PSO2(3)

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



26ME304	Fluid Mechanics and Machinery	L	T	P	C
		3	0	2	4
Course Objectives:					
- To introduce the students about properties of the fluids, behaviour of the fluids under statics, kinematics and dynamic conditions. - To expose to the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends. - To impart basic knowledge to the students about the working principles and performance characteristics of hydraulic machineries.					
Unit I	Fluids Properties and Fluid Statics				9
Types and properties of fluids, Viscosity, Surface tension and Compressibility, Basics of Compressible flow Fluid statics, Concept of fluid pressure, Manometers, Forces on plane and curved surfaces, Buoyancy and floatation, Stability of floating bodies, metacentric height and its determination.					
Suggested Activities: Mini case study on buoyancy applications in ships/submarines, Problem- solving using simulation tools for pressure distribution.					
Unit II	Fluid Kinematics and Dynamics				9
Kinematics: Classification of fluid flows, Eulerian and Lagrangian approach, concept of control volume and system, Velocity and acceleration, Stream function and velocity potentials, Flow nets; Dynamics: Application of control volume to continuity, energy and momentum, Euler's equation of motion along a stream line, Bernoulli's equation, Applications to velocity and discharge measurements, Linear momentum equation.					
Suggested Activities: Group activity on Bernoulli-based engineering applications (aircraft wing, carburetor, atomizer, etc., software demonstration for flow patterns.					
Unit III	Flow Through Pipes and Boundary Layer				9
Reynold's Experiment, Laminar flow through circular conduits, Hagen Poiseuille equation, Darcy-Weisbach equation, Moody diagram, Major and minor losses of flow in pipes, Hydraulic gradient and total energy gradient, Pipes in series and parallel, Equivalent pipes, Boundary layer concepts, types of boundary layer thickness.					
Suggested Activities: Pipe network design exercise using campus/building water supply layout, Industrial case study on pipeline losses and leakage reduction.					
Unit IV	Dimensional Analysis				7
Fundamental dimensions, Dimensional homogeneity, Rayleigh's method and Buckingham π theorem, Dimensionless parameters, Similitude and model studies, Distorted and undistorted models					
Suggested Activities: Model-making activity demonstrating similitude concepts, Group exercise on identifying dimensionless numbers in engineering systems.					
Unit V	Turbines and Pumps				11
Impact of jets, Velocity triangles, Theory of rotodynamic machines, Classification of turbines, Pelton wheel, Francis turbine and Kaplan turbine,working principles, Work done by water on the runner, Efficiencies, Draft tube, Specific speed, Performance curves for turbines.					
Classification of pumps, Centrifugal pumps, working principle, Heads and efficiencies, Work done by the impeller, NPSH, Minimum speed to start the pump, Pumps connected in series and parallel, Performance curves, Reciprocating pump working principle, Indicator diagram and its variations, Air vessels - Work saved by air vessels.					
Suggested Activities: Virtual demonstration of Pumps and Turbines.					
TOTAL (Theory): 45 PERIODS					
List of Experiments:					
- Determination of metacentric height. - Determination of coefficient of discharge of a venturimeter. - Determination of friction factor for flow through pipes. - Performance Test on Pelton Wheel Turbine - Performance Test on Francis Turbine - Characteristics of centrifugal pumps - Characteristics of reciprocating pump					
					
TOTAL (Lab.): 30 PERIODS					
TOTAL: 75 PERIODS					



Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).
Text Books:
1. R. K. Rajput, A Textbook of Fluid Mechanics and Hydraulic Machines, 6th Edition, S. Chand & Company Ltd., New Delhi, 2015.
2. R. K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, 10th Edition, Laxmi Publications, New Delhi, 2018.
References:
1. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, 23 rd Edition, Standard Book House, New Delhi, 2022.
2. A. K. Jain, Fluid Mechanics including Hydraulic Machines, 12th Edition, Khanna Publishers, New Delhi, 2022.
3. S. K. Som, Gautam Biswas and S. Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, 3 rd Edition, McGraw Hill Education, Chennai, 2024.
4. B. S. Pani, Fluid Mechanics: A Concise Introduction, 2nd Edition, PHI Learning Private Limited, 2021.
5. A. K. Jain, Fluid Mechanics including Hydraulic Machines, 12th Edition, Khanna Publishers, New Delhi, 2022.
E-resources:
1. https://onlinecourses.nptel.ac.in/noc25_ce107/preview
2. https://elearn.nptel.ac.in/shop/nptel/introduction-to-fluid-mechanics/
3. https://openwcw.aprende.org/courses/mechanical-engineering/2-06-fluid-dynamics-spring-2013/
4. https://www.digimat.in/nptel/courses/video/112105171/112105171.html
5. https://archive.nptel.ac.in/content/syllabus_pdf/105101082.pdf

CO	CO Description	PO	PSO
CO1	Explain fundamentals of fluid properties, statics, kinematics, dynamics, pipe flow, and hydraulic machines.	PO1 (2)	—
CO2	Apply fluid mechanics principles to compute forces, flow parameters, losses, and machine performance.	PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze fluid systems involving statics, dynamics, pipe flow, and hydraulic machines to determine behavior.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate Performance, efficiency and operating conditions of fluid systems and machines, dimensional analysis,	PO3 (2), PO5 (2)	PSO1(2), PSO2(2)
CO5	Explain and analyze the working principles, performance characteristics, energy transfer, and efficiencies of hydraulic turbines and pumps, and apply the concepts through experimental and virtual demonstrations.	PO3 (2), PO5 (2)	PSO1(2), PSO2(2)

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



26ME305	Basic Manufacturing Processes	L	T	P	C
		3	0	2	4
Course Objectives:					
• To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.					
Unit I	Metal Casting Processes	9			
Sand Casting: Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO2 process – Stir casting; Defects in Sand casting. Suggested Activities: Green-sand mould preparation and casting-defect identification.					
Unit II	Joining Processes	9			
Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Laser and Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure. Suggested Activities: Demonstration and comparative study of welding and joining processes.					
Unit III	Metal Forming Processes	9			
Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Suggested Activities: Demonstration and analysis of metal forming processes.					
Unit IV	Sheet Metal Processes	9			
Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes- Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction to Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming. Suggested Activities: Fabrication of a sheet-metal component using shearing and bending operations.					
Unit V	Manufacture of Plastic Components	9			
Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – introduction to blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics. Suggested Activities: Demonstration and case study of plastic processing techniques.					
TOTAL (Theory): 45 PERIODS					
LAB EXERCISES					
1. Prepare a green sand mould using single piece, split piece and loose piece patterns. 2. Prepare a shell mould using aluminium based pattern. 3. Welding of mild steel plates in flat, vertical and overhead position (SMAW) 4. Welding of mild steel pipes using TIG welding process 5. Manufacturing of simple sheet metal components using shearing and bending operations. 6. Manufacturing of sheet metal components using metal spinning on a lathe 7. Injection Moulding of Plastics					
TOTAL (Lab.): 30 PERIODS					
TOTAL (45 + 30): 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.					
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%)					
Text Books:					
1.Hajra Choudhary S.K and Hajra Choudhary S.K., Elements of workshop Technology, Vol. I – 16th Revised Edition (2015); Vol. II – 16th Revised & Enlarged Edition (2014) 2.Kalpajian. S, Manufacturing Engineering and Technology, Pearson Education India Edition, 8th Edition, 2023					

References:

1. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, 4th Edition, 2017, McGraw Hill Education.
2. R. K. Jain, Production Technology, Khanna Publishers. 17th Edition, 2012
3. Gowri P. Hariharan, A. Suresh Babu, Manufacturing Technology I, Pearson Education, 2008
4. Paul Degarmo E, Black J.T and Ronald A. Kosher, Materials and Processes, in Manufacturing 14th Edition, Prentice – Hall of India, 2025
5. Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2015.

E-resources:

1. <https://nptel.ac.in/courses/112104301>
2. <https://nptel.ac.in/courses/112104189>

CO	CO Description	PO	PSO
CO1	Explain different metal casting processes, associated defects, merits and demerits	PO1 (1)	PSO1 (3)
CO2	Compare different metal joining processes	PO2 (1), PO3 (3)	PSO1 (3) PSO2 (2)
CO3	Summarize various hot working and cold working methods of metals	PO1 (3) PO3 (3)	PSO1 (3) PSO2 (3)
CO4	Explain various sheet metal making processes	PO3 (3), PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Distinguish various methods of manufacturing plastic components and Prepare polymer composite by hand layer method	PO1 (3), PO2 (2), PO3 (3)	PSO1 (3), PSO2 (3)

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



26SDC01	Foundation Aptitude and Verbal ability Skills	L	T	P	C
		0	0	2	1
Course Objectives: - To Solve quantitative aptitude problems through practical exercises. - To Apply logical and analytical reasoning techniques. - To Improve grammar and vocabulary through practice-oriented activities. - To Demonstrate effective reading, listening and speaking skills. - To Demonstrate professional communication skills required for placement activities.					
List of Activities: - Number System, Simplification, Percentage and Ratio - Average, Profit and Loss, Simple and Compound Interest - Time, Work, Speed, Distance and Data Interpretation - Number Series, Analogy, Coding-Decoding and Logical Patterns - Blood Relations, Direction Sense, Ranking, Syllogism and Data Sufficiency - Grammar, Sentence Correction and Error Spotting - Vocabulary, Synonyms, Antonyms, Idioms and Sentence Completion - Reading Comprehension, Para Jumbles and Listening Skills - Speaking Skills, Group Discussion and Presentation Skills - Resume Preparation, Interview Skills and Mock Placement Activities					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing. 2024 R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publishing. Fully Revised Video Edition 2024–25 - Wren & Martin, High School English Grammar and Composition, S. Chand Publishing. Multicolour edition 2024 - Arun Sharma, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGraw Hill Education. 2026					
E-resources: https://nptel.ac.in/courses/109104030					

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

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



Semester – IV



26ME401	Thermal Engineering	L	T	P	C
		3	0	0	3
Course Objectives:					
• The course focuses on applying thermodynamic laws to analyze air standard and steam power cycles. Also provides an understanding of IC engines and their auxiliary systems.s					
Unit I	Gas and Steam Power Cycles	9			
Air Standard Cycles — Otto, Diesel, Dual, Brayton — Cycle Analysis, Performance and Comparison — Rankine, reheat and regenerative cycle					
Suggested Activities: Computational analysis and plotting of Otto, Diesel, Dual, Brayton and Rankine cycles					
Unit II	Internal Combustion Engines	9			
IC engine – Classification, working, components and their functions. Ideal and actual: Valve and port timing diagrams, P-V diagrams. Two stroke & four stroke, and SI & CI engines – comparisons. Combustion in SI & CI Engines – Abnormal combustion, Knocking and detonation.					
Suggested Activities: Demonstration and comparative study of SI/CI engines, valve timing and abnormal combustion					
Unit III	Internal Combustion Engine Testing	9			
Measurement of Performance parameters and characteristics, Performance calculations. Morse and Heat Balance tests					
Suggested Activities: IC engine performance, Morse test and heat balance test using laboratory data					
Unit IV	Internal Combustion Engines Auxiliary System	9			
Simple Carburettor, Fuel Injector, Multipoint Fuel Injection (MPFI), Gasoline Direct Injection (GDI) and Common Rail Direct injection (CRDI) systems, Electronic fuel Injection. Ignition system, Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging					
Suggested Activities: Demonstration and case study of fuel injection, ignition, cooling, lubrication, supercharging and turbocharging systems					
Unit V	Gas Turbines Cycle	9			
Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled and Reheated cycles					
Suggested Activities: Simulation and performance comparison of open/closed Brayton cycles with regeneration, intercooling and reheating					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. V. Ganesan, Internal Combustion Engines, 4th Edition, McGraw Hill Education, New Delhi, 2016/2017.					
2. R. K. Rajput, Thermal Engineering, 11th Edition, Laxmi Publications, New Delhi, 2023.					
References:					
1. P. K. Nag, Engineering Thermodynamics, 7th Edition, McGraw Hill Education. 2025					
2. R. S. Khurmi and J. K. Gupta, A Textbook of Thermal Engineering, S. Chand Publishing. 2025					
3. Heywood, J. B., Internal Combustion Engine Fundamentals, 2nd Edition, 2018, McGraw Hill Education.					
4. V. Kadambi and Manohar Prasad, An Introduction to Energy Conversion, New Age International Publishers.					
5. S. M. Yahya, Turbines, Compressors and Fans, 4th Edition, Tata McGraw Hill. 2011					
E-resources:					
1. https://onlinecourses.nptel.ac.in/noc25_me36/preview?					
2. https://onlinecourses.nptel.ac.in/noc24_me03/preview?					
3. https://online.vtu.ac.in/course-details/Applied-Thermodynamics?					



CO	CO Description	PO	PSO
CO1	Analyze the working and performance of Otto, Diesel, Dual, Brayton and Rankine cycles.	PO1(2), PO2(2)	-
CO2	Explain the construction, working and combustion characteristics of SI and CI engines.	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Evaluate IC engine performance using various performance parameters and tests	PO2 (2), PO3 (2)	PSO2 (2)
CO4	Explain the working of IC engine auxiliary systems such as fuel, ignition, cooling, and lubrication, supercharging and turbocharging systems.	PO4 (2), PO5 (1)	PSO2 (2), PSO3 (1)
CO5	Analyze the performance of gas turbines and the effects of regeneration, intercooling and reheating.	PO1 (2), PO2 (2)	PSO1 (2)

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



26ME402	Kinematics of Machinery	L	T	P	C
		3	0	0	3
Course Objectives:					
• To understand the basic components and layout of linkages in the assembly of a system machine. • To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism. • To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions. • To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.					
Unit I	Basics of Mechanisms	9			
Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler’s criterion – Grashof’s Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms Suggested Activities: Analysis of Degree of Freedom & inversion of Four bar, Single slider & Double Slider Mechanism					
Unit II	Kinematics of Linkage Mechanisms	9			
Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem. Suggested Activities: Analysis of Four Bar Chain and Slider Crank Mechanisms.					
Unit III	Kinematics of Cam Mechanisms	9			
Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams Suggested Activities: Cam displacement curves.					
Unit IV	Gears and Gear Trains	9			
Law of toothed gearing – Involute and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains. Suggested Activities: Study of velocity ratios of simple, compound, Epicyclic and differential gear trains.					
Unit V	Friction in Machine Elements	9			
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes. Suggested Activities: Study of Belt, Screw jack, Clutch, Bearing & Brake.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. F.B. Sayyad, “Kinematics of Machinery”, MacMillan Publishers Pvt Ltd., Tech-max Educational resources, 2025. 2. Rattan, S.S, “Theory of Machines”, 5th Edition, Tata McGraw-Hill, 2019.					
References:					
1. Allen S. Hall Jr., “Kinematics and Linkage Design”, Prentice Hall, 1961 2. Cleghorn. W. L, “Mechanisms of Machines”, Oxford University Press, 2014 3. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines”, 3 rd Edition Affiliated East-West Press. New Delhi, 2015. 4. John Hannah and Stephens R.C., "Mechanisms of Machines", Viva Low-Prices 2 nd Student Edition, 1999. 5. Thomas Bevan, "Theory of Machines", 3 rd Edition CBS Publishers and Distributors, 2005.					

E-resources:

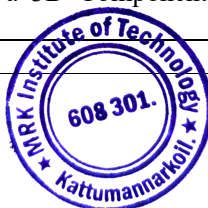
1. <https://nptel.ac.in/courses/112105268>.
2. <https://nptel.ac.in/courses/112104121>

CO	CO Description	PO	PSO
CO1	Discuss the basics of mechanism	PO1(2), PO2(1),	PSO1(1)
CO2	Calculate velocity and acceleration in simple mechanisms	PO1(3), PO2(3), PO3(2)	PSO1(2)
CO3	Develop CAM profiles	PO1(3), PO2(2), PO3(3), PO5(1)	PSO1(2), PSO2(1)
CO4	Solve problems on gears and gear trains	PO1(3), PO2(3), PO3(2)	PSO1(2), PSO2(1)
CO5	Examine friction in machine elements	PO1(3), PO2(2)	PSO1(1)

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



26ME403	Additive Manufacturing: Advanced Processes and Applications	L	T	P	C
		3	1	0	4
Course Objectives:					
- Understand the fundamental principles, concepts and process chain of Additive Manufacturing and 3D Printing. - Familiarize students with different 3D printing techniques, their working principles, materials, advantages, limitations and applications. - Develop knowledge of suitable materials and important process parameters involved in 3D printing. - Develop skills in 3D CAD modelling, file preparation, slicing, printer setup and basic post-processing techniques. - Understand the factors affecting dimensional accuracy, surface quality, mechanical properties and defects in 3D printed components.					
Unit I	Introduction to Additive Manufacturing				12
Introduction to Additive Manufacturing (AM) and 3D Printing - Evolution and history of 3D printing - Principles and fundamentals of Additive Manufacturing - Additive Manufacturing process chain - Classification of Additive Manufacturing processes - Additive Manufacturing versus conventional manufacturing - Advantages and limitations of 3D printing - Materials used in 3D printing - Design considerations for Additive Manufacturing - Basic terminologies - Overview of major 3D printing technologies. Suggested Activities: Prepare a 3D Printing Process Chain and Technology Comparison.					
Unit II	3D Printing Processes and Technologies				12
Vat Photopolymerization - Principles and processes - Stereolithography (SLA) - Digital Light Processing (DLP) - Material Extrusion - Principles and processes - Fused Deposition Modeling/Fused Filament Fabrication (FDM/FFF) - Powder Bed Fusion - Principles and processes - Selective Laser Sintering (SLS) - Selective Laser Melting (SLM) - Electron Beam Melting (EBM) - Material Jetting - Binder Jetting - Directed Energy Deposition (DED) - Comparison of major 3D printing technologies. Suggested Activities: Demonstrate 3D Printing Technologies and compare their working principles.					
Unit III	Materials and Process Parameters				12
Polymers for 3D printing - PLA - ABS - PETG - Nylon - TPU - Photopolymer resins - Metals for Additive Manufacturing - Ceramics and composite materials - Selection of materials for different applications - Important process parameters - Layer thickness - Printing speed - Nozzle temperature - Bed temperature - Infill density - Raster angle - Build orientation - Laser power and scanning speed - Effect of process parameters on part quality - Support structures and their importance - Common defects in 3D printed components - Warping - Shrinkage - Porosity - Delamination - Surface defects. Suggested Activities: Conduct a Material and Process Parameter Selection Study for 3D printing.					
Unit IV	3D Modelling, Slicing and Post-Processing				12
Fundamentals of CAD modeling for 3D printing - Creation and modification of 3D models - STL, OBJ, AMF and 3MF file formats - Conversion of CAD models into printable files - Mesh generation and repair - Slicing principles and functions - Selection of layer height, infill and support structures - Build orientation and its effect on strength and surface quality - G-code fundamentals - Printer setup and calibration - Post-processing techniques - Support removal - Sanding and polishing - Curing - Heat treatment - Surface finishing - Machining - Inspection and dimensional accuracy of 3D printed parts. Suggested Activities: Create a 3D CAD Model, perform Slicing and Post-Processing.					
Unit V	Applications, Quality and Future of 3D Printing				12
Quality characteristics of 3D printed components - Dimensional accuracy - Surface roughness - Mechanical properties of printed parts - Testing and characterization of 3D printed components - Design for Additive Manufacturing (DfAM) - Rapid prototyping and product development - Applications in automotive and aerospace industries - Applications in biomedical and healthcare sectors - Applications in tooling, casting and manufacturing - Applications in architecture, education and consumer products - Sustainable Additive Manufacturing - Recycling and environmental considerations. Suggested Activities: Print and Evaluate a 3D Component for dimensional accuracy, surface quality and mechanical properties.					
					TOTAL : 60 PERIODS



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

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

Text Books:

1. Ian Gibson, David Rosen and Brent Stucker, *Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing*, 3rd Edition, Springer, 2021.
2. Chua Chee Kai, Leong Kah Fai and Lim Chu Sing, *Rapid Prototyping: Principles and Applications*, 3rd Edition, World Scientific Publishing, 2010.

References:

1. Andreas Gebhardt and Jan-Steffen Hötter, *Additive Manufacturing: 3D Printing for Prototyping and Manufacturing*, Hanser Publications, 2016.
2. A. K. Kamrani and E. A. Nasr, *Rapid Prototyping: Theory and Practice*, Springer, 2006.
3. J. P. Kruth, M. Leu and T. Nakagawa, *Progress in Additive Manufacturing and Rapid Prototyping*, Springer, 1998.
4. C. K. Chua, K. F. Leong and C. S. Lim, *Rapid Prototyping: Principles and Applications*, 4th Edition, World Scientific, 2015
5. Brent Stucker and David Rosen, *Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing*, Springer, 3rd Edition, 2021

E-resources:

1. MIT Open Course Ware – Additive Manufacturing and 3D Printing Resources
2. NPTEL – Additive Manufacturing Courses and Lectures
3. ASTM International – Additive Manufacturing Resources

CO	CO Description	PO	PSO
CO1	Explain the fundamental principles, process chain, classifications and basic concepts of Additive Manufacturing and 3D Printing.	PO1(2), PO2(2)	-
CO2	Describe and compare various 3D printing techniques, materials, working principles, advantages, limitations and applications.	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Select suitable materials and process parameters to obtain good quality 3D printed components.	PO2 (2), PO3 (2)	PSO2 (2)
CO4	Develop CAD models, prepare printable files, perform slicing and understand printer setup, calibration and post-processing techniques.	PO4 (2), PO5 (1)	PSO2 (2), PSO3 (1)
CO5	Evaluate the quality, defects, applications, sustainability and emerging trends of 3D printed components for engineering applications.	PO1 (2), PO2 (2)	PSO1 (2)

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



26ME404	Industry 4.0 and Smart Manufacturing	L	T	P	C
		3	0	0	3
Course Objectives:					
- Understand the concepts, principles, technologies, and evolution of Industry 4.0. - Explain the role of cyber-physical systems, Internet of Things (IoT), Industrial Internet of Things (IIoT), and smart manufacturing. - Develop knowledge of artificial intelligence, machine learning, big data analytics, cloud computing, and digital twins used in modern industries.					
Unit I	Introduction to Industry 4.0	9			
Industrial Revolution – Evolution from Industry 1.0 to Industry 4.0 – Definition and characteristics of Industry 4.0 – Smart manufacturing – Digital transformation – Cyber-Physical Systems (CPS) – Smart factories – Connected manufacturing systems – Industry 4.0 architecture and components – Benefits and challenges of Industry 4.0.					
Suggested Activities: Prepare an Industry 4.0 Architecture and Smart Factory Model.					
Unit II	Connected and Smart Technologies	9			
Internet of Things (IoT) – Industrial Internet of Things (IIoT) – Sensors and actuators – Machine-to-Machine communication – Wireless technologies – Cloud computing – Edge computing – Fog computing – Industrial communication networks – Data acquisition and connectivity – Interoperability and system integration.					
Suggested Activities: Demonstrate IoT, IIoT and Industrial Communication Technologies.					
Unit III	Data, Artificial Intelligence and Digital Technologies	9			
Big Data and data analytics – Artificial Intelligence (AI) – Machine Learning (ML) – Predictive analytics – Digital Twin – Simulation and modelling – Cloud-based manufacturing – Blockchain technology – Augmented Reality (AR) and Virtual Reality (VR) – Applications of data-driven decision making in manufacturing.					
Suggested Activities: Develop a Digital Twin / AI-Based Predictive Analytics Application.					
Unit IV	Automation and Smart Manufacturing	9			
Industrial robots – Collaborative robots (Cobots) – Autonomous mobile robots – Automated Guided Vehicles (AGVs) – Additive manufacturing – 3D printing – Advanced automation – Computer Integrated Manufacturing (CIM) – Smart production planning – Predictive maintenance – Quality monitoring – Human-machine collaboration – Flexible and reconfigurable manufacturing systems.					
Suggested Activities: Demonstrate Robotics and Smart Automation for manufacturing.					
Unit V	Implementation, Cyber Security and Future Trends	9			
Industry 4.0 implementation strategies – Digital maturity and readiness assessment – Cybersecurity in smart manufacturing – Data privacy and security – Safety and ethical issues – Workforce transformation and skill requirements – Integration of legacy systems – Case studies of Industry 4.0 applications – Industry 5.0 – Future trends and challenges in smart manufacturing.					
Suggested Activities: Conduct an Industry 4.0 Implementation and Cybersecurity Case Study.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, A press, 2016.					
2. Bartodziej, Christoph Jan, The Concept Industry 4.0: An Empirical Analysis of Technologies and Applications in Production Logistics, Springer, 2017.					
References:					
1. Klaus Schwab, The Fourth Industrial Revolution, Crown Business, 2016.					
2. Andrew Harrison, Tillmann Storz and Klaus Bartels, Industrial Internet of Things and Industry 4.0, Springer.					
3. Ovidiu Vermesan and Peter Friess, Digitising the Industry: Internet of Things Connecting the					
4. Physical, Digital and Virtual Worlds, River Publishers, 2016.					
5. Sabina Jeschke, Christian Brecher, H. Song and D. B. Rawat, Industrial Internet of Things: Cyber manufacturing Systems, Springer, 2017.					
E-resources:					
1. Plattform Industrie 4.0 – https://www.plattform-i40.de/					
2. Industrial Internet Consortium – https://www.iiconsortium.org/					



CO	CO Description	PO	PSO
CO1	Explain the fundamentals, evolution, characteristics, and key technologies of Industry 4.0 and smart manufacturing.	PO1(2), PO2(2)	-
CO2	Apply IoT, IIoT, Cyber-Physical Systems, cloud computing, and industrial communication technologies for connected manufacturing.	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Analyze the applications of Artificial Intelligence, Machine Learning, Big Data Analytics, and Digital Twins in Industry 4.0.	PO2 (2), PO3 (2)	PSO2 (2)
CO4	Demonstrate the use of robotics, additive manufacturing, automation, predictive maintenance, and smart production technologies.	PO4 (2), PO5 (1)	PSO2 (2), PSO3 (1)
CO5	Evaluate Industry 4.0 implementation strategies, cybersecurity, ethical issues, workforce requirements, and emerging Industry 5.0 trends.	PO1 (2), PO2 (2)	PSO1 (2)

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



26ME405	Advanced Manufacturing Processes	L	T	P	C
		3	0	2	4
Course Objectives:					
• To understand the concepts of metal cutting and measurements. • To understand the working of standard machine tools, special purpose machines and allied machining processes. • To study the advancements in manufacturing operations.					
Unit I	Theory of Metal Cutting	9			
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.					
Suggested Activities: Conduct a Metal Cutting Force and Tool Wear Study.					
Unit II	Turning Machines	9			
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi-automatic – single spindle: Swiss type, automatic screw type – multi spindle.					
Suggested Activities: Perform Turning Operations to produce different component features.					
Unit III	Special and Gear Cutting Machines	9			
Shaper, Planer, Slotter - Types of operations. Drilling, reaming, boring, tapping. Milling operations-types of milling cutters. Gear cutting – forming and generation - principle and construction of gear milling, hobbing and gear shaping processes –finishing of gears.					
Suggested Activities: Perform Shaping, Milling and Gear Cutting Operations.					
Unit IV	Abrasive Process and Broaching	9			
Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centre less grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines.					
Suggested Activities: Perform Grinding and Broaching Operations for surface finishing.					
Unit V	CNC Machining	9			
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining –wafer machining.					
Suggested Activities: Develop and simulate CNC Part Programs for turning and milling.					
TOTAL(Theory): 45 PERIODS					
LAB EXERCISES					
1. Force measurement during turning operations					
2. Eccentric turning and knurling					
3. External thread cutting					
4. Internal thread cutting					
5. Taper turning by compound rest method					
6. Making round to square using shaping machine.					
7. Contour milling using vertical milling machine					
8. Spur gear cutting in milling machine					
9. Gear generation in hobbing machine					
10. Plain Surface grinding					
11. Cylindrical grinding					
12. CNC Part Programming for turning					
13. CNC Part Programming for milling					
TOTAL (Lab.): 30 PERIODS					
TOTAL (45 + 30): 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.					
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%)					
Text Books:					
1. Hajra Choudhury, Elements of Workshop Technology, Vol. II, Media Promoters, 16 th edition 2016					
2. Kalpakjian. S, Manufacturing Engineering and Technology, Pearson Education, 8th Edition in SI Units, 2023					

References:

1. Roy. A.Lindberg, Process and Materials of Manufacture, Fourth Edition, PHI/Pearson Education 2006.
2. Rao. P.N, Manufacturing Technology - Metal Cutting and Machine Tools, 4th Edition, Tata McGraw- Hill, New Delhi, 2018.
3. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White, Machine Tool Practices, Prentice Hall of India, 11th Edition, 2021.
4. Gefrey Bothroyd, Fundamental of Metal Machining and Machine Tools, McGraw Hill, 3rd Edition, 2005.
5. HMT, Production Technology, Tata McGraw Hill, 18th Edition.

E-resources:

1. MIT Open Course Ware: Introduction to Manufacturing Systems
2. NPTEL: Manufacturing Processes I, Learn Engineering:
3. The Engineering Mindset: Manufacturing Engineering, NYU Tandon School of Engineering:

CO	CO Description	PO	PSO
CO1	Develop relations for chip reduction coefficient, shear angle, shear strain, forces, power, specific energy and temperature in orthogonal cutting	PO1(2), PO2(2)	-
CO2	Make use of turning machine tools to produce various features on a cylindrical components	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Make use of shaper, planer, slotter and milling machine tools to produce flat surfaces and gears	PO2 (2), PO3 (2)	PSO2 (2)
CO4	Utilize different types of grinding machines to produce smooth flat and cylindrical surfaces and understand the basics of broaching machines	PO4 (2), PO5 (1)	PSO2 (2), PSO3 (1)
CO5	Apply the fundamental concepts to CNC machining to prepare and simulate CNC part programs	PO1 (2), PO2 (2)	PSO1 (2)

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



26ME406	Strength of Materials for Mechanical Engineering	L	T	P	C
		3	0	2	4
Course Objectives:					
To understand the behaviour of materials under different loading conditions and analyze stresses, strains, bending, torsion, deflection, columns, and pressure vessels.					
Unit I	Stress, Strain and Deformation of Solids	9			
Rigid bodies and deformable solids, Tension, Compression and Shear Stresses, Deformation of simple and compound bars, Thermal stresses, Elastic constants, Volumetric strains, Stresses on inclined planes, Principal stresses and principal planes, Mohr's circle of stress.					
Suggested Activities: Assignments and Quiz problems on stress, strain and deformation of solids.					
Unit II	Transverse Loading on Beams and Stresses In Beam	9			
Beams, Types, Transverse loading on beams, Shear force and Bending moment in beams, Cantilever, Simply-supported and over-hanging beams. Theory of simple bending Bending stress distribution, Load carrying capacity, Proportioning of sections, Flitched beams, Shear stress distribution.					
Suggested Activities: Demonstration of practical applications of transverse loading on beams, Simulation of Shear Force and Bending Moment Diagrams using web - based analysis tools.					
Unit III	Torsion	9			
Theory of Torsion, Stresses and Deformations in Solid and Hollow Circular Shafts, Combined bending moment and torsion of shafts, Power transmitted to shaft, Shaft in series and parallel, Closed and Open Coiled helical springs – springs in series and parallel.					
Suggested Activities: Assignments on torsion of solid and hollow circular shafts.					
Unit IV	Deflection of Beams and Springs	9			
Elastic curve, Governing differential equation, Double integration method, Macaulay's method, Area moment method, Conjugate beam method for computation of slope and deflection of determinant beams, Strain energy method for determinate beams, Maxwell's reciprocal theorem, Leaf springs.					
Unit V	Thin Cylinders, Spheres and Thick Cylinders	9			
Stresses in thin cylindrical shell due to internal pressure, circumferential and longitudinal stresses, Deformation in thin cylinders, Spherical shells subjected to internal pressure, Deformation in spherical shells, Thick cylinders, Lamé's theory.					
Suggested Activities: Assignments and Quiz problems on Thin Cylinders, Sphere and Thick Cylinders.					
TOTAL (Theory): 45 PERIODS					
List of Experiments:					
1. Tensile test on mild steel rod.					
2. Hardness test on metals (Rockwell and Brinell Hardness Tests)					
3. Double shear tests on metal rod					
4. Impact test on metal specimen (Izod and Charpy)					
5. Torsion test on mild steel rod.					
6. Deflection test on carriage spring.					
TOTAL (Lab.): 30 PERIODS					
TOTAL : 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).					
Text Books:					
1. R. K. Rajput, Strength of Materials (Mechanics of Solids), S. Chand Publishing. 8th Revised Edition, 2025					
2. S. Ramamrutham and R. Narayanan, Strength of Materials, Dhanpat Rai Publishing Company. New Revised and Enlarged Edition, 2025					



References:

1. R. C. Hibbeler, Mechanics of Materials, 11th Edition, Pearson. 2022
2. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf and David F. Mazurek, Mechanics of Materials, 8th Edition, McGraw Hill. 2026 Release.
3. Timoshenko and Gere, Mechanics of Materials, 2nd Edition, CBS Publishers & Distributors.
4. S. S. Rattan, Strength of Materials, 3rd Edition, McGraw Hill Education. 2016
5. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Mechanics of Materials, Laxmi Publications. 2025

E-resources:

1. <https://solidmechanics.org/>
2. https://www.engineeringtoolbox.com/stress-strain-d_950.html
3. https://www.engineeringtoolbox.com/beam-stress-deflection-d_1312.html

CO	CO Description	PO	PSO
CO1	Analyze stress, strain and deformation in different types of solids.	—	—
CO2	Determine shear force, bending moment and stresses in beams.	PO1(2), PO2(2)	PSO1(2)
CO3	Analyze torsion and power transmission in shafts and springs	PO1(2), PO2(2), PO4(2)	PSO1(2), PSO2(2)
CO4	Calculate slope and deflection of beams and springs using different methods.	PO2(2), PO3(2), PO5(2)	PSO1(2), PSO2(2), PSO3(1)
CO5	Analyze stresses and deformation in thin and thick cylinders and spherical shells.	--	--

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



26ME407	Thermal Engineering Laboratory	L	T	P	C
		0	0	4	2
Course Objectives:					
- To study the valve and port timing diagram and performance characteristics of IC engines - To study the Performance of refrigeration cycle / components - To study the various components of a Steam Generator.					
List of Experiments					
1. Valve Timing and Port Timing diagrams. 2. Performance Test on four – stroke Diesel Engine. 3. Heat Balance Test on 4 – stroke Diesel Engine. 4. Morse Test on Multi-Cylinder Petrol Engine. 5. Retardation Test on a Diesel Engine. 6. Determination of Flash Point and Fire Point of various fuels / lubricants 7. Performance test on Refrigeration System 8. Study of Steam Generators and Turbines.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books:					
1. V. Ganesan, Internal Combustion Engines, 4th Edition, McGraw Hill Education, New Delhi, 2016/2017. 2. R. K. Rajput, Thermal Engineering, 11th Edition, Laxmi Publications, New Delhi, 2023.					
References:					
1. V. Ganesan – Internal Combustion Engines, McGraw Hill. 4th Edition. 2. R. S. Khurmi & J. K. Gupta – A Textbook of Refrigeration and Air Conditioning, S. Chand, Revised/Reprint edition. 3. R. K. Rajput – Thermal Engineering, Laxmi Publications. 11th Edition. 4. P. K. Nag – Engineering Thermodynamics, McGraw Hill. 7th Edition. 5. M. M. Das – Thermal Engineering, Khanna Publishers.					
E-resources:					
1. https://nptel.ac.in/courses/112103316 2. https://onlinecourses.nptel.ac.in/noc24_me03/preview?					

CO	CO Description	PO	PSO
CO1	Conduct valve and port timing studies and evaluate the performance of IC engines	PO1 (1)	PSO1 (3)
CO2	Perform heat balance and Morse tests on IC engines and analyze the results.	PO2 (1) PO3 (3)	PSO1 (3) PSO2 (2)
CO3	Determine the flash point and fire point of fuels and lubricants.	PO1 (3) PO3 (3)	PSO1 (3) PSO2 (3)
CO4	Evaluate the performance of refrigeration systems.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Understand the working and performance of steam generators and turbines.	PO1 (3) PO2 (2)	PSO1 (3) PSO2 (3)

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



26SDC02	Professional and Corporate Communication Skills	L	T	P	C
		0	0	2	1
Course Objectives: - To develop effective verbal and professional communication skills. - To enhance grammar, vocabulary, reading and listening abilities. - To demonstrate effective speaking, presentation and group discussion skills. - To prepare students for corporate communication and workplace interactions. - To develop professional skills required for interviews, placements and corporate environments.					
List of Activities - Professional Communication Fundamentals and Workplace Etiquette - Verbal Ability, Grammar and Vocabulary Enhancement - Reading Comprehension and Critical Verbal Reasoning - Listening Skills and Effective Workplace Conversations - Professional Speaking, Pronunciation and Presentation Skills - Group Discussion, Team Communication and Negotiation Skills - Corporate Email, Business Writing and Digital Communication - Resume Writing, Self-Introduction and Personal Branding - Interview Skills, Corporate Etiquette and Workplace Interaction - Mock Corporate Communication, Presentation and Placement Simulation					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: - Meenakshi Raman & Sangeeta Sharma – Technical Communication: Principles and Practice, Oxford University Press. M. Ashraf Rizvi – Effective Technical Communication, McGraw Hill. - Rajendra Pal & H. S. Korlahalli – Essentials of Business Communication, Sultan Chand. - Norman Lewis – Word Power Made Easy, Penguin. - John Seely – The Oxford Guide to Writing and Speaking, Oxford University Press. - Michael Swan – Practical English Usage, Oxford University Press.					
E-resources: https://nptel.ac.in/courses/112107291					

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

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



MANDATORY COURSES

26MCC01		Disaster Management and Safety Awareness		L	T	P	C
				1	0	0	-
Course Objectives:							
To provide students with fundamental knowledge of natural and man-made disasters, disaster preparedness, risk reduction, emergency response, industrial safety and personal/community safety, enabling them to respond effectively during emergency situations							
Unit I	Fundamentals of Disaster Management						3
Disaster, hazard, vulnerability and risk; types of disasters; disaster management cycle; prevention, mitigation, preparedness, response and recovery; disaster risk reduction and early warning systems.							
Unit II	Natural Disasters						3
Earthquakes, tsunamis, floods, landslides, cyclones, thunderstorms, droughts and heat waves; causes and impacts; preparedness, mitigation, evacuation and emergency response.							
Unit III	Industrial and Man-Made Disasters						3
Industrial hazards and accidents; fire and explosion; chemical leakage; electrical and machinery hazards; biological and transportation disasters; personal protective equipment; hazard identification and risk assessment.							
Unit IV	Emergency Response and First Aid						3
Emergency action and evacuation plans; fire prevention and fire extinguishers; basic first aid; bleeding, burns, fractures, electric shock and heat-related emergencies; basic CPR awareness; emergency communication and rescue procedures.							
Unit V	Safety and Community Resilience						3
Occupational, laboratory, workshop, road and electrical safety; disaster recovery and rehabilitation; community resilience; role of government agencies, NGOs and volunteers; disaster risk mapping, safety audit, emergency drills and institutional disaster management planning.							
TOTAL : 15 PERIODS							
Text Books:							
1. R. B. Singh, Disaster Management, Rawat Publications, Jaipur, 2015							
2. S. K. Singh, Disaster Management, A.K. Publications, New Delhi, 2017.							
References:							
1. M. M. S. Maheshwari, Disaster Management, Pointer Publishers, Jaipur, 2011.							
2. B. K. Khanna, All You Wanted to Know About Disasters, New India Publishing Agency, New Delhi, 2005.							
3. National Disaster Management Authority (NDMA), National Disaster Management Guidelines, Government of India.							
4. Ministry of Home Affairs, National Disaster Management Plan, Government of India.							
5. S. K. Sharma, Disaster Management and Preparedness, CBS Publishers & Distributors, New Delhi.							

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

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



26MCC02	Gender Sensitization and Inclusive Society	L	T	P	C
		1	0	0	-
Course Objectives: • To create awareness about gender equality, equity, diversity and social inclusion. • To understand gender roles, stereotypes, discrimination and constitutional values. • To familiarize students with gender-based violence, safety measures and relevant legal provisions. • To promote respectful behaviour, empathy and equal opportunities in educational and professional environments.					
Unit I	Gender Concepts and Social Awareness	3			
Gender, sex and gender identity; gender roles and stereotypes; gender equality and equity; socialization and discrimination; importance of gender sensitivity.					
Unit II	Gender and Constitutional Values	3			
Fundamental rights and duties; equality and non-discrimination; constitutional provisions for gender equality; dignity, freedom and social justice; relevant laws for protection against discrimination and harassment.					
Unit III	Gender-Based Violence and Safety	3			
Types of gender-based violence; domestic violence, sexual harassment and cyber harassment; prevention and reporting mechanisms; workplace and institutional safety; role of Internal Complaints Committee (ICC).					
Unit IV	Inclusive Education and Workplace	3			
Inclusive education; equal opportunities; diversity and inclusion; accessibility; respectful communication; prevention of bias and discrimination in educational institutions and workplaces.					
Unit V	Building an Inclusive Society	3			
Role of students and professionals in promoting equality; empathy and responsible behaviour; gender-sensitive leadership; community awareness; case studies, group discussions and awareness activities.					
TOTAL : 15 PERIODS					
Text Books:					
1. A. S. Altekar, The Position of Women in Hindu Civilization, Motilal Banarsidass, New Delhi.					
2. B. R. Ambedkar, Annihilation of Caste, Navayana Publishing.					
References:					
1. United Nations, Gender Equality and Women’s Empowerment, UN Publications.					
2. Government of India, The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.					
3. National Commission for Women, Handbook on Sexual Harassment of Women at Workplace, Government of India.					
4. UGC, Policy on Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and Students in Higher Educational Institutions.					
5. UNESCO, Gender Equality and Education, UNESCO Publications.					

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

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



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