Sri SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

West Tambaram, Chennai - 44
www.sairam.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University

IQAC
Ensuring Quality

DEPARTMENT OF MECHANICAL ENGINEERING

REGULATIONS 2024

Academic Year 2024-25 onwards

AUTONOMOUS
CURRICULUM AND

SYLLABUS I - IV SEMESTERS

SRI SAIRAM ENGINEERING COLLEGE

VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.

MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.

Educational Organization Management System (EOMS) Policy

We at Sri Sai Ram Engineering College are committed to empower our students not only to excel academically but also imbibe essential values, enabling them to become exemplary global citizens. We build a better nation by fostering excellence and innovative practices in Engineering, Technology and Management Education. We are dedicated to consistently enhancing our systems, infrastructure and services to meet the needs and expectations of all our stakeholders for sustainable growth

DEPARTMENT OF MECHANICAL ENGINEERING

VISION

To develop a department that commands respect for its technological and engineering depth while maintaining Indian Individuality and assimilating global diversity and meeting eternal challenges.

MISSION

Department of Mechanical Engineering, SRI SAIRAM ENGINEERING COLLEGE is committed to

M1 Inculcate students for a successful career in engineering and technology.

M2 Promote excellence in engineering and technology by motivating students for higher studies.

M3 Motivate self-employment thereby reducing migration to urban areas.

M4 Maintain ethical values while assimilating diverse culture without compromising with Indian value system.

M5 Motivate for lifelong learning.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2024

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA101	Matrices and Calculus	3	1	0	4	4
2	24HSEN101	Communicative English	3	0	0	3	3
3	24BSPH101	Engineering Physics	3	0	0	3	3
4	24BSCY101	Engineering Chemistry	3	0	0	3	3
5	24ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	24ESGE101	Engineering Graphics	1	2	0	3	3
7	24HSTA101	Heritage of Tamils	1	0	0	1	1
PRACTICALS							
1	24BSPL101	Physics and Chemistry Laboratory	0	0	4	4	2
2	24ESPL101	Programming in C Laboratory	0	0	2	2	1
VALUE ADDITIONS - I							
1	24ENTP101	Functional Life Skills	0	0	2	2	1
2	24ESID101	Idea Engineering Lab -I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS					
					Total	30	25

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA203	Differential Equations and its Applications	3	1	0	4	4
2	24HSEN201	Professional English	2	0	0	2	2
3	24BSPH202	Physics of Materials	3	0	0	3	3
4	24BSCY201	Chemistry for Environment and Sustainability	3	0	0	3	3
5	24ESCE201	Engineering Mechanics	3	0	0	3	3
6	24HSTA201	Tamils and Technology	1	0	0	1	1
7	24HSNC201	NCC Course Level 1*	2*	0	0	2*	0
PRACTICALS							
1	24ESGE102	Engineering Practices Lab	0	0	4	4	2
VALUE ADDITIONS - II							
1	24ENTP201	Digital Dynamics	0	0	2	2	0
2	24ESID201	Idea Engineering Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC201	MS Office (Mandatory - NC)	0	0	0	0	0
					Total	24	19

*only for NCC cadets, to be conducted beyond working hours

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SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24BSMA304	Transforms and Numerical Methods	3	1	0	4	4
2	24MEPC301	Engineering Thermodynamics	3	0	0	3	3
3	24CEPC305	Fluid Mechanics and Machinery	3	0	0	3	3
4	24MEPC302	Engineering Metallurgy	3	0	0	3	3
5	24MEPW301	Manufacturing Process with Laboratory	3	0	2	5	4
6	24HSMC301	Universal Human Values - II	2	1	0	3	3
7	24HSNC301	NCC course Level 2*	3*	0	0	3*	0
PRACTICALS							
1	24MEPL301	Computer Aided Machine Drawing Laboratory	0	0	4	4	2
VALUE ADDITIONS - III							
1	24METP301	Aptitude skills	0	0	2	2	1
2	24MEID301	Innovative Design Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
1	24ESMC301	Joy of Computing using Python (Mandatory - NC)	0	2	0	2	0
					Total	31	24

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24MEPC401	Thermal Engineering	3	0	0	3	3
2	24MEPC402	Metrology and Measurements	3	0	0	3	3
3	24MEPC403	Theory of Machines	3	0	0	3	3
4	24CEPC405	Strength of Materials	3	0	0	3	3
5	24MEPW401	Machine Tool Technology with Laboratory	3	0	2	5	4
6	24xxOE9xx	Open Elective - I#	3	0	0	3	3
7	24HSNC401	NCC course Level 3*	3	0	0	3*	0
PRACTICALS							
1	24CEPL403	SoM and FMM Laboratory	0	0	4	4	2
2	24MEPT401	Dynamics & Metrology Laboratory with Theory	1	0	4	5	3
VALUE ADDITIONS - IV							
1	24METP401	Aptitude skills	0	0	2	2	0
2	24MEID401	Innovative Design Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
As recommended by BoS				Total		33	25

\# Logistics Department Specific
*only for NCC cadets, to be conducted beyond working hours

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SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24MEPC501	Heat Transfer	3	0	0	3	3
2	24MEPC502	Design of Machine Elements	3	0	0	3	3
3	24MEEL5xx	Professional Elective – I	3	0	0	3	3
4	24MEEL5yy	Professional Elective – II	3	0	0	3	3
5	24SCOE901	Open Elective - II#	3	0	0	3	3
6	24MGMC501	Constitution of India	2	0	0	2	0
PRACTICALS							
1	24MEPL501	Heat Transfer and IC Engines Laboratory	0	0	4	4	2
2	24MEPL502	CAD/ CAM Laboratory	0	0	4	4	2
VALUE ADDITIONS - V							
1	24METP501	Skill Enhancement	0	0	2	2	1
2	24MEID501	Prototype Development Lab - I	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS	Total			29	21

Department Specific Cyber Security Course

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CONTACT PERIODS	CREDITS
			L	T	P		
THEORY							
1	24MEPC601	Design of Transmission Systems	3	0	0	3	3
2	24MEPC602	Finite Element Analysis	3	0	0	3	3
3	24MEEL6xx	Professional Elective - III	3	0	0	3	3
4	24MEEL6yy	Professional Elective - IV	3	0	0	3	3
5	24HSMG501	Principles of Engineering Management	3	0	0	3	3
6	24xxOE9xx	Open Elective - III	3	0	0	3	3
PRACTICALS							
1	24MEPL601	Simulation and Analysis Laboratory	0	0	4	4	2
VALUE ADDITIONS - II							
1	24METP601	Technical Skill	0	0	2	2	0
2	24MEID601	Prototype Development Lab - II	0	0	2	2	1
ONLINE SUPPLEMENTARY							
		As recommended by BoS	Total			26	21

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SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	WEEK HOURS T	WEEK HOURS P	CONTACT PERIODS	CREDITS
		THEORY					
1	24MEPC701	Mechatronics and IoT	3	0	0	3	3
2	24MEEL7xx	Professional Elective - V	3	0	0	3	3
3	24MEEL7yy	Professional Elective - VI	3	0	0	3	3
5	24XXOE9xx	Open Elective - IV	3	0	0	3	3
6	24MGEL703	Creative Innovation and Entrepreneurship	2	0	0	2	2
		PRACTICALS					
1	24MEPL701	Mechatronics & Robotics Lab	0	0	4	4	2
2	24MEPJ701	Project work - Phase I	0	0	8	8	4
		VALUE ADDITIONS - VII					
1	24METP701	Company Specific Skills	0	0	2	2	1
		ONLINE SUPPLEMENTARY					
		As recommended by BoS					
					Total	31	24

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS L	WEEK HOURS T	WEEK HOURS P	CONTACT PERIODS	CREDITS
		THEORY					
1	24MEEL7zz	Professional Elective – VII	3	0	0	3	3
		PRACTICALS					
1	24MEPJ801	Project Work - Phase II	0	0	12	12	6
		VALUE ADDITIONS - VIII					
1	24MEIN801	Internship	0	0	9	9	3
					Total	21	9

CREDIT DISTRIBUTION

Category	BS	ES	HS	EL	PC+PL	PW	PT	OE	TP	PJ+ID	IS	MC	TOTAL
Credit	26	15	13	23	45	8	3	12	4	16	3	Y	168
Percentage	15.48	8.93	7.74	13.69	26.79	4.76	1.79	7.14	2.38	9.52	1.79	-	

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PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL501	Measurements in Thermal Engineering	3	Energy Engineering
2	24MEEL502	Automotive Systems	3	Energy Engineering
3	24MEEL503	Solar Energy Systems	3	Energy Engineering
4	24MEEL504	Material Joining Techniques	3	Advanced Manufacturing Systems
5	24MEEL505	Non Traditional Machining Techniques	3	Advanced Manufacturing Systems
6	24MEEL506	Non Destructive Testing and Evaluation	3	Advanced Manufacturing Systems
7	24MEEL507	CAD/CAM	3	Engineering Design
8	24MEEL508	Design Concepts in Engineering	3	Engineering Design
9	24MEEL509	Applied Hydraulics and Pneumatics	3	Engineering Design
10	24MEEL510	Industrial Engineering	3	Industrial Engineering
11	24MEEL511	Product Design and Development	3	Industrial Engineering
12	24MEEL512	Safety Engineering and Management	3	Industrial Engineering
13	24MGELxxx	Disaster Management	3	Management

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL513	Internal Combustion Engines	3	Energy Engineering
2	24MEEL514	Fuels and Combustion	3	Energy Engineering
3	24MEEL515	Solar vehicle technology	3	Energy Engineering
4	24MEEL516	Renewable Energy Technologies	3	Advanced Manufacturing Systems
5	24MEEL517	Casting and Welding Processes	3	Advanced Manufacturing Systems
6	24MEEL518	Metal Additive Manufacturing Processes	3	Advanced Manufacturing Systems
7	24MEEL519	Design Codes and Standards	3	Engineering Design
8	24MEEL520	Surface Engineering	3	Engineering Design
9	24MEEL521	Robotics	3	Engineering Design
10	24MEEL522	Process Planning and Cost Estimation	3	Industrial Engineering
11	24MEEL523	Green Manufacturing systems and strategies	3	Industrial Engineering
12	24MEEL524	Lean and Agile Manufacturing	3	Industrial Engineering
13	24MGELxxx	Project Management	3	Management

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PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL601	Renewable Energy Sources	3	Energy Engineering
2	24MEEL602	Refrigeration and Air Conditioning	3	Energy Engineering
3	24MEEL603	Alternative Fuels	3	Energy Engineering
4	24MEEL604	Computer Integrated Manufacturing Systems	3	Advanced Manufacturing Systems
5	24MEEL605	Flexible Manufacturing Systems	3	Advanced Manufacturing Systems
6	24MEEL606	Testing of Materials	3	Advanced Manufacturing Systems
7	24MEEL607	Design of Pressure Vessels	3	Engineering Design
8	24MEEL608	Manufacturing System Design	3	Engineering Design
9	24MEEL609	Design for Manufacturing	3	Engineering Design
10	24MEEL610	Statistical Quality Control and Reliability Engineering	3	Industrial Engineering
11	24MEEL611	Industrial Safety and Maintenance Engineering	3	Industrial Engineering
12	24MEEL612	Systems Engineering	3	Industrial Engineering
13	24MGELxxx	Industrial Relations and Labour Legislation	3	Management

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL613	Turbo Machines	3	Energy Engineering
2	24MEEL614	Gas Dynamics and Jet Propulsion	3	Energy Engineering
3	24MEEL615	Numerical heat transfer and fluid flow	3	Energy Engineering
4	24MEEL616	Automotive Materials, Components, Design & Testing	3	Advanced Manufacturing Systems
5	24MEEL617	Environment Sustainability and Impact Assessment	3	Advanced Manufacturing Systems
6	24MEEL618	Productivity and Reengineering	3	Advanced Manufacturing Systems
7	24MEEL619	Operational Research	3	Engineering Design
8	24MEEL620	Design of Material Handling Equipment	3	Engineering Design
9	24MEEL621	Design of Jigs and Fixtures	3	Engineering Design
10	24MEEL622	Project planning and Management	3	Industrial Engineering
11	24MEEL623	Economics for Engineers	3	Industrial Engineering
12	24MEEL624	Six sigma Quality	3	Industrial Engineering
13	24MGELxxx	Supply Chain and Logistics Management	3	Management

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PROFESSIONAL ELECTIVES - V

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL625	Power plant Technology	3	Energy Engineering
2	24MEEL626	Energy Conservation & Waste Heat Recovery	3	Energy Engineering
3	24MEEL627	Design of heat exchangers	3	Energy Engineering
4	24MEEL628	Materials Characterization	3	Advanced Manufacturing Systems
5	24MEEL629	Polymer Materials and their Processing	3	Advanced Manufacturing Systems
6	24MEEL630	Mechanical Behaviour of Materials	3	Advanced Manufacturing Systems
7	24MEEL631	Ergonomics in Design	3	Engineering Design
8	24MEEL632	Mechanics of Composite Materials	3	Engineering Design
9	24MEEL633	Industrial Layout Design and Safety	3	Engineering Design
10	24MEEL634	Intellectual Property Rights	3	Industrial Engineering
11	24MEEL635	Industrial robotics and Material Handling systems	3	Industrial Engineering
12	24MEEL636	Smart Manufacturing	3	Industrial Engineering
13	24MGELxxx	Total Quality Management	0	Management

PROFESSIONAL ELECTIVES - VI

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL701	Computational Fluid Dynamics	3	Energy Engineering
2	24MEEL702	Cryogenic technology	3	Energy Engineering
3	24MEEL703	Energy System and Energy Audit	3	Energy Engineering
4	24MEEL704	Composite Materials and Mechanics	3	Advanced Manufacturing Systems
5	24MEEL705	Wear, Corrosion and Surface Protection of Materials	3	Advanced Manufacturing Systems
6	24MEEL706	Sustainable Manufacturing	3	Advanced Manufacturing Systems
7	24MEEL707	Nano Technology	3	Engineering Design
8	24MEEL708	Product Life Cycle Management	3	Engineering Design
9	24MEEL709	New Product Development	3	Engineering Design
10	24MEEL710	Digital Manufacturing and IoT	3	Industrial Engineering
11	24MEEL711	Quality Engineering	3	Industrial Engineering
12	24MEEL712	Supply Chain Management	3	Industrial Engineering
13	24MGELxxx	Intellectual Property Rights	3	Management

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PROFESSIONAL ELECTIVES - VII

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEEL713	Combustion and Emission Control	3	Energy Engineering
2	24MEEL714	Direct Energy Conversion Techniques	3	Energy Engineering
3	24MEEL715	Space propulsion and launching vehicles	3	Energy Engineering
4	24MEEL716	Measurements and Controls	3	Advanced Manufacturing Systems
5	24MEEL717	3D Printing and Sustainable Design	3	Advanced Manufacturing Systems
6	24MEEL718	Precision Manufacturing	3	Advanced Manufacturing Systems
7	24MEEL719	Robot Kinematics and Dynamics	3	Engineering Design
8	24MEEL720	Value Engineering	3	Engineering Design
9	24MEEL721	Industrial Engineering	3	Engineering Design
10	24MEEL722	Microrobotics	3	Industrial Engineering
11	24MEEL723	Entrepreneurship Development	3	Industrial Engineering
12	24MEEL724	Facility Layout and Materials Handling	3	Industrial Engineering
13	24MGELxxx	Professional Ethics and Values	3	Management

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
Delphi TVS

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEIE501	Advanced Fuel Injection System - I	3	Energy Engineering
2	24MEIE601	Advanced Fuel Injection System - II	3	Energy Engineering

INDUSTRY CONNECTED PROFESSIONAL ELECTIVES
L&T

S. NO	COURSE CODE	COURSE TITLE	CREDIT	DOMAIN
1	24MEIE502	Design of Fire and Life Safety Systems	3	Building Utility Service
2	24MEIE503	Building Information Modelling in Construction	3	Inter-disciplinary
3	24MEIE504	Safety for Engineers	3	Inter-disciplinary
4	24MEIE505	Utility Systems for Industrial Facilities	3	Process Plant Engineering
5	24MEIE506	Ambience Control System Design	3	Building Utility Service
6	24MEIE507	Mechanical Service Engineering	3	Building Utility Service
7	24MEIE508	Engineering Strategies for Sustainability	3	Inter-disciplinary
8	24MEIE509	Power Plant Engineering - An Industrial Context	3	Power Plant Engineering
9	24MEIE601	Industrial Piping & Pipeline Engineering	3	Mechanical & Chemical Engineering
10	24MEIE602	Integrated Approach to Building Services	3	Building Utility Service
11	24MEIE603	Industrial Valves – Application, Manufacturing & Special Testing	3	Manufacturing Engineering
12	24MEIE604	Heavy Manufacturing and Elements of digitalization	3	Digital Manufacturing
13	24MEIE605	Robotics and Digitalization in Manufacturing	3	Digital Manufacturing
14	24MEIE606	Digital Technologies with CPS, IIOT & Cloud in Manufacturing	3	Digital Manufacturing
15	24MEIE607	Design & Simulation of Process Plant Equipment	3	Process Plant Engineering
16	24MEIE608	Technology and Processes in Heavy Manufacturing	3	Manufacturing Engineering
17	24MEIE609	Heat Exchanger: Design & Applications	3	Process Plant Engineering
18	24MEIE701	Collaborative Robotics in Manufacturing with AI, ML & IIOT	3	Digital Manufacturing
19	24MEIE702	Steam Generator & Auxiliary Systems	3	Power Plant Engineering
20	24MEIE703	Steam Turbine & Auxiliary Systems	3	Power Plant Engineering
21	24MEIE704	Project Management for Professionals	3	Inter-disciplinary

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 To promote successful career in engineering and technological organizations and in other industries with the emphasis in the fields of Design, Engineering, Manufacturing, Service and R&D.

PEO2 To prepare students for higher studies and research in institutes of national importance and developed countries by providing strong fundamentals in basic sciences and applying them in engineering.

PEO3 Entrepreneurial skill and self-employment in the program adopted.

PEO4 Working with ethical values in diverse culture and adherence to Indian culture without compromise in the profession is promoted.

PEO5 Institutional program prepares for total development of personality encouraging cultural events, sports, social activities etc.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 To impart sound fundamental of basic sciences viz. mathematics, physics, chemistry so as to apply them for engineering problem analysis, and prepare students for higher education and research in the chosen field.

PSO2 To achieve ability to gather and synthesis engineering data with basic knowledge of engineering and prepare students for successful career in industry, while generating thirst for knowledge and lifelong learning.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences (BS)	15	28	26
Engineering Sciences (ES)	9	18	15
Humanities and Social Sciences (HS)	8	13	13
Professional Electives (EL)	14	23	23
Program Core + Program Lab (PC+PL)	27	57	45
Program theory with Lab (PW) / Program Lab With Theory (PT)	7	15	11
Open Elective (OE)	7	12	12
Training & Placement (TP)	2	14	4
Innovation & Development (ID) / Project (PJ)	10	32	16
Internships (IN)	2	9	3
Mandatory Courses (MC)	0	4	0
Total	100	225	168

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM

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

01 Engineering knowledge
Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis
Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

11 Project management
Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

03 Development of solutions
Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

10 Communicate effectively
Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

ENGINEERING DEGREE PROGRAM OUTCOMES

04 Investigate complex problems
Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

09 Individual & Teamwork
Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

05 Modern tool usage
Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

08 Apply ethical principles
Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

07 Environment & Sustainability
Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

06 The Engineer and Society
Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

SEMESTER - I

24BSMA101 SDG NO. 4 & 9	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives, maxima and minima for functions of several variables.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To provide understanding of double integration, triple integration and their applications.
- To impart the knowledge of Fourier series..

MODULE I   MATRICES   12

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (without proof) – Symmetric and orthogonal matrices - Reduce the Quadratic to Canonical form using orthogonal transformation - Nature of Quadratic forms.

MODULE - II   FUNCTIONS OF SEVERAL VARIABLES   12

Limits, Continuity - Definitions - Partial derivatives -Taylor's series - Jacobians, Maxima and Minima - Method of Lagrange multipliers.

MODULE - III   VECTOR DIFFERENTIATION   4

Scalar and Vector valued functions- Gradient and Directional derivatives – Tangent plane - Divergence and Curl- Irrotational and Solenoidal vector fields - Scalar and Vector Potentials - Vector identities (without proof).

MODULE - IV   VECTOR INTEGRATION   8

Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Greens, Gauss divergence and Stoke's theorems -Verification and Application in evaluating line, Surface and Volume integrals. Problems involving Cube and Cuboids.

MODULE - V   MULTIPLE INTEGRALS   12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from cartesian to polar coordinates-Triple integrals – Volume of solids - Change of variables from cartesian to Spherical and Cylindrical polar coordinates.

MODULE - VI   FOURIER SERIES   12

Fourier series – Convergence of Fourier series -Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
2. Engineering Mathematics for first year, T. Veerarajan, Tata McGraw-Hill, New Delhi, 2008.
3. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

WEB REFERENCES:

1. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
2. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/
3. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial derivatives/
4. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://www.khanacademy.org/math/differential-calculus

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values for functions of several variables. (K3)

3. Compute the derivatives of scalar and vector point functions. (K3)
4. Use the vector point function to establish the relation between line, surface and volume integrals. (K3)
5. Apply double and triple integrals to find the area and the volume of a region. (K3)
6. Compute Fourier series expansion of a function. (K3)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	-	-	-	-	-	1
CO2	3	1	1	1	-	-	-	-	-	-	-	1
CO3	3	1	1	1	-	-	-	-	-	-	-	1
CO4	3	1	1	1	-	-	-	-	-	-	-	1
CO5	3	1	1	1	-	-	-	-	-	-	-	1
CO6	3	1	1	1	-	-	-	-	-	-	-	1

SEMESTER - I

24HSEN101	COMMUNICATIVE ENGLISH	L	T	P	C
SDG NO. 4		3	0	0	3

OBJECTIVES:
- Develop the basic LSRW skills
- Acquire enhanced knowledge of English grammar
- Improve modern and technical vocabulary
- Enhance the communicative and cognitive skills
- Interpret the texts and write reviews critically

MODULE - I   COMMUNICATION PROCESS   8

Listening – informal conversations - Speaking – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - Reading comprehension – skimming/ scanning/ predicting – question & answers – objective and descriptive answers - Writing – paragraph writing, personal notes - Language Development – parts of speech, prefix, suffix, word formation

MODULE - II   LANGUAGE BARRIERS, LEVELS AND CHANNELS   8

Listening –interviews - Speaking – describing a simple process – asking and answering questions - Reading – critical reading – finding key information in a given text – ideation, mind mapping - Writing - dialogue,, instructions – Language Development – regular, irregular verbs, tenses, framing questions,

MODULE - III NARRATION AND SUMMATION   8

Listening - long texts - TED talks - extensive speech on current affairs - Speaking – role plays – asking about routine actions and expressing opinions - Reading- longer texts & making a critical analysis of the given text - Writing – essay (comparative / analytical), jumbled sentences, recommendations - Language Development – writing single sentence definitions, sequence words

MODULE - IV WRITING MECHANICS   7

Listening -debates and discussions – practicing multiple tasks –Speaking - self introduction about friends/ places/ hobbies - Reading -Making inference from the reading passage – Predicting the content of the reading passage - Writing – informal letters, e-mails - accuracy, coherence, brevity – Language Development- single word substitutes, compound words- conditionals

MODULE - V   INTERPRETATION SKILLS   7

Listening- popular speeches and presentations - Speaking - impromptu speeches -Reading - articles – magazines - Writing – review writing, channel conversion – bar diagram/ table, poster/ picture interpretation - Language Development – modal verbs, collocations, 21st century vocabulary

MODULE - VI COGENT EXPOSITIONS   7

Listening - Motivational speeches - Speaking - Debates and discussion - Reading - analytical reading - newspapers - Writing - process description - Language Development - voices, sentences expressing purpose, synonyms & antonyms

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. A Course in Technical English, D. Praveen Sam and K.N. Shoba, Cambridge University Press, 2020

REFERENCES:
1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:
1. https://onlinecourses.nptel.ac.in/noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

ONLINE RESOURCES:
1. https://wwPearson.com/english/catalogue/business-english/technical-english.html
2. https://ww.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Improve understanding and application of listening, speaking, reading, and writing skills (K2)
2. Demonstrate the ability to write personal notes, clear and coherent paragraphs (K2)
3. Apply analytical skills to write essays, rearrange jumbled sentences, and formulate recommendations (K3)
4. Apply skills to develop email etiquette and construct professional emails and informal letters (K3)
5. Analyze and interpret data to write comprehensive and effective reviews (K3)
6. Enhance vocabulary, improve grammatical accuracy, and confidently engage in debates (K2)

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	3	-	-

SEMESTER - I

24BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of mechanics and its use in engineering applications.
- To illustrate the various laws of electromagnetic waves and its applications.
- To understand the concept of waves and lasers and its applications.
- To apply the concepts of quantum mechanics to engineering studies.
- To identify the basic principles involved in thermal physics and its applications.
- To understand the basics of crystal for engineering applications.

MODULE - I   PROPERTIES OF MATTER   8

Elasticity – Hooke's law- Poisson's ratio - Stress - strain diagram and its uses - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders.

MODULE - II   MECHANICAL WAVES AND LASERS   7

Waves on a string – standing waves – traveling waves – Energy transfer of a wave – Reflection and refraction of light waves – interference –Theory of air wedge and experiment - Theory of laser – characteristics – Spontaneous and stimulated emission – Einstein's coefficients – population inversion – Nd-YAG laser, CO_2 laser – Basic applications of lasers in industry.

MODULE - III ELECTROMAGNETIC WAVES　　　　　　8

The Maxwell's equations – wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field – properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter – polarization – Producing electromagnetic waves – Energy and momentum in EM - Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

MODULE - IV BASIC AND APPLIED QUANTUM MECHANICS　　　7

Black body radiation – Planck's derivation – Electrons and matter waves –The Schrodinger equation (Time dependent and time independent forms) – significance of wave function – Normalization –Free particle – particle in a infinite potential well: 1D, 2D and 3D Boxes; - Barrier penetration and quantum tunneling (qualitative) – Scanning Tunneling Microscope.

MODULE - V CRYSTAL PHYSICS　　　　　　　　　8

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - X-Ray diffraction - Calculation of number of atoms per unit cell - Atomic radius - Coordination number – packing. factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy. Crystal Growth: Chochralski technique - Molecular beam epitaxy.

MODULE - VI THERMAL PHYSICS　　　　　　　　7

Transfer of heat energy - Conduction, Convection and Radiation - Thermal conductivity, Forbe's method and Lee's disc method - Conduction through compound media - series and parallel methods - Heat exchangers - Refrigerators and Solar water heaters.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattacharya & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu And P.G. Kshirsagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

REFERENCES:

1. D. Halliday, Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma," Physics for Engineers", PHI Learning Private Limited, 2014.
4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.
7. Arthur Beiser. "Concepts of Modern Physics", McGraw-Hill, 6th Edition. 2003.
8. Charles Kittel, "Introduction to Solid State Physics". John Wiely & Sons. 8th Edition, 2005.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. To understand the mechanical properties of materials. (K2)
2. To express the knowledge of waves and to discuss about lasers and its applications (K2)
3. To understand the properties of electromagnetic waves and its propagation in different medium (K2)
4. To discuss the dual nature of matter and radiation and application of one dimensional Schrodinger's wave equations to a matter wave system (K3)
5. To understand the basics of crystal, its structure determination and different growth techniques. (K2)
6. To discuss the heat transfer in different media and its applications. (K2)

CO-PO, PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	-	-	-	-	-	-	1
CO2	3	2	2	1	3	-	-	-	-	-	-	2
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	2	2	-	-	-	-	-	-	1
CO5	3	2	2	3	1	-	-	-	-	-	-	1
CO6	3	3	3	2	2	-	-	-	-	-	-	1

SEMESTER - I

24BSCY101 SDG NO. 4,7,8,9, 11,12 & 17	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enumerate the importance, synthesis, and applications of polymers.
- To impart basic knowledge of chemistry and the principles involved in electrochemistry, energy storage devices, and their commercial applications.
- To familiarize the fundamental laws and concepts of important photophysical and photochemical processes, as well as spectroscopy.
- To explore the fundamental concepts, laws, and principles of thermodynamics, and apply its derivations to optimize and innovate engineering processes across various disciplines.
- To comprehend the chemistry of fuels and combustion, and their applications across various engineering and industrial processes.
- To gain an understanding of the emergence and challenges of nanomaterials and nanotechnology across various scientific and technological disciplines.

MODULE - I   POLYMER CHEMISTRY   8

Polymers: Definition, Degree of polymerization, Functionality of monomer, Classification of polymer with examples, Types of polymerization, Mechanism of addition polymerization (Free radical mechanism).

Plastics: Definition and Characteristics - Thermoplastics & Thermosets. Preparation, properties and engineering applications of plastics -PVC, Teflon, Kevlar and Bakelite.

Fibers: Characteristics fibers - Preparation, properties and applications of Nylon and Dacron. Biodegradable polymers & Conducting Polymers: Characteristics, Classification and their applications.

MODULE - II   ELECTROCHEMISTRY AND BATTERY TECHNOLOGY   7

Electrochemistry: Types of Cells (Electrochemical and Electrolytic cell) – Redox reaction – Single and Standard electrode potential, Reference electrodes - SHE, Calomel electrode, Measurement of Single Electrode Potential, Nerns't equation (Derivation & Problems), Electrochemical series and its significance.

Batteries: Evolution of batteries – Primary and Secondary battery (Lead acid battery), Next Generation Battery Technology (NGBT) - Solid-state batteries (Lithium-ion), Sodium-ion batteries.

MODULE - III PHOTOCHEMISTRY & SPECTROSCOPY   7

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination- Photo processes - Jablonski diagram (Internal Conversion, Intersystem crossing, Fluorescence, Phosphorescence), Chemiluminescence and Photo-sensitization.

Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and Rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only).

MODULE - IV CHEMICAL THERMODYNAMICS   8

Terminology of Thermodynamics - Laws of Thermodynamics – I law – Significance – Mathematical formulation and its applications. II law – Need for the II law. Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes, entropy of phase transitions; Clausius inequality. Helmholtz and Gibbs free energy functions, Criteria of spontaneity, Maxwell relations, Gibbs-Helmholtz equation, Van't Hoff Isotherm and Isochore.

MODULE - V   FUELS   8

Fuels: Introduction –Classification of fuels – Coal – Analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – Octane number and Cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gas (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of fuels: Introduction – Calorific value – Higher and Lower Calorific values- Theoretical calculation of Calorific value(Dulong formula) – Flue gas analysis (ORSAT Method).

MODULE - VI NANOCHEMISTRY   7

Introduction - Types of nanomaterials - Emergence and challenges in nanotechnology- Synthesis routes for nanomaterials: Bottom-up and top-down approaches - Sol-gel, precipitation, Thermolysis, Laser ablation, Chemical Vapour Deposition (CVD), Electro deposition - Properties of nanomaterials- Mechanical properties, Chemical, Optical, Electrical and Magnetic properties-applications of nanomaterials (Gold nanoparticles as an example). Quantum Dots - concept, properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand &CompanyLTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P)LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD,New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2024.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi,2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.
4. Chemistry of Nanomaterials Vol.1 S.S.R Kumar Challa (Ed).
5. Advanced chemistry by Phillip Matthews Vol.1 and Vol.2.
6. Chemistry in Engineering and Technology Vol. 1 & 2, J.C. Kuriacose and J. Rajaram.
7. Applied chemistry - A textbook for Engineers and Technologists by H.D. Gesser.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Explain the importance of polymers in science and technology, describe their roles in different applications and discuss their impacts on modern advancements. (K3)
2. Recognize the basic principles of electrochemistry and describe their application in battery technologies. (K3)
3. Apply the concepts of key photophysical and photochemical processes, as well as spectroscopy, to develop and optimize various applications. (K3)
4. Describe the principles of the second law of thermodynamics and its derivations to analyze engineering applications across all disciplines. (K3)
5. Categorize the chemistry of fuels and combustion and their applications at various levels. (K3)
6. Demonstrate the knowledge of nanomaterials, including their properties, behavior, interactions and applications across various disciplines of science and technology. (K3)

CO-PO, Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	2	-	-	-	-	-	-	-	1

SEMESTER - I

24ESCS101	PROBLEM SOLVING AND	L	T	P	C
SDG NO. 4 & 9	PROGRAMMING IN C	3	0	0	3

OBJECTIVES:
- Interpret Mathematical problems using algorithms, flowchart and pseudocode.
- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops, Arrays and Strings
- To develop applications in C using Functions, Pointers and Structures
- To perform I/O operations and File Handling in C

MODULE - I   INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING   7

Introduction to Problem Solving through programs- Algorithm-Flowchart–Pseudocode-Memory, Variables, Values, Instructions, Programs-compilation process-Syntax and Semantic Errors- The language of C : Phases of developing a running computer program in C - Character set – Constants – Keywords – Primitive data types –Declaration, Type Conversion

MODULE - II   BASICS OF C PROGRAMMING   7

Sequential- Arithmetic Operators, Relational Operators, Logical Operators, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, selective – If Else-If, Switch- repetitive structures-for, while, do while, Nested loops, go to, break, continue –Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD and LCM, Prime number generation

MODULE - III ARRAYS AND STRINGS   8

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

MODULE - IV FUNCTIONS AND POINTERS   9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions - Factorial and Fibonacci Generation - Towers of Hanoi problem - – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

MODULE - V   STRUCTURES   7

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

MODULE - VI FILE PROCESSING   7

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. R.G. Dromey, "How to solve it by Computers", Reprint, PHI Publishers, 2011.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2018.
3. Kernighan, B.W and Ritchie D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

1. Yashwant Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
2. Byron Gottfried, "Programming with C", Fourth Edition, Tata McGraw Hill Education, 2018.
3. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication, 2015.
4. Jeri R. Hanly & Elliot B.Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
5. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. https://www.learn-c.org/
2. https://codeforwin.org/
3. https://www.cprogramming.com

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programing_books/gnu_c_programming_tutorial
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Understand the concepts of algorithms for solving a problem.(K2)
2. Illustrate the various constructs in C to develop simple applications.(K3)
3. Understand the concepts of Array & Strings.(K2)
4. Demonstrate the usage of Functions and Pointers.(K3)
5. Explain the Structure and union concepts.(K2)
6. Describe the file manipulation and its organisation.(K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	2	2	2	2
CO2	3	3	3	3	2	-	-	-	-	-	2	2	2	2
CO3	3	3	3	3	2	-	-	-	-	-	2	-	2	2
CO4	2	2	-	2	2	-	-	-	-	-	1	-	3	2
CO5	2	2	-	-	1	-	-	-	-	-	1	-	3	3
CO6	2	2	-	-	2	-	-	-	-	-	1	-	3	3

SEMESTER - I

24ESGE101 SDG NO. 4,6,7,9, 12,14 & 15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To visualize the job in three dimensions.
- To have a clear conception and appreciation of the shape, size, proportion and design.
- To expose the student community to existing national standards related to technical drawings.

MODULE - I   PLANE CURVES   **6+4**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – Drawing of tangents and normal to the above curves.

MODULE - II   PROJECTION OF POINTS, LINES AND PLANES   **6+4**

Projection of Points (Concept only). Projection (Elevation and Plan) of straight lines, inclined to both reference planes by rotating line method. Projection of plane surfaces, inclined to one of the reference planes by rotating object method.

MODULE - III PROJECTION OF SOLIDS   **6+4**

Projection of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes.

MODULE - IV ORTHOGRAPHIC PROJECTION   6+4

Orthographic Projection - Principles of orthographic projections, Orthographic projection of objects from pictorial view.

MODULE - V   SECTION AND DEVELOPMENT OF LATERAL SURFACE   6+4

Projection of sectioned solids (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to HP alone and cutting plane inclined to HP only. Development of lateral surfaces of sectioned regular vertical solids (Prisms, Pyramids, Cylinder and Cone) with cutting plane inclined to HP only.

MODULE - VI ISOMETRIC PROJECTIONS   6+4

Isometric projection – Principle, isometric scale, Isometric views and Isometric projections of truncated solids - Prisms, Pyramids, Cylinder and Cone in simple vertical positions only.

TOTAL: 60 PERIODS

TEXT BOOKS:
1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:
1. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.

WEB REFERENCES:
1. https://archive.nptel.ac.in/courses/112/102/112102304/

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/105/104/105104148/
2. https://nptel.ac.in/courses/112/103/112103019/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Perform free hand drawing of conical sections and cycloids. (K3)
2. Sketch the orthographic projection of lines and plane surfaces of rectangle, square, pentagon and Hexagon. (K3)
3. Draw the orthographic projection of regular solids like prism, pyramids, cylinder and cone using change of position method. (K3)
4. Draw plan, elevation and side views for the 3dimensional isometric drawing by using the concepts of orthographic projection. (K3)
5. Draw the section and development of lateral surfaces for the regular solids like Prism, Pyramid, Cylinder and Cone for the axis perpendicular to HP. (K3)
6. Draw the isometric view, projection for regular and truncated solids like Prism, Pyramid, Cylinder and Cone. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO2	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO3	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO4	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO5	3	-	-	-	-	-	-	2	-	2	-	-	3	2
CO6	3	-	-	-	-	-	-	2	-	2	-	-	3	2

SEMESTER - I

24HSTA101 SDG NO. 4	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

OBJECTIVES:
- Develop interest for classical language and literature to promote Tamil heritage
- Understand the ancient Tamil sculptures, folk and martial arts and contribution of Tamil to the freedom of India

UNIT - I   LANGUAGE AND LITERATURE   3

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

UNIT - II   H E R I T A G E - R O C K A R T P A I N T I N G S T O M O D E R N   ART – SCULPTURE   3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT - III   FOLK AND MARTIAL ARTS   3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT - IV   THINAI CONCEPT OF TAMILS   3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT - V   CONTRIBUTION OF TAMILS TO INDIAN NATIONAL   MOVEMENT AND INDIAN CULTURE   3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

தமிழர் மரபு

அலகு - I   மொழி மற்றும் இலக்கியம்:   **3**
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு - II   மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை
**   - சிற்பக் கலை:**   **3**
நடுகல் முதல் நவீன சிற்பங்கள் வளர - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - கதர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு - III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:   **3**
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலொட்டம், தொல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV   தமிழர்களின் திறைக் கோட்பாடுகள்:   **3**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்கொப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு - V   இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்
**   தமிழர்களின் பங்களிப்பு:**   **3**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறபகுதிகளில்

தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:

Upon completion of the course, the learners will be able to:

1. Understand Tamil as a classical language & Literature (K2)
2. Explore about Tamil Heritage & Sculptures,Role of temples (K2)
3. Appreciate Sports and games of Tamils (K2)
4. Perceive Thinai concept of Tamils (K2)
5. Comprehend Education and literacy during Sangam Age (K2)
6. Understand the Contribution of Tamils to National Movement & Indian Culture (K2)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	3	-	-

SEMESTER - I

24BSPL101 **SDG NO. 4,6,11,** **12 & 17**	**PHYSICS AND CHEMISTRY LABORATORY**	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY (Any Five Experiments to be conducted)

OBJECTIVES:
- Demonstrate the wave nature of light using diffraction and interference properties.
- Study the thermal conductivity of a bad conductor.
- Verify experimentally the elastic properties of materials.

Sl.No.   Name of the Experiment

1   (a) Determination of wavelength of Laser
(b) Determination of numerical aperture and acceptance angle in an optical fiber.
(c) Determination of particle size using laser source.

2   Determination of thermal conductivity of a bad conductor – Lee's Disc method.

3   Determination of Young's modulus by non-uniform bending method.

4   Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.

5   Find out the thickness of the given wire by air wedge method.

6   Calculation of lattice cell parameter – X-ray diffraction method.

7   Determination of Planck's constant.

8   Determination of wavelength of mercury spectrum – spectrometer grating.

9	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
10	Determination of band gap of a semiconductor.
11	Determination of Hall coefficient by Hall Effect experiment.
12	Determination of solar cell characteristics.

CHEMISTRY LABORATORY (Any Five Experiments to be conducted)
OBJECTIVES:
- To acquaint students with practical knowledge of the basic concepts of chemistry that they will encounter during their studies and in the industry and engineering fields.
- To acquaint students with the determination of the molecular weight of a polymer by viscometry.
- To develop and understand the basic concepts of acidic and basic nature using pH.

Sl.No.	Name of the Experiment
1	Conductometric titration of strong acid vs strong base.
2	Determination of chloride content of water sample by Argentometric method.
3	Determination of strength of acids in a mixture of acids using conductivity meter.
4	Determination of total, temporary & permanent hardness of water by EDTA method.
5	Estimation of iron content of the given solution using potentiometer.
6	Determination of DO content of water sample by Winkler's method.
7	Determination of strength of given hydrochloric acid using pH meter.
8	Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method).
9	Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.
10	Determination of molecular weights of polymer samples using Ostwald's Viscometer.
11	Synthesis of nano-CdS by precipitation. (Demonstration only)
12	Corrosion experiment-weight loss method.

TOTAL: 60 PERIODS

TEXT BOOKS:
1. Engineering Physics Lab, Dr. G. SenthilKumar, VRB publishers. (2019)
2. Engineering Physics Practical, Dr. P. Mani, Dhanam Publications. (2020)

TEXTBOOK:
1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).
2. Practical Physical chemistry by B. Viswanathan, P. S. Raghavan (Vivabooks), 2009.
3. Foundation of Experimental Chemistry by Jubaraj B. Baruah, ParikshitGogoi, 2010.

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Demonstrate the wave nature of light using diffraction and interference properties. (K3)
2. Study the thermal conductivity of a bad conductor. (K3)
3. Verify experimentally the elastic properties of materials. (K3)
4. Describe multiple measurement techniques, including volumetric titrations, conductivity, pH, redox potential and optical density measurements, used to estimate the amount of substance present in a solution. (K3)
5. Apply spectroscopic techniques to determine the concentration of metal ions in solutions and use viscometry to determine the molecular weight of a polymer. (K3)
6. Demonstrate the ability to synthesize nanoparticles using simple chemical or physical methods and apply the weight loss method to study and analyze the corrosion behavior of materials in different environments. (K3)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	3
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	2	2	2	1	-	-	-	-	-	-	-	1
CO6	2	2	2	1	-	-	-	-	-	-	-	1

SEMESTER - I

24ESPL101 SDG NO. 4 & 9	**PROGRAMMING IN C LABORATORY**	L	T	P	C
		0	0	2	1

OBJECTIVES:
- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

LIST OF EXPERIMENTS
1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is a leap year or not? (Hint: not every century is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is an Armstrong number or not?
6. Write a program to check whether a given number is odd or even?
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to print half pyramid of *.
10. Write a program to display array elements using two dimensional arrays.
11. Write a program to perform swapping using a function.
12. Write a program to display all prime numbers between two intervals using functions.
13. Write a program to solve towers of Hanoi using recursion.
14. Write a program to get the largest element of an array using the function.
15. Write a program to concatenate two strings.
16. Write a program to find the length of String.
17. Write a program to find the frequency of a character in a string.
18. Write a program to store Student Information in Structure and Display it.

19. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
(a) Total marks obtained by each student.
(b) The highest marks in each subject and the marks of the student who secured it.
(c) The student who obtained the highest total marks.
20. Write a program to demonstrate file operations (e.g. count the number of characters, words and lines in a file, replace a specific word with the given word in the same file).

TOTAL: 30 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Stand alone desktops with C compiler 30 Nos. (Or)
   Server with C compiler supporting 30 terminals or more.

OUTCOMES:
Upon completion of the course, the student will be able to:

1. Illustrate C programs for simple applications making use of basic constructs, arrays, strings, functions and recursion.(K2)
2. Demonstrate C programs involving pointers, and structures. (K3)
3. Interpret applications using sequential and random access files. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	3	1	2
CO2	3	3	3	3	2	-	-	-	-	-	-	3	2	1
Co3	3	3	3	3	2	-	-	-	-	-	-	3	3	2

SEMESTER - I

24ENTP101 SDG NO. 4	**FUNCTIONAL LIFE SKILLS**	L	T	P	C
		0	0	2	1

OBJECTIVES:
- Resolve common communication problems
- Observe the effectiveness of nonverbal messages
- Communicate precisely through the digital media
- Understand the importance of empathetic listening
- Explore reading and speaking processes

MODULE - I   LISTENING   5

Techniques of effective listening

Listening and comprehending

Probing questions

Barriers to listening

Reflection from listening

MODULE - II   SPEECH MECHANICS   5

Pronunciation

Enunciation

Vocabulary

Fluency

Common errors

MODULE - III   READING SKILLS   5

Techniques of effective reading

Kinds of reading

Gathering ideas and information from the text

Evaluating the ideas and information

Interpreting the text from multiple angles

MODULE - IV   WRITING ASPECTS   5

Writing process

Effective writing strategies

Different modes of writing

Optimizing the use of resources

Editing

MODULE - V   PRESENTATION SKILLS   5

Types of presentations

Nonverbal communication

Understanding the purpose and the audience

Beginning and closure of presentations

Presentation tools and strategies

MODULE - VI   ARTICULATION ASPECTS   5

Perform exercises

Slow speeches

Long speeches

Monologues, Dialogues and Conversation
Feedback necessity

TOTAL : 30 PERIODS

REFERENCES:
1. Sen, Madhuchanda.2010, An Introduction to Critical Thinking, Delhi, Pearson.
2. Effective Communication Skills Strategies for Success. Edited by Nitin Bhatnager and Mamta Bhatnager. 2023, Pearson
3. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma. Oxford University Press, 2015

WEB REFERENCES:
1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Utilize various listening techniques effectively (K1)
2. Demonstrate the ability to speak spontaneously in different contexts (K1)
3. Comprehend and interpret written texts accurately (K2)
4. Exhibit the ability to write freely with sufficient and relevant content (K1)
5. Articulate explanations clearly and concisely (K1)
6. Understand and present convincing speeches/ arguments effectively (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	2	-	2	-	-

SEMESTER - I

24ESID101	**IDEA ENGINEERING LAB – I**	L	T	P	C
SDG NO. 1-17		0	0	2	1

OBJECTIVES:

- To understand the significance of Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) of the United Nations
- To familiarize with SDG targets and indicators
- To identify the Constitutional implementation pertaining to SDGs in Panchayat Raj
- To acquire knowledge of the State and the Central government welfare schemes
- To recognise the role of educational institutions' in community development
- To develop critical thinking skills to address complex societal challenges through an immersion program

MODULE - 1   United Nations Sustainability and the Sustainable
Development Agenda   3

- Introduction to Sustainability
- Indian Rural Environment: Necessity and Sustainability
- Millennium Development Goals (MDGs)
- United Nations Sustainable Development Goals (SDGs) & the Agenda
- Overview of the Sustainable Development Goals (SDGs)

MODULE - 2   Universal SDG Targets   4

- SDG Framework
- Key Components
- Pillars of the SDGs
- Targets of the Goals
- Indicators of the Targets

MODULE - 3   SDG and Indian Gram Panchayat   3

- Gram Panchayat
- Salient Features of Constitutional Amendments
- Transition from SDGs to LSDGs (Localizing Sustainable Development Goals)

MODULE - 4   Government Schemes   **4**
- Introduction to State and Central Government Schemes
- Overview of Government Schemes
- Localization and Implementation at the Regional Level
- Impact on Local Communities

MODULE - 5   Community Engagement   **4**
- Key Recommendations of the National Education Policy
- Guidelines for Fostering Social Responsibility
- Awareness
- Participation
- Collaboration

MODULE - 6   Idea Generation   **12**
- Immersion Program
- Focus Areas
- Channelizing Ideas
- Forming Working Teams for SDGs (Sustainable Development Goals)

                                                        TOTAL: 30 PERIODS

REFERENCES:
1. Joy Elamon and Ms. Mariamma Sanu George,"The Handbook on Sustainable Development Goals and Gram Panchayats" , State Institute for Rural Development (SIRD).
2. Dr.C.R.Rene Robin, Dr.PA.Shanthi , Dr.B.Thanuja & Dr.V.Yuvaraj ,"Sairam SDG Idea Engineering Lab I", Sri Sairam Engineering College.

WEB REFERENCES
1.   UN Sustainable Development Goals
2.   https://srmuniv.digimat.in/nptel/courses/video/109106200/L30.html
3.   https://avcce.digimat.in/nptel/courses/video/109106200/L26.html

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Understand the United Nations Agenda of MDGs and SDGs (K1)
2. Summarize the targets and indicators of SDGs (K2)
3. Interpret the constitutional amendments of LSDG in Gram Panchayat (K2)
4. Classify various localized and regional government schemes (K2)

5. Understand social responsibility in community development (K1)
6. Implement viable projects in SDGs through the immersion program (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	-	2	-	2	2
CO2	-	-	-	-	-	2	2	-	2	-	2	2
CO3	-	-	-	-	-	2	2	-	2	-	2	2
CO4	-	-	-	-	-	2	2	-	2	-	2	2
CO5	-	-	-	-	-	2	2	-	2	-	2	2
CO6	2	2	-	-	-	2	2	-	2	-	2	2

SEMESTER - II

24BSMA203 SDG NO. 4	DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To solve second and higher order differential equations with constant and variable coefficients.
- To find the numerical solution of ordinary and partial differential equations.
- To solve first order partial differential equations, linear homogeneous and non homogeneous partial differential equations of second and higher order.
- To find the Fourier series solution for one dimensional wave equation, one and two dimensional heat equations.
- To obtain the numerical solution of partial differential equations.

MODULE - I   ORDINARY DIFFERENTIAL EQUATIONS   12

Second and higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogeneous equation of Euler's and Legendre's types - System of simultaneous linear differential equations with constant coefficients.

MODULE - II   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   10

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods: Milne's predictor corrector methods for solving first order equations.

MODULE - III   SOLUTIONS OF FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS   9

Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation.

MODULE - IV   SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS   9

Linear homogeneous and non-homogeneous partial differential equations of second and higher order with constant coefficients.

MODULE - V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS10

Classification of Partial Differential Equations – Method of separation of variables – Fourier Series Solutions of one-dimensional wave equation – Transient state solution of one dimensional heat conduction equation – Steady state solution of two dimensional heat conduction equation.

MODULE - VI NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 10

Solution of two dimensional Laplace's and Poisson's equations on rectangular domain – Forward time central space scheme - One dimensional heat flow equation by Crank Nicholson method – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Advanced Modern Engineering Mathematics, Glyn James, 3rd Edition, Pearson Education, 2010.
3. Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar, R. K. Jain, 4th Edition, New age international Private Ltd. 2003.

REFERENCES:

1. Numerical methods, Kandasamy P, Thilagavathy, Dr. K. Gunavathy, S. Chand & Company Ltd.. 2006.
2. Higher Engineering Mathematics, B.S. Grewal, 44th Edition, Khanna Publishers, 2010.
3. Applied Numerical Analysis, Gerald, C.F. and Wheatley, P. O., 7th Edition, Pearson Education, Asia, New Delhi, 2004.
4. Transforms and Partial Differential Equations, 3rd Edition Veerarajan T

WEB REFERENCES

1. https://people.maths.ox.ac.uk/suli/nsodes.pdf
2. https://skim.math.msstate.edu/LectureNotes/NumerPDEs_Lecture.pdf
3. https://math.libretexts.org/Bookshelves/Differential_Equations/Differential_Equations_for_Engineers_(Lebl)/4%3A_Fourier_series_and_PDEs/4.07%3A_One_dimensional_wave_equation
4. https://ocw.mit.edu/courses/18-303-linear-partial-differential-equations-fall-2006/d11b374a85c3fde55ec971fe587f8a50_heateqni.pdf

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=NBcGLLU90fM&list=PLbMVogVj 5nJSGlf9sluucwobyr_zz6gl
2. https://www.youtube.com/watch?v=B9l1fZLLW1E
3. https://www.youtube.com/watch?v=7JrMHsiSNWA&list=PLpklqhIbn1 jq0ngwe94LpiZ8OG8eiNzC-
4. https://in.video.search.yahoo.com/search/video?fr=mcafee&ei=UTF-8&p=solution+of+one+dimensional +HEAT+equation+VIDEO &vm=r&type=E211IN714G0#id=2&vid=8e1235b2280eb002b6055c309 55520cd&action=view

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Solve ordinary differential equations of second and higher order differential equations with constant and variable coefficients. (K3)
2. Apply various differential equation techniques to solve ordinary differential equations. (K3)
3. Determine the solution of first order partial differential equations. (K3)
4. Apply the concepts of partial differential equations in heat and wave equations. (K3)
5. Solve partial differential equations of second and higher order differential equations with constant coefficients. (K3)
6. Apply various partial differential equation techniques to solve partial differential equations. (K3)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	-	-	-	-	-	-	-	0	-	-
CO2	3	1	1	1	-	-	-	-	-	-	-	0	-	-
CO3	3	1	1	1	-	-	-	-	-	-	-	0	-	-
CO4	3	1	1	1	-	-	-	-	-	-	-	0	-	-
CO5	3	1	1	1	-	-	-	-	-	-	-	0	-	-
CO6	3	1	1	1	-	-	-	-	-	-	-	0	-	-

SEMESTER - II

24HSEN201 SDG NO. 4	PROFESSIONAL ENGLISH	L	T	P	C
		2	0	0	2

OBJECTIVES:

- Acquire techniques for comprehending and critically analyzing passages
- Improve the communicative competence
- Enhance learners' ability to read and write complex texts, summaries, definitions and reports
- Write effective formal letters and reports
- Develop skills for preparing effective job application

MODULE - I   EFFECTIVE COMMUNICATION   6

Listening – Listening to conversations – Speaking – making conversations in real life occurrences – Reading - short stories, happenings - Writing – autobiographical writing, preparation of checklist – communication and types of communication – Language Development –- subject - verb agreement, commonly confused words – spellings

MODULE - II   BASICS OF TECHNICAL WRITING   5

Listening – listening to advertisements and products – Speaking - creating greetings/wishes/excuses and thanks – Reading – articles/novels - Writing - summary of articles, writing modes, formats, compositions - Language Development - reported speech, numerical adjectives

MODULE - III REPORT WRITING   4

Listening – listening to podcasts – Speaking - practicing telephonic conversations – observing and responding. Reading – regular columns of newspapers/magazines - Writing – reports – feasibility, accident, preparation of agenda and minutes – Language Development - cause & effect expressions, discourse markers

MODULE - IV DIVERSE WRITING SKILLS   5

Listening – documentaries, anecdotes and short stories - Speaking – expressing opinions using verbal and non-verbal communication – Reading biographies/autobiographies, travelog, – Writing – formal letters – inviting guests – acceptance/declining letters - Language Development- degrees of comparison – embedded sentences - acronyms and abbreviations

MODULE - V   CAREER COMPETENCIES   **6**

Listening – expert talks – recommending suggestions & solutions – Speaking – Debate- participating in a group discussion – learning GD strategies – Reading – innovations, ideations - Writing – Job application, resume, – proposals – Language Development – verbal analogies – phrasal verbs

MODULE - VI LEXICAL ENHANCEMENT   **4**

Listening - technical and general talks - Speaking - oral presentation with visual aids - Reading - successful stories/autobiographies - Writing - writing blogs - Language Development - common errors in English, idiomatic expressions

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Raman, Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford University Press.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York, 2011.
2. Raman, Meenakshi, Sharma, Sangeeta. Technical Communication. Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan & Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamil Nadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Vesilind Aarne P., Public Speaking and Writing Skills for Engineering Students (2nd Ed), Lakeshore press, 2007
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://takelessons.com/en-in/search?service=English&sort=1&utm_

ONLINE RESOURCES:
1. https://www.coursera.org/specializations/improve-english?
2. https://www.fluentu.com/blog/educator-english/business-english-conversation-topics/

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Demonstrate an understanding of various types of communication and prepare effective checklists.(K2)
2. Summarize articles/ write ups (K2)
3. Construct feasibility reports, accident reports, survey reports and meeting minutes (K3)
4. Apply skills to compose official letters with emphasis and clarity (K3)
5. Compose job applications and technical proposals (K3)
6. Demonstrate the ability to express opinions in both oral and written forms of communication (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	3	-	-

SEMESTER - II

20BSPH202 SDG No : 4	PHYSICS OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To introduce the formation of alloy and phase diagrams.
- To interpret the properties of ferrous alloys and their uses.
- To familiarize with the magnetic properties of materials.
- To expose the dielectric and superconducting materials properties and application.
- To explicate the properties and applications of new engineering materials.
- To inculcate the idea of significance of nanostructures, properties and application.

MODULE - I   ALLOY FORMATION AND PHASE DIAGRAMS   8

Introduction to alloys and their significance in materials science and engineering- Types of alloying elements and their effects on material properties- Gibbs free energy and its application to alloy formation- Driving forces for alloy formation: enthalpy and entropy - Definition and types of phase diagrams- Components, phases, and phase equilibrium- Construction and interpretation of binary phase diagrams: Isomorphous, Eutectic and Peritectic systems- Tie-line, Lever rule and its application in determining phase fractions

MODULE - II   FERROUS ALLOYS   7

Ferrous alloys: types, -Iron-carbon Diagram – Phases and phase transformation- microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels –factors influencing microstructure formation in ferrous alloys- effect of alloying elements on the iron-carbon system- T-T-T-diagram for eutectoid steel- pearlite, baintic and martensite transformations - tempering of martensite- Mechanical properties of ferrous alloys –hardness –Brinell and Vickers- fatigue

MODULE - III MAGNETIC PROPERTIES OF MATERIALS   8

Magnetic dipole moments - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism- paramagnetism-ferromagnetism-antiferromagnetism-Ferromagnetism: origin and exchange interaction-Domain Theory - M versus

H behaviour - Hard and soft magnetic materials - applications – Ferrites and its applications

MODULE - IV DIELECTRIC AND SUPERCONDUCTING MATERIALS 7

Dielectric materials - types of polarization - Langevin -Debye equation - frequency and temperature effects on polarization - dielectric breakdown- - Ferroelectric materials - superconducting materials - properties - Type-I and Type-II superconductors - applications - Cryotron, SQUID and Magnetic Levitation.

MODULE - V NEW ENGINEERING MATERIALS 8

Metallic glasses: types, glass forming ability of alloys, twin spinning process, and applications -shape memory alloys: phases shape memory effects, pseudo elastic- NiTi alloy, applications- - Ceramics – mechanical, thermal, electrical, magnetic, optical properties and its applications, Composites: Classification, role of matrix and reinforcement- mechanical, thermal, electrical properties and its applications-Biomaterials and its application.

MODULE - VI NANO MATERIALS 7

Introduction to Nanomaterials - Quantum Confinement and Size Effects- Quantum well, Quantum wire and Quantum dot- Synthesis methods for nanomaterials- top down- Ball Milling Method - bottom up – CVD- Electronic, mechanical, thermal, magnetic properties-Nanomaterials in Electronics and Photonics- solar cells, QD LED, Nanomaterials in Energy Applications- Batteries and supercapacitors - Biomedical Applications of Nanomaterials- biosensors, cancer treatment, drug delivery

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William D. Callister Jr., William D. Callister Jr., David G. Rethwisch, "Callister's Materials Science and Engineering", 10th edition, Global edition, John Wiley & Sons, 2019.
2. V.Raghavan, "Physical Metallurgy: Principles and Practice", PHI Learning, 2015.
3. S.O. Pillai "Solid State Physics", New Age International Publishers, 5th Edition, New Delhi, 2018.
4. C. Kittel, "Introduction to Solid State Physics", Wiley, 2019.
5. Palanisamy P.K. Materials Science. SCITECH publishers, 2015.

REFERENCES:

1. O.P.Kanna, "Materials science and Metallurgy", Dhanpat Raj Publications, 2nd edition, 2014.
2. Susan Troiler –Mckinstry and Robert E. Newnham, "Materials Engineering: Bonding, Structure, Structure – property relationship" Cambridge University Press, 2018.
3. Ben Rogers, Jesse Adams and Sumita Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2017.
4. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 2014 (ebook).
5. Nanomaterials – Handbook by Yury Gogotsi, CRC Press, Taylor & Francis group, 2006. NSC

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Understand the basics of how alloys are made and how to use phase diagrams to guess what materials will do. (K2)
2. Gain understanding of the Iron-Carbon phase diagram, different microstructures, and analyze the impact of alloying in ferrous alloys(K2)
3. Explain the characteristics of magnetic materials and their practical uses. (K2)
4. Elucidate the characteristics of dielectric and superconducting materials and their respective utilizations(K2)
5. Describe the characteristics and uses of new engineering materials. (K2)
6. Acquire knowledge of fundamental Concepts of nonmaterial, preparation methods, and Quantum Structures. (K2)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	3
CO6	3	3	3	2	-	-	-	-	-	-	-	3

SEMESTER - II

24BSCY201 SDG NO. 4	CHEMISTRY FOR ENVIRONMENT AND SUSTAINABILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain a comprehensive understanding of environmental science, the intricate relationships within ecosystems, and the crucial role of biodiversity conservation..
- To introduce the structure and components of the atmosphere, and provide an overview of the photochemical reactions involved.
- To foster a sound understanding of water quality parameters and water treatment techniques.
- To explore the various components of soil and understand the steps involved in Solid Waste Management (SWM).
- To advocate the benefits of renewable energy and promote awareness of sustainable energy practices. .
- To implement the principles of Green Chemistry in alignment with the Sustainable Development Goals (SDGs).

MODULE - I   INTRODUCTION TO ENVIRONMENTAL SCIENCE   8

Environment: Definition, concept of environment and   its components - scope and importance of environment – need for public awareness.

Ecosystem: Structure and functions: Structures - Biotic and Abiotic components. Functions - Energy flow in ecosystems, food chains and food webs. Biogeochemical cycles(C,N&P), Ecological succession.

Biodiversity and its conservation: Definition, types, importance of biodiversity, values and threats to biodiversity. Endangered and endemic species - concept and basis of identification of 'Hotspots'; hotspots in India. Strategies for biodiversity conservation: in situ, ex situ and in vitro conservation.

MODULE - II   ATMOSPHERIC CHEMISTRY   7

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect - role of greenhouse gases (CO_2, CH_4, N_2O, CFCs) on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures).

MODULE - III WATER CHEMISTRY   8

Importance and scope of water chemistry - Sources and impurities in water - Water Quality Parameters - Specifications as per WHO/BIS standards. Hardness of water, types, numerical problems on hardness of water. Softening of water - Internal treatment (Lime-soda, Phosphate, Calgon, Sodium Aluminate and Colloidal conditioning). External treatments: Ion exchange and Zeolite processes. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water by Reverse osmosis. Sustainable water management practices (water recycling and rainwater harvesting)

MODULE - IV SOIL CHEMISTRY AND SOLID WASTE MANAGEMENT   7

Soil Chemistry: Chemical composition of soil, Acid-Base and Ion-Exchange Reactions in Soil, Soil acidity and salinity. Importance of NPK in Soil Fertility. Modern agriculture - Impacts of both excessive and insufficient fertilizer use, alongside the effects of pesticides on soil chemistry and the environment. Sustainable agriculture - Approaches to improve soil salinity (leaching, soil amendments, crop rotation), Design and use of green pesticides for sustainable farming.

Solid Waste Management System: Sources and types of solid waste, Elements of solid waste management, Methods of residential and commercial waste collection, Treatment / processing - Incineration, Composting, Landfill - Dumpsite rehabilitation.

MODULE - V ENERGY AND ENVIRONMENT   8

Energy sources – Renewable and non-renewable energy sources. Principle and generation of solar energy (solar collectors, photo-voltaic modules, solar ponds), wind energy, geothermal energy; tidal energy, OTEC energy from biomass, biofuels, Nuclear energy - fission and fusion, Nuclear fuels, Nuclear reactor – principles and types. Need for energy efficiency, Energy conservation and sustainability - action strategies for sustainable energy management from a future perspective.

MODULE - VI GREEN CHEMISTRY AND SUSTAINABILITY   7

Green Chemistry: Introduction to green chemistry, Principles of Green Chemistry (12-principles), the concept of atom economy and chemical synthesis, Important techniques used in green chemistry. Application of green chemistry, viz. replacement of ozone depleting substances including CFCs, manufacture of biodegradable polymers, use of H_2O_2 as benign bleaching agents in the paper industry.

Sustainable Development: Definition and concepts of sustainable

development, Need for sustainable development; Sustainable development goals – 17 SDG goals.

Sustainable practices: Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment and Environmental Impact Assessment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.
4. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

REFERENCES:

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies'', Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Chemistry for Environmental Engineering, Clair N. Sawyer, Perry L. Mc Carty, Gene F. Parkin, 4th Edition, McGraw-Hill.

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Develop a foundational understanding of environmental science, the interactions within ecosystems, the significance of biodiversity, and the importance of conservation strategies for maintaining ecological balance. (K3)
2. Identify the primary components of the atmosphere, explain the causes of atmospheric pollution, and propose basic strategies to promote a sustainable and clean atmosphere. (K3)
3. Demonstrate complex water quality parameters, and develop innovative methods for producing cost-effective soft water suitable for both industrial use and potable consumption. (K3)
4. Describe the composition and functions of soil components, analyze the sources and characteristics of solid wastes, and evaluate the methods and strategies employed in solid waste management (SWM). (K3)

5. Explain renewable and non-renewable resources, describe various methods for harnessing energy from different sources and explain their applications in various contexts. (K3)
6. Illustrate a comprehensive understanding of green chemistry principles and their alignment with sustainable development goals, preparing them to contribute to environmentally friendly and sustainable practices in their future careers.(K3)

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	2	2	2	-	-	-	-	-	-	-	1
CO5	2	2	2	1	-	-	-	-	-	-	-	1
CO6	2	2	2	1	-	-	-	-	-	-	-	1

SEMESTER - II

24ESCE201 SDG NO. 4, 9, 12	**ENGINEERING MECHANICS**	L	T	P	C
		3	0	0	3

OBJECTIVES:

● To learn the use scalar and vector analytical techniques for analysing forces.
● To introduce the equilibrium of rigid bodies, vector methods and free body diagram
● To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems
● To develop basic dynamics concepts – force, momentum, work and energy.
● To predict the effect of force and motion in the course of carrying out the design functions of Engineering

MODULE - I   STATICS OF PARTICLES   7

Introduction – Units and Dimensions – Laws of Mechanics –Newton's laws-Lami's theorem- Parallelogram, triangular Law and polygon law of forces-Principle of transmissibility-Vectorial representation of forces – Fundamental vector operations of forces–Free body diagram- Equilibrium of a particle in 2 D – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces.

MODULE - II   EQUILIBRIUM OF RIGID BODIES   9

Beams and Trusses - Moments and Couples - Vectorial representation– Scalar components of a moment – Varignon's theorem- Moment of a force about a point and about an axis- Single equivalent force-Types of supports –Action and reaction forces – types of equilibrium -Equilibrium of Rigid bodies in Two and Three dimensions.

MODULE - III FRICTION   7

Friction force – Types of friction-Laws of Coulomb friction – Simple contact friction-Two bodies in contact- Wedge friction, ladder friction- Rolling resistance.

MODULE - IV PROPERTIES OF SURFACES AND SOLIDS   8

Centroids and Centre of Mass and Volume – Simple and Composite areas and solids -Theorems of pappus - Moments of Inertia of composite areas – Parallel axis theorem and perpendicular axis theorem –Polar moment of inertia-Radius of gyration-Product of inertia-Principal moments of inertia of plane areas and composite areas – Principal axes of inertia-Mass moment of inertia –Prismatic, Cylindrical and spherical solids from first principle.

MODULE - V   DYNAMICS-KINEMATICS   7

Displacement, Velocity and Acceleration – Relative motion - Curvilinear motion - Newton's laws of motion.

MODULE - VI DYNAMICS-KINETICS   7

D' Alembert's principle, Work Energy principle - Impulse and Momentum – Impact of elastic bodies. Rigid body motion-Translation and Rotation– General Plane motion of simple rigid bodies such as Cylinder, Disc or Wheel and Sphere.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2004.
2. N.H Dubey, "Engineering Mechanics – Statics and Dynamics", McGraw Hill Education (India) Pvt Ltd.
3. Vela Murali, "Engineering Mechanics", Oxford University Press, 2010.

REFERENCES:
1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna MohanaRao. G., "Engineering Mechanics Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
6. Dr.N.Kottiswaran, Engineering Mechanics (statics and Dynamics), Sri Balaji Publications, Erode.

WEB RESOURCES:
1. https://nptel.ac.in/courses/112/105/112105164/
2. https://nptel.ac.in/courses/112/103/112103109/

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/112/106/112106286/
2. https://nptel.ac.in/courses/112/103/112103108/
3. https://nptel.ac.in/courses/112/106/112106180/
4. https://www.coursera.org/learn/engineering-mechanics-statics

OUTCOMES:
At the end of the course, the student should be able to:
1. Interpret the concepts of laws of mechanics, vector operations, systems of Forces and equilibrium of particles in spaces. (K3)
2. Solve the engineering problems based on the concepts moment and couples, support and its types and equilibrium of rigid bodies in 3 dimensions. (K3)

3. Illustrate about Friction, its types, laws of friction, wedge and ladder friction. (K2)
4. Apply the concepts of centroid, centre of gravity, polar moment of inertia and principal moment of inertia for prisms, cylinder and spherical solids. (K3)
5. Solve engineering problems based on the concepts of relative motion and curvilinear motion. (K3)
6. Apply the concepts of Newton's law of motion, work energy method, impulse and momentum and rigid body motion in engineering problems. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	1	1	-	-	-	-	2
CO2	3	3	1	1	-	1	1	-	-	-	-	2
CO3	3	3	1	1	-	2	1	-	-	-	-	2
CO4	3	3	1	1	-	1	1	-	-	-	-	2
CO5	3	3	1	1	-	1	1	-	-	-	-	2
CO6	3	3	1	1	-	1	1	-	-	-	-	2

SEMESTER - II

24HSTA201 SDG NO. 4	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

OBJECTIVES:
- Understand the techniques that help for a better livelihood
- Identify the methods used for scientific Tamil computing

UNIT - I   WEAVING AND CERAMIC TECHNOLOGY   3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT - II   DESIGN AND CONSTRUCTION TECHNOLOGY   3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT - III   MANUFACTURING TECHNOLOGY   3

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

UNIT - IV   AGRICULTURE AND IRRIGATION TECHNOLOGY   3

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

UNIT - V   SCIENTIFIC TAMIL & TAMIL COMPUTING   3

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

தமிழர் மரபு

அலகு - I   நெசவு மற்றும் பானைத் தொழில்நுட்பம்:   **3**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு - II   வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:   **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க கொலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் ___ சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் கொலத்தில் சென்ளனயில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு - III   உற்பத்தித் தொழில் நுட்பம்:   **3**

கப்பல் கட்டும் கலை -உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணொடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு - IV   வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:   **3**

அணை, ஏரி, குளங்கள், மதகு -சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் ___ பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு - V   அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:   **3**

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூ லகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

                                                           TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1.   தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2.   கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES:
Upon completion of the course, the learners will be able to:
1. Understand Weaving and Ceramic Technology during Sangam Age (K2)
2. Explore about Design & Construction of House and Temples during Sangam Age (K2)
3. Appreciate Manufacturing Technology of Tamils (K2)
4. Perceive Agriculture and Agro-processing during Sangam Age (K2)
5. Comprehend Ancient Knowledge of Ocean & Fisheries(K2)
6. Understand the Scientific Tamil & Tamil Computing (K2)

CO- PO, PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO2	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO3	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO5	3	-	-	-	-	3	-	-	-	-	-	3	-	-
CO6	3	-	-	-	-	3	-	-	-	-	-	3	-	-

SEMESTER - II

24HSNC201 SDG NO. 4	NCC COURSE LEVEL 1	L	T	P	C
		2	0	0	0

ARMY WING

NCC GENERAL   **6**

NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS   **4**

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT   **7**

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP   **5**

L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT   **8**

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

NAVAL WING

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

ARMY WING

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2

NATIONAL INTEGRATION AND AWARENESS   **4**

NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1

PERSONALITY DEVELOPMENT   **7**

PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2

LEADERSHIP   **5**

| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani | 2 |

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT   **8**

SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1

TOTAL: 30 PERIODS

SEMESTER - II

24ESGE102 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:
- To provide exposure to the students with hands-on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering.

ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp, and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring.

4.   Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5.   Measurement of energy using single phase energy meter.
6.   Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

1.   Study of Electronic components and equipment – Resistor- colour coding, measurement of AC signal parameter (peak-peak RMS, period, frequency) using CRO.
2.   Study of logic gates AND, OR, EX-OR, and NOT.
3.   Generation of Clock Signal.
4.   Soldering practice – Components, Devices, and Circuits – Using general purpose PCB.
5.   Measurement of ripple factor of Half Wave Rectifier and Full Wave Rectifier.
6.   Simulation of Half Wave Rectifier and Full Wave Rectifier using TinkerCAD.

CIVIL ENGINEERING PRACTICE
Buildings:
Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:
1.   Study of pipeline joints, its location and functions: valves, taps, couplings,unions, reducers, elbows in household fittings.
2.   Study of pipe connections requirements for pumps and turbines.
3.   Preparation of plumbing line sketches for water supply and sewage works.
4.   Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5.   Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
1.   Study of the joints in roofs, doors, windows and furniture.
2.   Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:
1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding demo practice.

Basic Machining:
1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:
1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

Demonstration on:
1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

ELECTRICAL
1.	Assorted electrical components for house wiring	15 Sets
2.	Electrical measuring instruments	10 Sets
3.	Study purpose items:	
	Iron box, fan and regulator, emergency lamp	1 Each
4.	Megger (250V/500V)	1 No
5.	Power Tools:	
	Range Finder	2 Nos
	Digital Live-wire detector	2 Nos

ELECTRONICS
1.	Soldering guns	10 Nos
2.	Assorted electronic components for making circuits	50 Nos
3.	Small PCBs	10 Nos
4.	Multimeters	40 Nos

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.   15 Sets
2. Carpentry vice (fitted to work bench).   15 Nos
3. Standard woodworking tools.   15 Sets
4. Models of industrial trusses, door joints, furniture joints   5 each
5. Power Tools:
   Rotary Hammer   2 Nos
   Demolition Hammer   2 Nos
   Circular Saw   2 Nos
   Planner   2 Nos
   Hand Drilling Machine   2 Nos
   Jigsaw   2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders   5 Nos
2. Arc welding transformer with cables and holders   5 Nos
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.   5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.   2 Nos
5. Centre lathe.   2 Nos
6. Hearth furnace, anvil and smithy tools.   2 Sets
7. Moulding table, foundry tools.   2 Sets
8. Power Tool: Angle Grinder.   2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner. 1 each

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Infer the values of resistance, peak to peak RMS values, time period, frequency. [K2]
2. Outline the logic gates, rectifier, timer circuits and soldering practices. [K2]
3. Demonstrate the measurement of electrical parameters such as voltage, current, resistance, power and energy. (K2)
4. Illustrate the residential wiring, staircase wiring and fluorescent lamp wiring.[K2]

5. Prepare the carpentry and plumbing joints. (K2)
6. Perform the basic operations of welding, sheet metal work and basic machining operations in Lathe and Drilling (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO2	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO3	3	2	1	-	-	-	-	-	-	-	1	-	3	2
CO4	3	1	1	-	-	-	-	-	-	-	1	-	3	2
CO5	2	-	-	-	-	-	-	2	-	-	-	-	2	2
CO6	2	-	-	-	-	-	-	2	-	-	-	-	2	2

SEMESTER - II

24ENTP201 SDG NO. 4	DIGITAL DYNAMICS	L	T	P	C
		0	0	2	0

OBJECTIVES:
- Explore online communication
- Master computer skills
- Use virtual platforms
- Understand digital ethics and cyber security
- Observe and follow do's and don'ts

MODULE - I   DIGITAL CULTURE AND SOCIETY   6

Adapting to changes
Importance in today's digital landscape
Digital identity and self- presentation
Online communities and forums
Digital divide and consequences
Online collaboration and collective action

MODULE - II   DIGITAL LITERACY AND ACCESS TO TECHNOLOGY   5

Computer skills
Social and cultural understanding

Social media campaign and Activism
Netiquettes
Trending Technologies
Digital tools and softwares

MODULE - III DIGITAL ETHICS   **3**
Digital ethics and moral panics
The art of protecting secrets
Overview of digital tools

MODULE - IV CYBER SECURITY   **3**
Threats, vulnerability and consequences
Data making and usage practice
Importance of security

MODULE - V DIGITAL NETWORKING   **7**
Remote work and virtual teams
Authenticity in digital interactions
Engaging content creation
Tools and and techniques for insightful usage
Balancing online and offline interactions
Collaboration for research and innovation

**MODULE - VI   BUREAU OF INDIAN STANDARDS (BIS): BASIC CONCEPTS,
                STANDARDS FORMATION PROCESS AND CHALLENGES   6**
Standardization – Basic Concepts:
Basic concepts of standardization
Purpose of standardization, marking and certification of articles and processes
Importance of standards to industry, policy makers, trade, sustainability and innovation
Standards Formulation Process and Challenges:
Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/ IEC Directives
WTO Good Practices for Standardization
World of Standards:
Important Indian and International Standards

                                          TOTAL: 30 PERIODS

REFERENCES:

1. Communication Skills and Soft Skills – an Integrated Approach. Edited by E. Sureshkumar, P. Sreehari and J. Savithri, Pearson.
2. Silvia. P.J.2007. How to Read a Lot. Washington DC, American Psychological Association.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

OUTCOMES:

Upon completion of the course, the student will be able to:

1. Demonstrate basic understanding of effective online communication techniques (K1)
2. Show and utilize fundamental computer skills (K1)
3. Comprehend and apply the use of virtual platforms to enhance communication reachability (K2)
4. Understand and implement principles of digital ethics (K2)
5. Use basic technologies for securing data and maintaining information integrity (K1)
6. Understand the importance of standardization and adhere to BIS (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	2	-	2	-	-

SEMESTER - II

24ESID201	IDEA ENGINEERING LAB – II	L	T	P	CP	C
SDG NO. 1-17		0	0	2	2	1

OBJECTIVES:

To impart the basics of technologies that are used to identify sustainable solutions to societal problems

- To Provide awareness on Printed Circuit Board (PCB) design using ORCAD software.
- To Raise awareness of at least three Internet of Things (IoT) projects and their applications.
- To Upskill learners through practical experience with 3D printing and scanning technologies.
- To prepare the learners to correctly align the ideas to SDGs
- To comprehensive knowledge on entrepreneurship and effective idea presentation techniques.
- To evaluate the effectiveness and implementation strategy of SDGs through SCOUT for SDGs

MODULE-1   BASICS OF DESIGN THINKING IN ELECTRICAL AND
ELECTRONIC COMPONENTS   4

- Awareness Session on Basics of Design Thinking
- Study of Active & Passive Electronic Components
- Study of Basic AC & DC Electrical Circuits
- Study of Microprocessors & Microcontrollers
- Demonstration of Arduino Board, ESP 32 Board ,Raspberry Pi Board & PCB design software-Eagle
- Demonstration of PCB design using the software's Orcad, Eagle etc.

MODULE-2   EMBEDDED SYSTEMS, IOT AND ROBOTICS   4

- Study of sensors and transducers
- Study of embedded protocols
- Study of IOT protocols
- Demonstration of applications using embedded C
- Demonstration of robotic models
- Demonstration of drone models

MODULE-3   BASICS OF MECHANICAL ENGINEERING   4

- Study of mechanical modeling using fusion 360
- Demonstration of 3D scanner
- Demonstration of 3D printer
- Demonstration of laser cutter and RD works software
- Study of slicer software
- Study of master cam software

MODULE 4   ALIGNMENT AND MAPPING OF IDEAS   4

- Project Title: Problem Statement, solution and justification for SDG and SAP

MODULE-5   ENTREPRENEURSHIP SKILLS   4

- Startup Awareness
- Entrepreneurship Opportunities
- Mock Presentations
- Innovation
- Novelty Feasibility
- Presentation Skills

MODULE-6   SCOUT for SDGs   4

History of Scouting and Guiding - Introduction to Rovering and Rangering - Education objectives - Different Sections of Scouting- Bunnies, Cubs-Bulbuls, Scouts-Guides, Rovers-Ranger

Promise and Law: Scouting and Guiding with meaning to each point-how a boy and girl implement it on the daily life, saving life, Duties as citizens.

Leadership Skills: Mindsets of Leadership, Carrier Council. Community Service: Meaning, Types, duration, difference between community Service and Community Development.

Sairam SDG Ideathon   6

- Preparedness of Ideathon
- Idea Pitching

TOTAL: 30 PERIODS

REFERENCES:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education,2019
3. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House 4. Basic Mechanical Engineering by Pravin Kumar, Pearson Education

5. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
6. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2017.
7. JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
8. Scouts Hand Book

WEB REFERENCES
1. https://onlinecourses.nptel.ac.in/noc24_ee112/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs115/preview
3. https://onlinecourses.nptel.ac.in/noc24_me104/preview
4. https://onlinecourses.nptel.ac.in/noc24_me88/preview
5. http://sdgs.scout.org

OUTCOMES:
Upon completion of the course, the student will be able to:
1. Gain the knowledge on Basic Electronics & Electrical Circuits (K2)
2. Understand the Basics of Embedded systems, IOT & Robotics (K1)
3. Explore the Basics of Mechanical Modeling (K2)
4. Interpret the mapping of SDGs to ideas. (K2)
5. Comprehend the guidance for the Idea presentation and to Innovate the ideas for market opportunities (K2)
6. Understand the scouting as a way of life for community development and illustrate the ideas for Ideathon event emphatically (K4)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Po11
CO1	3	-	-	-	-	2	2	-	2	-	2
CO2	3	-	-	-	-	2	2	-	2	-	2
CO3	3	-	-	-	-	2	2	-	2	-	2
CO4	3	-	-	-	-	2	2	-	2	-	2
CO5	3	-	-	-	-	2	2	-	2	-	2
CO6	2	2	-	-	2	2	2	-	2	-	2

SEMESTER - III

24BSMA304 - SDG NO. 4	TRANSFORMS AND NUMERICAL METHODS	L	T	P	CP	C
		3	1	0	4	4

OBJECTIVES:

- Determine Laplace transform for various functions and basic properties
- Solving differential equations using Laplace transforms
- To introduce the basic concepts of solving algebraic and transcendental equations
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology discipline
- To introduce basic concepts of python for using the software to find the numerical solution.

MODULE - I LAPLACE TRANSFORMS   12

Existence conditions – Transforms of elementary functions – Transform of Unit step function and Unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Transform of Periodic functions.

MODULE - II INVERSE LAPLACE TRANSFORMS   9

Partial fraction method – using properties - Convolution theorem - Initial and Final value theorem - Solution of second order linear ordinary differential equations with constant coefficients.

MODULE - III NUMERICAL SOLUTIONS OF ALGEBRAIC AND
TRANSCENDENTAL EQUATIONS   12

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

MODULE - IV INTERPOLATION   9

Newton's forward and backward difference interpolation - Lagrange's and Newton's divided difference interpolations.

MODULE - V   NUMERICAL DIFFERENTIATION AND INTEGRATION   9

Approximation of derivatives using interpolation polynomials – Solution of single integrations using Trapezoidal, Romberg method, Simpson's 1/3 & 3/8 rules - Solution of Double integration using Trapezoidal, Simpson's 1/3 rules.

MODULE - VI PYTHON AND ITS NUMERICAL IMPLEMENTATION   9

Variables, Data types, Input/Output – Control structures: if, for, while - Functions and basic error handling - Introduction to Jupyter Notebook / Google Colab or any IDE – Python libraries for numerical computing – NumPy, SciPy, matplotlib, SymPy – Solving an algebraic / transcendental equation (scipy.optimize.bisect, scipy.optimize.newton) – Interpolating temperature data from a dataset (scipy.interpolate.lagrange, interp1d) - Differentiating a dataset to find velocity from displacement (numpy.gradient) - Integrating a function to find area under curve (scipy.integrate.trapz, scipy.integrate. simps).

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Numerical Analysis, Burden, R.L and Faires, J.D, 9th Edition, Cengage Learning, 2016.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th edition, John Wiley & Sons, 2006.
3. Higher Engineering Mathematics, Ramana B.V, Tata McGraw Hill Publishing Company, New Delhi, 2017.

REFERENCES:

1. Higher Engineering Mathematics, Dass H. K. and Er. Rajnish Verma, S. Chand, 2014.
2. Numerical Methods in Engineering and Science, Grewal B. S. and Grewal J. S., 10th edition, Khanna Publishers, New Delhi, 2015.
3. A Textbook of Engineering Mathematics, N. P. Bali and Manish Goyal, 9th edition, Laxmi Publications, 2016.
4. Applied Numerical Analysis, Gerald. C.F. and Wheatley. P.O, 7th edition, Pearson Education India, 2007.

WEB RESOURCES:

1. https://www.vyssotski.ch/BasicsOfInstrumentation/LaplaceTransform .pdf
2. https://www.sjsu.edu/me/docs/hsu-Chapter%206%20Laplace%20transform.pdf

3. https://www.maths.gla.ac.uk/~cc/2x/2005_2xnotes/2x_chap5.pdf
4.
   https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004032
   250571912siddharth_bhatt_engg_Interpolation.pdf
5. https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200403
   2250571912siddharth_bhatt_engg_Numerical_Differentation_and_Integ
   ration.pdf

ONLINE RESOURCES:
1. https://www.youtube.com/watch?v=c9NibpoQjDk
2. https://www.youtube.com/watch?v=2LyY4t0Gfvs
3. https://www.youtube.com/watch?v=AIysepirN3w
4. https://archive.nptel.ac.in/courses/111/107/111107105/#
5. https://nptel.ac.in/courses/105105043

OUTCOMES
Upon completion of the course, the student will be able to:
1. Apply Laplace transform techniques to solve engineering problems involving elementary, periodic, and piecewise functions. (K3)
2. Apply inverse Laplace transform techniques and related theorems to solve second-order linear differential equations. (K3)
3. Apply iterative and direct numerical methods to solve algebraic, transcendental, and linear systems of equations. (K3)
4. Apply Newton's and Lagrange's interpolation techniques to estimate values from discrete data. (K3)
5. Apply numerical techniques to approximate derivatives and evaluate definite single and double integrals. (K3)
6. Implement Python programming fundamentals and apply numerical computing libraries (NumPy, SciPy, matplotlib, SymPy) to solve engineering problems including equation solving, data interpolation, numerical differentiation, and integration using appropriate computational methods. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	2	-	-	-	-	-	-	-	2	-
CO2	3	2	-	2	-	-	-	-	-	-	-	2	-
CO3	3	3	2	3	2	-	-	-	-	-	-	2	2
CO4	3	2	2	3	2	-	-	-	-	-	-	2	2
CO5	3	2	2	3	2	-	-	-	-	-	-	2	2
CO6	3	3	2	3	3	-	-	-	-	-	2	3	2

SEMESTER - III

24MEPC301 112106310 SDG NO. 4,7,12,15	ENGINEERING THERMODYNAMICS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the basics of classical thermodynamics containing zeroth, first and second laws, and their corollaries.
- To apply the basics of first and second law for the analysis and design of thermal systems.
- To develop interest in subject by migrating to higher level for pursuing higher studies in the field.

MODULE - I   BASIC CONCEPTS   7

Thermodynamic systems and their types, Basic concepts of continuum, Microscopic and Macroscopic approach, Intensive and extensive properties, Path and point functions, Thermodynamic Equilibrium; state, path and process, quasi-static, State Postulate, Caloric theory, Heat and work transfer definition comparison & sign convention. Displacement work and other modes of work, p-V diagram. Zeroth law of thermodynamics, concept of temperature and thermal equilibrium.

MODULE - II   FIRST LAW OF THERMODYNAMICS   7

First law of thermodynamics, and its application to closed system, open systems, steady and unsteady flow processes.

MODULE - III SECOND LAW OF THERMODYNAMICS, CARNOT THEORY AND ENTROPY   8

Second Law of Thermodynamics, Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. High and low grade energy, Concept of Reversibility, Corollaries of second law, Carnot cycle , Reversed Carnot cycle, Coefficient of Performance, Clausius inequality, Concept of entropy, T-s diagram, entropy change for pure substances, principle of increase in entropy.

MODULE - IV PROPERTIES OF PURE SUBSTANCE,   STEAM PROPERTIES AND RANKINE CYCLE   8

Study of thermodynamic properties on p-v-T surface.   Study of Steam Table and Mollier Chart, dryness fraction. Ideal and actual Rankine cycles, Rankine Cycle Improvisation Methods, Reheat and Regenerative cycles.

MODULE - V   IDEAL, REAL GASES AND THERMODYNAMIC RELATIONS 7

Properties of Ideal and real gas - Equations of state for ideal and real gases. Reduced properties - Principle of Corresponding states. Generalized Compressibility Chart and its use, Maxwell relations, T ds Equations, Difference and ratio of heat capacities, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes.

MODULE - VI PSYCHROMETRY   8

Psychrometry, humidity, wet and dry bulb temperature, Psychrometric charts, Property calculations of air and vapour mixtures using chart and expressions. Psychrometric processes, adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing and their Applications.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics", Fifth Edition,2017, Lakshmi Publishers.
2. Nag.P.K., "Engineering Thermodynamics", 5th Edition, Tata McGraw-Hill, New Delhi, 2013.
3. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.

REFERENCES:
1. Yunus A. Cengel& Michael A. Boles, "Thermodynamics", 8th edition 2015.
2. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2016.

3. Borgnakke & Sonnatag, "Fundamental of Thermodynamics", 8th Edition , 2016.

WEB RESOURCES:
1. https://nptel.ac.in/courses/112/104/112104113/
2. https://nptel.ac.in/courses/112/108/112108148/
3. https://ww.mcgoodwin.net/pages/thermodynamics.pdf

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/112/102/112102255/
2. https://nptel.ac.in/courses/112/105/112105123/
3. https://nptel.ac.in/courses/101/104/101104063/
4. https://nptel.ac.in/courses/101/104/101104067/
5. https://nptel.ac.in/courses/112/105/112105220/
6. https://nptel.ac.in/courses/112/105/112105266/
7. https://nptel.ac.in/courses/112/103/112103275/

OUTCOMES
Upon completion of the course, the student will be able to:
1. Understand basics of thermodynamics its importance to life and world. [K3]
2. Understand first law and its application to thermal systems. [K4]
3. Explain second law of thermodynamics and its application to thermal devices, understand concept of entropy. [K3]
4. Calculate properties of steam, explain Rankine cycle and its application to steam power plant. [K3]
5. Calculate properties of ideal and real substance and derive various gas equations for real substance. [K3]
6. Predict the properties of gas mixtures, moisture and its application for various psychometric processes and basics of Refrigeration and air conditioning. [K3].

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO4	3	2	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	-	-	2	-
CO6	3	2	-	2	-	-	-	-	-	-	-	2	2

SEMESTER - III

24CEPC305 112105206 SDG NO. 4,6,9,14	FLUID MECHANICS AND MACHINERIES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To Understand Fundamental Fluid Properties and Static Behavior.
- To Apply Fluid Kinematics and Dynamics in Engineering Applications.
- To Analyze Internal and External Fluid Flow Phenomena.
- To Utilize Dimensional and Model Analysis for Fluid Systems.
- To Examine Hydraulic Machines.
- To Examine Pumping Systems.

MODULE - I   FUNDAMENTALS OF FLUID MECHANICS   8

PROPERTIES OF FLUID – Introduction – Properties of Fluids, Density, Specific Weight, Specific Volume and Specific Gravity – Viscosity – Compressibility and Bulk Modulus – Surface tension and Capillarity – Vapour pressure and Cavitation.

FLUID STATICS AND FLOATING BODIES - Pressure Measurement - Pressure at a point, Pascal's Law, Pressure variation in a fluid at rest. Buoyancy, Centre of Buoyancy, Types of Equilibrium of Floating Bodies.

MODULE - II   FLOW CHARACTERISTICS: KINEMATICS AND DYNAMICS 8

FLUID KINEMATICS - Introduction - Description of Fluid Motion - Types of Fluid Flow - Rate of Flow - Continuity Equation - Continuity Equation in Cartesian Coordinates.

FLUID DYNAMICS - Introduction - Equations of motion - Euler's Equation for Motion - Bernoulli's Equation for Real Fluid - Practical Applications of

Bernoulli's Equation Venturimeter, Orifice meter, Rotameter, Pitot Tube - Impulse-Momentum Equation - Moment of Momentum Equation.

MODULE - III LAMINAR FLOW AND BOUNDARY LAYER THEORY   8

LAMINAR FLOW - Introduction - Reynolds Experiment - Laminar Flow in Circular Pipes - Major losses - Darcy Weisbach equation - Friction Factor - Minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel.

BOUNDARY LAYER THEORY - Introduction - Boundary Layer Definitions and Characteristics - Boundary layer thickness - Displacement thickness - Momentum thickness - Energy thickness.

MODULE - IV DIMENSIONAL AND MODEL ANALYSIS   7

DIMENSIONAL ANALYSIS - Introduction - Fundamental dimensions - Dimensional homogeneity - Buckingham Pi theorem.

MODEL ANALYSIS - Introduction - Similitude - Types of Similarities- Dimensionless Number - Similitude and model studies - Distorted and undistorted models.

MODULE - V   HYDRAULIC MACHINES – TURBINES   7

Introduction - Theory of rotodynamic machines - Classification of turbines - Working principles - Velocity Triangles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

MODULE - VI PUMPS   7

Introduction - Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Discharge, Work Done and Power Required to Drive Reciprocating Pump - Coefficient of Discharge and Slip of Reciprocating Pump.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Dr R K Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, 5th Edition, Laxmi Publication, 2012.
2. Cengel Y. A. & Cimbala J., "Fluid Mechanics -Fundamentals and Applications", 3/e, McGraw Hill Edition, 2013.
3. Modi P N and Seth, S M Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019).

4.   Robert W. Fox, Alan T. McDonald, Philip J. Pirtchard John W. Mitchell, Introduction to Fluid Mechanics, 9th Edition, Wiley Publications, 2015.

REFERENCE BOOKS:
1.   1. R K Rajput, "A Text Book of Fluid Mechanics and Hydraulic Machines", 6th edition, S. Chand, 2015.
2.   Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John A. Roberson, Engineering Fluid Mechanics, John Wiley & Sons, 10th Edition, 2013.
3.   V L Streeter, Fluid Mechanics, McGraw Hill Book Co., 2010.
4.   White F M., "Fluid Mechanics", 7/e, McGraw Hill Edition, 2010.
5.   S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.

WEB RESOURCES:
1.   https://ekumbh.aicte-india.org/allbook.php#
2.   https://books.google.co.in/books?id=0clZbfwgiyUC&printsec= copyright&redir_esc=y#v=onepage&q&f=false
3.   https://www.slideshare.net/slideshow/r-k-bansal-a-textbook-of-fluid-mechanics-and-hydraulic-machines-9laxmipdf/255316731
4.   https://civil.aitmbgm.ac.in/wp-content/uploads/2023/01/Fluid-Mechanics-Fluid-Machines.pdf
5.   https://ggnindia.dronacharya.info/Downloads/Sub-info/RelatedBook/5thSem/FLUID-MACHINES-REFERENCE-BOOK-2.pdf
6.   https://nptel.ac.in/courses/112104118
7.   https://archive.nptel.ac.in/courses/112/104/112104117/#

ONLINE RESOURCES:
1.   https://nptel.ac.in/courses/105101082
2.   https://onlinecourses.nptel.ac.in/noc22_ce85/preview
3.   https://archive.nptel.ac.in/courses/112/105/112105287/
4.   https://archive.nptel.ac.in/courses/112/105/112105171/
5.   https://archive.nptel.ac.in/courses/112/105/112105206/

OUTCOMES
Upon completion of the course, the student will be able to:
1.   Explain the fundamental properties of fluids, pressure measurement techniques, buoyancy, and the stability of floating bodies. (K3)

2. Analyze different types of fluid motion and apply continuity, momentum, and energy equations to solve real-world flow problems. (K3)
3. Evaluate laminar flow in pipes, compute major and minor losses, and understand boundary layer formation and its effects. (K4)
4. Apply dimensional analysis and similitude principles to develop models for fluid flow experiments and engineering applications. (K4)
5. Understand the working principles, classifications, velocity triangles, and efficiency calculations of hydraulic turbines. (K5)
6. Analyze the performance of centrifugal and reciprocating pumps by evaluating head, efficiency, and power requirements. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	1	1	-
CO2	3	3	2	-	-	-	-	-	-	-	1	1	2
CO3	3	3	2	2	-	-	-	-	-	-	1	1	2
CO4	3	3	3	3	2	-	-	-	-	-	2	1	3
CO5	3	2	3	-	-	-	-	-	-	-	1	1	2
CO6	3	3	3	-	-	-	-	-	-	-	1	1	2

SEMESTER - III

24MEPC302 112105206 SDG NO. 4,8,9,12	ENGINEERING METALLURGY	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:
- To introduce students to the basic structure of alloys and phase diagrams.
- To help students understand the purpose and process of heat treatment.
- To explain advanced case hardening techniques.
- To explore the properties and applications of ferrous and nonferrous metals.
- To provide an understanding of ceramic materials and composites.
- To teach students about strengthening mechanisms and material testing.

MODULE - I   ALLOYS AND PHASE DIAGRAMS   8

Constitution of alloys– Solid solutions, substitutional and interstitial–phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron - microstructure, properties and application.

Plastic Deformation: Dislocations and Deformations by Slip, Twinning, Stacking faults. Dislocation Theory.

MODULE - II   HEAT TREATMENT - INTRODUCTION   7

Definition - Full annealing, stress relief, recrystallisation and spheroidising – normalizing, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR.

MODULE - III HEAT TREATMENT - CASE HARDENING   7

Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

MODULE - IV FERROUS AND NONFERROUS METALS & NON METALLIC
MATERIAL-POLYMER   8

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels– HSLA, Maraging steels– Cast Iron-Grey, white, malleable, Spheroidal – alloy cast irons, Copper and copper alloys Cupronickel–Aluminium and Al-Cu –precipitation strengthening treatment–Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA,PET,PC, PA,ABS, PI,PAI, PPO,PPS, PEEK, PTFE,Polymers – Urea and Phenol formaldehydes.

MODULE - V   NON METALLIC MATERIALS - CERAMICS   7

Engineering Ceramics – Properties and applications of Al_2O_3, SiC, Si_3N_4, PSZ and SIALON –Composites- Classifications- Metal Matrix and FRP - Applications of Composites.

MODULE - VI MECHANICAL METALLURGY AND TESTING OF MATERIALS
AND STRENGTHENING MECHANISMS   8

Strengthening Mechanisms: Cold working, Grain size control, precipitation strengthening, dispersion strengthening, particulate and fiber strengthening, texture strengthening.

Fracture: Types, Griffith's theory of brittle fracture. Testing of Materials - Tension, Torsion, Shear, Delamination, Hardness, Impact, fatigue and Creep Testing of materials according to ASTM Standards.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill Book Company,1997.
2. Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition 2014.

REFERENCES:
1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials",Prentice Hall of India Private Limited, 2010.
2. R.K.Rajput, " Engineering Materials and Metallurgy", S.Chand& Co
3. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd., 2015.
4. U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012
5. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering",Viva Books Pvt. Ltd., New Delhi, 2006

WEB REFERENCES:
1. https://nptel.ac.in/courses/112/108/112108150/
2. https://nptel.ac.in/courses/113/106/113106032/

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/122/102/122102008/
2. https://nptel.ac.in/courses/113/102/113102080/
3. https://nptel.ac.in/courses/113/104/113104074/
4. https://nptel.ac.in/courses/112/104/112104219/
5. https://nptel.ac.in/courses/113/105/113105028/
6. https://nptel.ac.in/courses/113/106/113106075/
7. https://nptel.ac.in/courses/112/104/112104220/

OUTCOMES
Upon completion of the course, the student will be able to:
1. Understand the concept of binary phase diagrams, reactions terminologies associated with metallurgy and also able to describe the microstructure of steel and cast iron.(K2)

2. Identify the suitable heat treatment processes for a specific requirement and demonstrate the hardenability tests on steel. (K2)
3. Identify the appropriate case hardening processes in the heat treatment of steel and enumerate the impact of alloying elements on the properties and applications of ferrous and non-ferrous metals in the broader engineering context. (K3)
4. Understand the properties and applications of the non-metallic materials (polymers) for suitable engineering applications. (K3)
5. Understand the properties and applications of the non-metallic materials (Ceramics and composites) for suitable engineering applications. (K3)
6. Comprehend the various plastic deformation mechanisms and its effect on mechanical properties and also able to test the mechanical properties of materials. (K4)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	3	3	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	3	-	-	-	-	-	-	3
CO4	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	3	-	-	-	-	-	3	3
CO6	3	-	-	3	3	-	-	-	-	-	-	3	3

SEMESTER - III

24MEPW301 112107144 SDG NO. 4,7,12,15	MANUFACTURING PROCESS WITH LABORATORY	L	T	P	CP	C
		3	0	2	5	4

OBJECTIVES:
- To impart foundational knowledge on metal casting processes
- To familiarize students with various metal joining techniques
- To provide a comprehensive understanding of metal forming techniques
- To develop competency in sheet metal fabrication
- To explore the processing and moulding of plastic components
- To introduce composite materials and their classifications

MODULE - I   METAL CASTING PROCESSES   8

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: Defects in Sand casting.– Testing and inspection of castings.

MODULE - II   JOINING PROCESSES   8

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 ,Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects:

MODULE - III METAL FORMING PROCESSES   8

Hot working and cold working of metals - Forging processes -. Rolling of metals- Types of Rolling - - Defects in rolled parts. Principle of rod and wire drawing - Tube drawing - Principles of Extrusion - Types - Hot and Cold extrusion

MODULE - IV SHEET METAL PROCESSES   7

Sheet metal characteristics - shearing, bending and drawing operations - Stretch forming operations - Metal spinning, Formability of sheet metal - High Energy Rate Forming processes: Explosive forming- Electro hydraulic forming,

MODULE - V   MANUFACTURE OF PLASTIC COMPONENTS   7

Introduction - Types and characteristics of plastics - Moulding of thermoplastics - working principles and typical applications - injection moulding - Plunger and screw machines - Compression moulding, Transfer Moulding .

MODULE - VI INTRODUCTION TO COMPOSITE MATERIALS   7

Definition-Matrix -polymers-metals-ceramics - Reinforcements: Particles, whiskers, inorganic fibers, metal filaments- ceramic fibers- fiber fabrication- natural composite - Advantages and drawbacks of composites.

LIST OF EXPERIMENTS

1. Basic melting and casting process.
2. Welding and cutting
3. Determination of power consumption in sheet rolling process
4. Ericson cupping test

5. Preparation of composite material
6. Construction of FLD of sheet metal .

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Stir Casting machine -1 No
2. Gas Welding set up - 1 No
3. Two High roll Mill- 1 No
4. Ericson cupping tester- 1 No

TOTAL: 60 PERIODS

TEXT BOOKS:
1. A Textbook of Manufacturing Technology: Manufacturing Processes - R. K. Rajput
2. HajraChouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology", Volume I and II, Media promoters and Publishers Private Limited, Mumbai, 2008.
3. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013.

REFERENCES:
1. P. N. Rao, Manufacturing Technology (Volume 1) – Foundry, Forging and Welding, 4th Edition, Tata McGraw Hill Education, New Delhi, 2013.
2. 2. Mikell P. Groover, Fundamentals of Modern Manufacturing Materials, Processes and Systems, Publishers: Wiley India, 2012

WEB REFERENCES:
1. https://nptel.ac.in/courses/112/107/112107084/
2. https://nptel.ac.in/courses/112/107/112107144/
3. https://nptel.ac.in/courses/112/106/112106153/
4. https://nptel.ac.in/courses/112/107/112107090/

ONLINE RESOURCES:
1. https://archive.nptel.ac.in/courses/112/107/112107083/
2. https://onlinecourses.nptel.ac.in/noc23_me90/preview
3. https://onlinecourses.nptel.ac.in/noc19_me52/preview
4. https://www.classcentral.com/course/youtube-mechanical-manufacturing-processes-i-47654

OUTCOMES

Upon completion of the course, the student will be able to:

1. Develop suitable casting processes for various materials and components (K2)
2. Identify a suitable welding process for an application.(K2)
3. Design a suitable metal forming system for making an industrial product(K3)
4. Summarize hot working and cold working methods of metals(K2)
5. Select fabrication method for polymer products and composite materials (K2)
6. Fabricate simple components by various manufacturing processes(K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	3	-	3	-	-	-	-	-	-	3	3
CO2	2	-	-	-	2	-	-	-	-	-	-	-	2
CO3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	-	-	-	2	-	-	-	-	-	-	3	3
CO6	3	-	3	-	3	-	-	-	-	-	-	-	3

SEMESTER - III

24HSMC301 - SDG NO. 4 & 9	UNIVERSAL HUMAN VALUES – II UNDERSTANDING HARMONY	L	T	P	CP	C
		2	1	0	3	3

OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Developing clarity with harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.
- Recognizing the potential of excellence than competition

SYLLABUS:

The course has 28 lectures and 14 practice sessions in 6 modules:

MODULE - I   COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION   (5+2)

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

MODULE - II UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF   (5+2)

6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

MODULE - III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY HARMONY IN HUMAN-HUMAN RELATIONSHIP   (6+2)

12. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

13. Understanding the meaning of Trust; Difference between intention and competence

14. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

15. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

MODULE - IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE   (6+2)

16. Understanding the harmony in the Nature

17. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature

18. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

19. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE - V   IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS   (4+4)

20. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

21. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

MODULE - VI UNIVERSAL HUMAN ORDER   (4+3)

25. Programs to ensure Sanyam and Health

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc

TOTAL : 45 PERIODS

TEXT BOOKS:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3rd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

REFERENCES:

1. AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology)Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values,A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj- Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda- Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

OUTCOMES

Upon completion of the course, the student will be able to:

1. Express the harmony of relationship among human being, family, society, nature and existence with right understanding and right feeling. (K2)
2. Develop the responsibility of handling problems by finding holistic and sustainable solutions based on the natural acceptance for maintaining mutual human relationships. (K2)

3. Develop a holistic perspective of life based on self-exploration about self, family, society and nature/existence. (K2)
4. Elucidate a critical ability for dedicative commitment towards human values, relationships and society. (K2)
5. Implement the process of verification and validation of learning in daily life. (K2)
6. Develop self reflection, commitment and courage to act in life challenging situations. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	3	2	-	-	3
CO2	-	1	-	-	-	3	3	2	-	-	-
CO3	-	-	3	-	-	3	3	2	-	-	-
CO4	-	-	-	-	-	3	3	2	-	2	3
CO5	-	-	-	-	-	3	3	-	-	-	3
CO6	-	-	-	-	-	3	3	-	-	3	2

SEMESTER - III

24HSNC301 - SDG NO. 4	**NCC COURSE LEVEL 2**	L	T	P	CP	C
		3	0	0	3	0

ARMY WING

PERSONALITY DEVELOPMENT 9

PD 3   Group Discussion: Change your mindset, Time Management, Social Skills 6

PD 5   Public Speaking 3

LEADERSHIP 7

L 2   Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 7

DISASTER MANAGEMENT 13

DM 1   Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation 3

| DM 2 | Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters | 9 |
| DM 3 | Fire Service & Fire Fighting | 1 |

ENVIRONMENTAL AWARENESS & CONSERVATION   **3**

| EA 1 | Environmental Awareness and Conservation | 3 |

GENERAL AWARENESS   **4**

| GA 1 | General Knowledge | 4 |

ARMED FORCES 6

| AF 1 | Armed Forces, Army, CAPF, Police | 6 |

ADVENTURE   1

| AD 1 | Introduction to Adventure Activities | 1 |

BORDER & COASTAL AREAS   **2**

| BCA 1 | History, Geography & Topography of Border/Coastal areas | 2 |

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT   **9**

| PD 3 | Group Discussion: Change your mindset, Time Management, Social Skills | 6 |
| PD 5 | Public Speaking | 3 |

LEADERSHIP 7

| L 2 | Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 | 7 |

DISASTER MANAGEMENT   **13**

DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION   **3**

| EA 1 Environmental Awareness and Conservation | 3 |

GENERAL AWARENESS   **4**
GA 1   General Knowledge   4

NAVAL ORIENTATION 6
AF 1   Armed Forces and Navy Capsule   3
EEZ 1   EEZ Maritime Security and ICG   3
ADVENTURE   1
AD 1   Introduction to Adventure Activities   1

BORDER & COASTAL AREAS   **2**
BCA 1   History, Geography & Topography of Border/Coastal areas   2
TOTAL: 45 PERIODS

AIR FORCE WING
PERSONALITY DEVELOPMENT 9
PD 3   Group Discussion: Change your mindset, Time Management, Social Skills   6
PD 5   Public Speaking   3

LEADERSHIP   7
L 2   Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965   7

DISASTER MANAGEMENT   **13**
DM 1   Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation   3
DM 2   Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters   9
DM 3   Fire Service & Fire Fighting   1

ENVIRONMENTAL AWARENESS & CONSERVATION   **3**
EA 1   Environmental Awareness and Conservation   3

GENERAL AWARENESS   **4**
GA 1   General Knowledge   4

GENERAL SERVICE KNOWLEDGE   **6**
GSK 1   Armed Forces & IAF Capsule   2

GSK 2   Modes of Entry in IAF, Civil Aviation   2
GSK 3   Aircrafts - Types, Capabilities & Role   2

ADVENTURE   1
AD 1   Introduction to Adventure Actitivities   1

BORDER & COASTAL AREAS   **2**
BCA 1   History, Geography & Topography of Border/Coastal areas   2

TOTAL :45 PERIODS

SEMESTER - III

24MEPL301- SDG NO. 4,6,9,14	COMPUTER AIDED MACHINE DRAWING LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:
- To make the students understand and interpret drawings of machine components.
- To prepare assembly drawings both manually and using standard CAD packages.
- To familiarize the students with Indian Standards on drawing practices and standard components.
- To gain practical experience in handling 2D drafting.

LIST OF EXPERIMENTS:
1. Study of Introduction to Machine Drawing.
2. Study of BIS specifications– Welding symbols, riveted joints, keys, Fasteners.
3. Study of Limits, Fits of individual dimensions.
4. Study of Basic principles of geometric dimensioning & tolerance.
5. 2D assembly drawing of Screw Jack.
6. 2D assembly drawing of Plummer Block.
7. 2D assembly drawing of Flange Coupling.
8. 2D assembly drawing of Universal Coupling.
9. 2D assembly drawing of Knuckle Joint.
10. 2D assembly drawing of Gib & Cotter Joint.
11. 2D assembly drawing of Sleeve & Cotter Joint.
12. 2D assembly drawing of Engine Piston.

13. 2D assembly drawing of Connecting Rod.
14. 2D assembly drawing of Lathe Tailstock.
15. 2D assembly drawing of Stuffing Box.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No	List of Equipment	Qty.
1	Pentium IV computer or better hardware, with suitable graphics facility.	30
2	Licensed Software for 2D Drafting and 3D Modeling	30
3	LASER Printer	1

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, the student will be able to:

1. Interpret BIS standards, welding symbols, riveted joints, fasteners, fits, and geometric tolerances to create technically accurate machine drawings (K3).
2. Develop detailed 2D assembly drawings of mechanical components and subassemblies such as screw jack, flange coupling, piston, and connecting rod using conventional drawing practices (K3).

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	3	-	-	-	2	-	2	-	3
Co2	-	-	2	-	3	-	-	-	2	-	2	-	3

SEMESTER - III

24METP301 - SDG NO. 4	**APTITUDE SKILLS**	L	T	P	CP	C
		0	0	2	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Educate and enrich students on quantitative ability, reasoning ability, and verbal ability.
- Build a strong foundation for solving recruitment-based problems with speed and accuracy.
- Enhance creative thinking skills.
- Enhance logical problem-solving skills.

MODULE - I   QUANTITATIVE ABILITY   22

● Number Properties, Speed Math, HCF and LCM, Percentages, Time and Work, Time Speed and Distance, Ratio Proportion and Variations, Averages Mixtures and Alligation

MODULE - II   QUANTITATIVE ABILITY REASONING ABILITY   16

● Profit and Loss, Simple Interest and Compound Interest, Blood Relation, Directions, Coding and Decoding, Series, Ranking and Arrangements

MODULE - III VERBAL ABILITY   7

● Subject-Verb Agreement, Tenses, Prepositions - Concepts, Error Spotting, Sentence Correction, Fill in the Blanks

TOTAL: 45 PERIODS

REFERENCES:
1. Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2. A Modern Approach to Logical Reasoning – R.S. Aggarwal
3. High School English Grammar & Composition – Wren & Martin
4. Word Power Made Easy – Norman Lewis.
5. Fast Track Objective Arithmetic – Rajesh Verma

LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS – PHASE 2

OBJECTIVES:
● Familiarize the team and leadership skills.
● Understand the standards relevant to ECE.

MODULE - I JEEVAN KAUSHAL 2.0 – TEAM SKILLS AND LIFE SKILLS 14

Trust and Collaboration: Importance of Trust in Creating a Collaborative Team- Agree to Disagree and Disagree to Agree – Spirit of Teamwork- Understanding Fear of Being Judged and Strategies to Overcome Fear.

Listening as a Team: Advantages of Effective Listening, Listening as a Team Member and Team Leader.

Brainstorming: Brainstorming as a Technique to Promote Idea Generation, Brainstorming: Meaning and the Process, Procedure for Conducting Brainstorming, Importance of Using Brainstorming Technique, Types of Brainstorming.

Social and Cultural Etiquette: Need for Etiquette, Aspects of Social and Cultural/Corporate Etiquette in Promoting Teamwork, Importance of Time, Place, Propriety and Adaptability to Diverse.

Internal Communication: Internal Communication – Meaning and Need, Use of Various Channels of Transmitting Information to Team Members including Digital and Physical.

Leadership Skills: Understanding Leadership and Its Importance, Models of Leadership, Basic Leadership Skills.

MODULE - II RANGER AND ROVER   10

Four Bonds of BSG: Sign, Salute, Left Handshake, Moto and Good Turn.

Discipline and Uniform: Uniform of Rovers and Rangers, 14 Programme ideals.

Knowledge of Merit: Know about Knowledge of Merit Badges (Proficiency Badge).

Sustainability E-learning: (Online Course Available in WOSM Learning Zone).

Activating the Earth Tribe Initiative in your Community.

MODULE - IIIINTRODUCTION OF STANDARDS & TECHNICAL
DRAWINGS   6

Standardization – Basic Concepts: Basic concepts of standardization; Purpose of Standardization, marking and certification of articles and processes; Importance of standards to industry, policy makers, trade, sustainability and innovation.

Standards Formulation Process and Challenges: Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/IEC Directives; WTO Good Practices for Standardization.

World of Standards: Important Indian and International Standards.

Technical Drawings: Types of projections; representation of lines, view, sections and cuts. Standardized representation of threads, fasteners, welds, bearings, springs and related components. Limits, fits and tolerances, dimensional and geometric tolerances, surface finish symbols.

TOTAL: 30 PERIODS

REFERENCES:
1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES
1. https://lms.scout.org/course_items/show/1172182?course_id= 214307#course-item-id=1172182

2. https://lms.scout.org/courses/show/214123?force_course_hub= true

OUTCOMES

Upon completion of this course, the students will be able to:

1. Demonstrate improved quantitative aptitude for solving numerical problems. [K2]
2. Apply logical reasoning to tackle reasoning-based challenges. [K2]
3. Enhance verbal communication and comprehension skills through grammar and language exercises. [K2]
4. Exhibit critical thinking and problem-solving skills in various cognitive scenarios. [K2]
5. Realize life skills. [K2]
6. Explain the fundamental concepts, processes, and significance of standardization and interpret standardized technical drawings and symbols used in engineering design. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	1	-	-	-	1	-	2	-	-
CO3	2	2	2	2	-	-	-	-	1	-	2	-	-
CO4	2	2	2	2	1	-	-	-	1	-	2	-	-
CO5	-	-	-	-	-	3	-	-	1	-	2	2	2
CO6	-	-	-	-	-	3	-	-	1	-	2	2	2

SEMESTER - III

24ECID301 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - I	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To provide opportunities for students to develop an entrepreneurial mindset and explore real-world problem-solving through a startup-centric approach.
- To enable hands-on experience in identifying market needs
- To enable development of skill sets for designing, validating, and realizing a Minimum Viable Product (MVP) for an entrepreneurial venture.

- To guide students in validating market opportunity, and formulating a solution with realistic constraints.
- To inculcate ethical research practices, foster a commitment to lifelong learning, and promote the development of socially responsible and sustainable innovations aligned with relevant Sustainable Development Goals (SDGs).
- To prepare students to design sustainable business models and present entrepreneurial ideas through structured, outcome-driven business pitches using core startup frameworks.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, specifically through the lens of entrepreneurship and innovation.
2. The project work must involve identifying a problem, validating market opportunity, and developing a solution with realistic constraints, culminating in a business plan and prototype/MVP. It must also include appropriate elements of the following: market research, competitive analysis, value proposition design, business model development, financial feasibility, go-to-market strategy, and potentially software/hardware development for the MVP.
3. Project can be individual work or a group project, with a maximum of 3 students. In case of a group project, the individual project report of each student should specify the individual's contribution to the group project. The roles and responsibilities of all team members must be well-defined and documented.
4. On completion of the project, the student shall submit a detailed project report outlining their entrepreneurial journey, solution development, and business plan. The project should be reviewed and the report shall be evaluated, and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION:

1. First evaluation (Milestone 1 - Week 4): 20 marks (Focus on Problem Identification, Opportunity Discovery, Customer & Markets, Value Proposition)
2. Second evaluation (Milestone 2 - Week 8): 30 marks (Focus on Competitive Advantage, Business Model, and MVP Development)
3. Final evaluation (Milestone 3 & 4 - Last week of the semester): 50 marks (Focus on Financial Feasibility, Go-to-Market Strategy, Growth and Scale, Funding Strategy, and Overall Project Report & Viva-Voce)

Note: All three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
1. Apply entrepreneurial thinking to identify and articulate real-world problems and explore market needs using structured approaches. (K3)
2. Develop skill sets to design potential solutions and validate market opportunities within realistic constraints. (K4)
3. Evaluate sustainable, ethical, and responsible innovation strategies, and communicate business models effectively. (K5)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	-	-	-	2	2
Co3	3	3	2	-	-	-	-	2	-	-	-	2	2

SEMESTER - IV

24MEPC401 112103316 SDG NO. 4,7,9,13	THERMAL ENGINEERING	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the basics of Power Producing and Power consuming thermal system and their functioning.
- To apply above basics for the analysis and design of such systems.

MODULE - I GAS POWER CYCLES   8

Air standard cycles, Otto cycle, Diesel cycle, Dual cycle and Brayton cycle, efficiency, mean effective pressure. Performance analysis of cycles.

MODULE- II AIR SYSTEMS   7

Compressor, fans and blowers; rotary and reciprocating. Their types, classification and functioning. Single and multi-stage compressor. Performance calculation and power consumption for compressor.

MODULE -III I.C. ENGINES   8

S.I. Engine and C.I. Engines. Two and Four stroke Engines, Valve timings, Components of Engines. Auxiliary Systems such as air system, cooling system, lubrication system, fuel system, lubricating system etc. of S.I. and C.I. Engines, Super-charging, Carburettor and Fuel Engine System, Governing and performance analysis of engines.

MODULE- IV BOILERS AND COGENERATION   7

Boilers its types, power and process boilers, its accessories and mountings, functioning of various accessories. Cogeneration.

MODULE- V STEAM TURBINE   8

Nozzle and diffusers, their function, pressure ratio, Steam Turbines, Types, Impulse and reaction principles, construction of steam turbine, Velocity diagrams, Work done and efficiency calculation, optimal operating conditions. Multi-staging, compounding and governing.

MODULE - VI REFERIGERATION AND AIRCONDITIONING   7

Vapor compression and vapor absorption refrigeration cycle, Performance calculation, Effect of superheat and sub-cooling, working principle of air cycle, and concept of RSHF, GSHF and ESHF, Cooling load calculations. Components

of air conditioning systems and working principle of summer and winter air conditioning.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Rajput. R. K., "Thermal Engineering", S. Chand Publishers, 2017.
2. Rudramoorthy R., "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003.
3. Nag P.K, "Power Plant Engineering", Tata McGraw-Hill, New Delhi, 1st edition, 2002.

REFERENCES:
1. I Kothandaraman. C.P, Domkundwar. S, Domkundwar. A.V., "A course in thermal Engineering", Fifth Edition, DhanpatRai& sons , 2016.
2. Arora C. P. "Refrigeration and Air Conditioning", Tata McGraw-Hill, 2008.
3. Ganesan V., "Internal Combustion Engines", Third Edition, Tata Mcgraw-Hill 2012.
4. Ramalingam K.K., "Thermal Engineering", SCITECH Publications (India) Pvt. Ltd., 2009.
5. Sarkar B.K, "Thermal Engineering", Tata McGraw-Hill Publishers, 2007.

WEBRESOURCES:
1. https://nptel.ac.in/courses/112/106/112106133/
2. https://nptel.ac.in/courses/112/105/112105129/

ONLINERESOURCES:
1. https://nptel.ac.in/courses/112/107/112107216/
2. https://nptel.ac.in/courses/112/107/112107291/
3. https://nptel.ac.in/courses/112/103/112103277/
4. https://nptel.ac.in/courses/112/103/112103275/
5. https://nptel.ac.in/courses/112/107/112107208/
6. https://nptel.ac.in/courses/112/105/112105128/

OUTCOMES
Upon completion of the course, the student will be able to:
1. Understand different power cycles. [K3]
2. Gain knowledge of different air systems. [K3]
3. Understand different types of IC Engines and their parts and its functioning. [K3]

4. Learn different types of boilers and thermal power generation. [K3]
5. Understand steam turbine and its functioning. [K3]
6. Gain knowledge and understand working of different types of air conditioning systems. [K4]

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	-	-	2	2
CO2	3	3	-	-	2	-	-	-	-	-	-	2	-
CO3	3	3	-	-	2	-	-	-	-	-	-	3	2
CO4	3	3	-	-	2	-	-	-	-	-	-	2	2
CO5	3	3	-	-	2	-	-	-	-	-	-	2	-
CO6	3	3	-	-	2	-	-	-	-	-	-	2	2

SEMESTER - IV

24MEPC402 112104250 SDG NO. 4,8,9,12,16	METROLOGY AND MEASUREMENTS	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:
- To introduce the fundamentals of metrology
- To provide knowledge on angular measurement techniques
- To develop understanding of form and surface measurement
- To impart knowledge on laser-based metrology systems
- To enable students to measure mechanical parameters
- To familiarize students with advanced metrology tools

MODULE - I   BASICS OF METROLOGY   7

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards - Limit gauges – gauge design – terminology – procedure – concepts of interchange ability and selective assembly.

MODULE- II ANGULAR MEASUREMENTS 7

Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

MODULE- III FORM MEASUREMENT 7

Thread Measurement – Measurement of effective diameter using Two wire and Three wire method - Principles and Methods of straightness – Flatness measurement – Surface finish measurement, Roundness measurement – Applications.

MODULE - IV LASER IN METROLOGY 8

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment.

MODULE -V MEASUREMENT OF POWER, FLOW AND TEMPERATURE 8

Force, torque, power - mechanical, Pneumatic, Hydraulic, and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer.

MODULE- VI ADVANCES IN METROLOGY 8

Basic concept of CMM – Types of CMM – Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Jain R.K. "Engineering Metrology", Khanna Publishers, 2005.
2. Gupta. I.C., "Engineering Metrology", Dhanpatrai Publications, 2005.

REFERENCES:
1. Alan S. Morris, "The essence of Measurement", Prentice Hall of India 1996.
2. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education , 2014.
3. Charles Reginald Shotbolt, "Metrology for Engineers", 5th edition, Cengage Learning EMEA,1990.
4. Donald Peckman, "Industrial Instrumentation", Wiley Eastern, 2004.

5. Raghavendra ,Krishnamurthy "Engineering Metrology & Measurements", Oxford Univ. Press, 2013.

WEB REFERENCES:
1. https://nptel.ac.in/courses/112/106/112106139/
2. https://www.matweb.com

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2. https://nptel.ac.in/courses/112/106/112106179/
3. https://nptel.ac.in/courses/112/104/112104250/
4. https://nptel.ac.in/courses/112/103/112103261/
5. https://nptel.ac.in/courses/112/106/112106140/
6. https://nptel.ac.in/courses/112/107/112107242/
7. https://nptel.ac.in/courses/112/107/112107259/

OUTCOMES
Upon completion of the course, the student will be able to:
1. Explain the importance of metrology, elements affecting measurements, and types of errors,precision, accuracy, and interchangeability in measurements.(K2)
2. Demonstrate the working principles and applications of angular measuring instruments such as bevel protractors, sine bars, autocollimators, and clinometers. (K3)
3. Apply different methods to measure thread dimensions, straightness, flatness, surface finish, and roundness. (K3)
4. Apply laser interferometry for straightness and alignment measurements. (K3)
5. Compare mechanical, pneumatic, hydraulic, and electrical methods of force, torque, and power measurement. (K4)
6. Understand the working principles and applications of Coordinate Measuring Machines (CMM) and Machine Vision Systems.(K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3
CO3	3	-	-	3	3	-	-	-	-	-	-	-	3
CO4	3	-	-	3	3	-	-	-	-	-	-	-	3
CO5	3	3	-	-	3	-	-	-	-	-	-	3	3
CO6	3	-	-	-	3	-	-	-	-	-	3	3	3

SEMESTER - IV

24MEPC403 112105268 SDG NO. 4,9,12	THEORY OF MACHINES	L	T	P	CP	C
		3	0	0	3	3

OBJECTIVES:

- To understand the principles in the formation of mechanisms and their kinematics.
- To learn the basic concepts of toothed gearing and kinematics of gear trains.
- To study the types of Cams & Followers and to draw the Cam Profile based on the follower motion.
- To analyze the forces and torque acting on Reciprocating Engines and Balancing of Rotating & Reciprocating masses.
- To know the concepts of vibration and the related parameters.
- To examine the effect of friction in different machine elements and to understand the principle of stability control.

MODULE - I   BASICS OF MECHANISMS AND KINEMATICS   7

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of Freedom, Mobility, Kutzbach criterion, Gruebler's criterion (Definitions only) – Grashof's Law - Kinematic inversions of four-bar chain and slider crank chains. Relative Velocity method (Graphical Method) for the Velocity and Acceleration analysis of Four bar chain and Single slider Mechanisms.

MODULE - II GEARS AND GEAR TRAINS   7

Types of Gears - Law of gearing (Definition only) - Spur Gear terminology – Involute and Cycloidal tooth profiles – Problems on Length of path of Contact and Arc of Contact - Contact ratio and Interference.(No derivations) Gear trains – Speed ratio, train value – Parallel axis gear trains.

MODULE - III KINEMATICS OF CAM   7

Classification of Cams and Followers – Terminology and definitions – Displacement diagrams –Uniform velocity, Simple harmonic, Parabolic and Cycloidal motions- Layout of plate cam profiles with Reciprocating Followers - Pressure angle.

MODULE - IV FORCE ANALYSIS AND BALANCING OF FORCES   8

D- Alembert's principle – Dynamic force Analysis in reciprocating engines. Static and dynamic balancing– Balancing of Rotating and Reciprocating masses – Balancing of masses rotating in same and different planes - Balancing of Single cylinder and Four-cylinder inline Engines.

MODULE - V   FREE AND FORCED VIBRATIONS   8

Basic features of vibratory systems – Free vibration– Equations of motion (Definitions only)-   Dunkerley's method - Natural frequency-Critical speed of shafts. Free Damped vibration, Types of Damping (Definitions only)–Logarithmic decrement-Damping factor. Forced, Damped Vibration - Periodic Harmonic forcing – Amplitude of Vibration & Transmissibility.

MODULE - VI FRICTION ELEMENTS AND CONTROL MECHANISMS   8

Friction in screw threads (Definitions only)– Screw Jack – Pivot and Collar Bearings – Flat & V-Belt drives. Gyroscopic forces and couples - Gyroscopic effects in Aeroplanes and Ships .

TOTAL : 45 PERIODS

TEXT BOOKS:
1.   Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press, 2009.
2.   Khurmi, R.S.,"Theory of Machines", 14th Edition, S Chand Publications, 2020.
3.   Rattan, S.S, "Theory of Machines", 5th Edition, Tata McGraw-Hill, 2019.

REFERENCES:
1.   V.P.Singh,"Mechanical Vibrations", Dhanpat Rai & Co (p) Ltd., New Delhi, 2015.

2. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.

3. V.Ramamurthi, "Mechanics of Machines", Narosa Publishing House, 2002.

4. Rao.J.S. and Dukkipati.R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.

5. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.

6. Allen S. Hall Jr., "Kinematics and Linkage Design", Prentice Hall, 1961.

7. Thomas Bevan, "Theory of Machines",3rd Edition, CBS Publishers and Distributors, 2005.

8. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2005.

WEB REFERENCES:
1. http://www.mekanizmalar.com
2. http://www.mechanisms.com
3. http://dynref.engr.illinois.edu

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/112/104/112104121/
2. https://nptel.ac.in/courses/112/105/112105268/
3. https://nptel.ac.in/courses/112/104/112104114/

OUTCOMES

Upon completion of the course, the student will be able to:
1. Identify the suitable mechanisms required for a specified motion with the basic principles in the formation of simple mechanisms and its kinematics. (K3)
2. Determine the working parameters of Gears and Kinematics of Gear trains by knowing the types, Terminologies of Gears and Gear trains. (K3)
3. Prepare the Cam Profile, according to Follower motion relating to the types, application of Cams & followers. (K3)
4. Analyze the forces and torque acting on Reciprocating Engines and Balancing of Rotating & Reciprocating masses. (K3)
5. Calculate the various parameters of Vibration through the concepts and equations on types of vibrating systems (K3)
6. Examine the effect of friction on different machine elements and stability control devices. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	-	-	-	1	-	-	-	-	-	3	2
CO2	2	3	-	-	-	1	-	-	-	-	-	3	2
CO3	2	2	-	-	-	1	-	-	-	-	-	2	2
CO4	2	3	-	-	-	1	-	-	-	-	-	3	2
CO5	2	3	-	-	-	1	-	-	-	-	-	3	2
CO6	2	3	-	-	-	1	-	-	-	-	-	3	2

SEMESTER - IV

24CEPC405 105104160 SDG NO. 4, 9	STRENGTH OF MATERIALS	L	T	P	CP	C
		3	1	0	5	4

OBJECTIVES:

- To calculate stresses and deformations in simple and compound bars under axial loads.
- To determine thermal stresses in bars and analyze principal stresses
- To solve problems involving stress and deformation in thin and thick pressure vessels.
- To analyze torsion problems in shafts and calculate stresses in helical springs
- To draw shear force and bending moment diagrams and compute bending stresses in beams
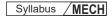- To calculate beam deflections and determine buckling loads for columns.

MODULE - I   STRESS, STRAIN & DEFORMATIONS OF SOLIDS   8

Definition of Stress and Strain – Tension, Compression and Shear Stresses. Stress-Strain relationship and Hooke's law. Deformation of simple bars and compound bars. Elastic constants and their relations.

MODULE - II   THERMAL STRESSES AND ANALYSIS OF STATE OF STRESS 7

Thermal stresses – Bars in Series and Bars in Parallel. Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

MODULE - III THIN AND THICK SHELLS   7

Stresses and deformation in thin and thick cylinders subjected to internal pressure. Stresses and deformation in thin and thick spherical shells subjected to internal pressure.

MODULE - IV TORSION AND SPRINGS   7

Torsion Equation - Deformation in solid and hollows shafts, Stepped shafts. Stresses and deflection in closed coil helical springs with axial load.

MODULE - V   STRESSES IN BEAMS   8

Transverse loading on beams – Shear force and bending moment diagram – Cantilever, simply supported and over hanging beams. Theory of simple bending – bending stress distribution.

MODULE - VI DEFLECTION OF STRUCTURAL ELEMENTS   8

Computation of slope and deflection in beams – Double Integration method, Macaulay's method.
Column - Computation of buckling load using Euler's Equation and Rankine Formula.

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Ferdinand P. Beer and E. Russell Johnston Jr., "Mechanics of Materials", 7th Edition in S.I. Units, McGraw Hill Education (India) Pvt. Ltd., 2017.
2. Bansal, R.K., "A Text Book of Strength of Materials", Laxmi Publications (P) Ltd. New Delhi, 2024.

REFERENCES:
1. Rajput, R.K., "A Textbook of Strength of Materials (Mechanics of Solids) SI Units, 7/e (LPSPE)", S. Chand Publications, 2022.
2. Jindal U.C., "Strength of Materials", 2nd Edition, Pearson India Education, 2018.
3. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2016.
4. Hibbeler, R.C., "Mechanics of Materials", Pearson India Education, 2017.

WEB RESOURCES:
1. http://ocw.mit.edu/courses/mechanical-engineering
2. http://nitc.ac.in/index.php/?url=users/view/270/12/3

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/105/106/105106116/
2. https://nptel.ac.in/courses/112/106/112106141/
3. https://nptel.ac.in/courses/105/106/105106172/
4. https://nptel.ac.in/courses/112/107/112107146/
5. https://nptel.ac.in/courses/112/107/112107147/

OUTCOMES

Upon completion of the course, the student will be able to:
1. Apply the concepts of stress and strain to determine the deformation of deformable bodies. (K3)
2. Determine the stresses developed due to thermal response and in inclined plane due to axial load. (K3)
3. Compute the Stresses and deformation of thin and thick vessels subjected to internal pressure. (K3)
4. Calculate the dimensions and deformation of cylindrical member's subjected to torsional load. (K3)
5. Compute the stresses and dimensions of the structural member subjected to transverse load. (K3)
6. Determine the deflection in structural member subjected to transverse load and Axial Load. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3
CO4	3	2	2	-	-	-	-	-	-	-	-	2	3
CO5	3	2	2	-	-	-	-	-	-	-	-	2	3
CO6	3	2	2	-	-	-	-	-	-	-	-	2	3

SEMESTER - IV

24MEPW401 112105233 SDG NO. 9, 11, 12	MACHINE TOOL TECHNOLOGY WITH LABORATORY	L	T	P	CP	C
		3	0	2	5	4

OBJECTIVES:

- To provide fundamental knowledge of metal cutting principles
- To familiarize students with various turning machines
- To impart understanding of shaper, milling, drilling, and gear cutting operations
- To introduce abrasive machining and broaching processes
- To develop competency in CNC machining and part programming
- To expose students to unconventional machining methods

MODULE - I   THEORY OF METAL CUTTING   8

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.

MODULE- II   TURNING MACHINES   8

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

MODULE - III SHAPER, MILLING AND GEAR CUTTING MACHINES   8

Shaper — Types of operations. Drilling,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting — forming and generation principle and construction of gear milling, hobbing and gear shaping processes –finishing of gears.

MODULE - IV ABRASIVE PROCESS AND BROACHING   7

Abrasive processes: grinding wheel — specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications — concepts of surface integrity, broaching machines: broach construction — push, pull, surface and continuous broaching machines

MODULE- V   CNC MACHINING   7

Numerical Control (NC) machine tools — CNC types, constructional details, special features, machining centre, part programming fundamentals CNC — manual part programming — micromachining — wafer machining.

MODULE -VI UNCONVENTIONAL MACHINING PROCESSES   7

Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, UltrasonicMachining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish,tool wear, dielectric, power and control circuits, wire EDM; Electrochemical machining (ECM), etchant &masking, process parameters, MRR and surface finish.Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron BeamMachining.

LIST OF EXPERIMENTS

1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. CNC Part Programming

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Turret and Capstan Lathes – 1 No each.
2. Horizontal Milling Machine – 2 Nos.
3. Vertical Milling Machine – 1 No.
4. Surface Grinding Machine – 1 No.
5. Cylindrical Grinding Machine – 1 No.
6.   Radial Drilling Machine – 1 No.
7. lathe Tool Dynamometer– 1 No.
8. Milling Tool Dynamometer – 1 No.
9. Gear Hobbing Machine – 1 No.
10. Tool Makers Microscope – 1 No.
11. CNC Lathe – 1 No.
12. CNC Milling machine – 1 No.

13. Gear Shaping machine – 1 No.
14. Centreless grinding machine – 1 No.
15. Tool and cutter grinder – 1 No.

TOTAL: 60 PERIODS

TEXT BOOKS:
1. A. Ghosh and A. K. Mallik, Manufacturing Science, East West Press, Second Edition, 2010.
2. Mikell P. Groover, Fundamentals of modern manufacturing: materials, processes, and systems. John Wiley & Sons, 2010.
3. P N Rao, Manufacturing Technology Vol 2, 4th Edition. Tata Mc Graw Hill Publishers.2018

REFERENCES:
1. Production Technology HMT, Tata McGraw Hill, 2001.
2. M. C. Shaw, Metal Cutting Principles, Second Edition, Oxford University Press, 2005.
3. P. K. Mishra, Nonconventional Machining, Narosa Publishing House, 2007
4. R.K. Jain., Production Technology, 17th Edition, Khanna Publishers, 2001.

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2. https://archive.nptel.ac.in/courses/112/107/112107219/
3. https://archive.nptel.ac.in/courses/112/104/112104204/

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1. https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-me05/
2. https://onlinecourses.nptel.ac.in/noc16_me17
3. https://archive.nptel.ac.in/courses/112/105/112105306/
4. https://onlinecourses.nptel.ac.in/noc24_me50/preview

OUTCOMES
Upon completion of the course, the student will be able to:
1. Understand the functions of metal cutting tools (K2)
2. Compare the functions of various metal cutting tools (K2)
3. Recognize the applications through functional properties of different metal cutting tools (K3)
4. Describe the functional process layout of a component. (K2)

5. Demonstrate the programming in CNC machining. (K2)
6. Understand the importance of Unconventional Machining Processes (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3
CO3	3	3	-	-	3	-	-	-	-	-	-	-	3
CO4	2	-	2	-	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	3	-	-	-	-	-	-	2	-
CO6	2	-	-	-	-	2	-	-	-	-	-	3	3

SEMESTER - IV

24HSNC401 - SDG NO. 4	**NCC COURSE LEVEL 3**	L	T	P	CP	C
		3	0	0	3	0

ARMY WING

PERSONALITY DEVELOPMENT   **9**
PD 3   Group Discussion: Team Work   2
PD 4   Career Counselling, SSB Procedure & Interview Skills   3
PD 5   Public Speaking   4

BORDER & COASTAL AREAS   **4**
BCA 2   Security Setup and Border/Coastal management in the area   2
BCA 3   Security Challenges & Role of cadets in Border management   2

ARMED FORCES 3
AF 2   Modes of Entry to Army, CAPF, Police   3

COMMUNICATION   **3**
C 1   Introduction to Communication & Latest Trends   3

INFANTRY   **3**
INF 1   Organisation of Infantry Battalion & its weapons   3

MILITARY HISTORY	**23**
MH 1	Biographies of Renowned Generals	4
MH 2	War Heroes - PVC Awardees	4
MH 3	Study of Battles - Indo Pak War 1965, 1971 & Kargil	9
MH 4	War Movies	6

TOTAL: 45 PERIODS

NAVAL WING

PERSONALITY DEVELOPMENT	**9**
PD 3	Group Discussion: Change your mindset, Time Management, Social Skills	6
PD 5	Public Speaking	3

LEADERSHIP 7

L 2	Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty, Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965	7

DISASTER MANAGEMENT	**13**
DM 1	Disaster Management Capsule: Organisation, Types of Disasters, Essential Services, Assistance, Civil Defence Organisation	3
DM 2	Initiative Training, Organising Skills, Do's & Don't's, Natural Disasters, Man Made Disasters	9
DM 3	Fire Service & Fire Fighting	1

ENVIRONMENTAL AWARENESS & CONSERVATION	**3**
EA 1 Environmental Awareness and Conservation	3
GENERAL AWARENESS	**4**
GA 1	General Knowledge	4

NAVAL ORIENTATION 6

AF 1	Armed Forces and Navy Capsule	3
EEZ 1	EEZ Maritime Security and ICG	3

ADVENTURE   1

AD 1	Introduction to Adventure Activities	1

BORDER & COASTAL AREAS	**2**
BCA 1	History, Geography & Topography of Border/Coastal areas	2

TOTAL: 45 PERIODS

AIR FORCE WING

PERSONALITY DEVELOPMENT		**9**
PD 3	Group Discussion: Team Work	2
PD 4	Career Counselling, SSB Procedure & Interview Skills	3
PD 5	Public Speaking	4
BORDER & COASTAL AREAS		**4**
BCA 2	Security Setup and Border/Coastal management in the area	2
BCA 3	Security Challenges & Role of cadets in Border management	2
AIRMANSHIP		**1**
A 1	Airmanship	1
BASIC FLIGHT INSTRUMENTS		**3**
FI 1	Basic Flight Instruments	3
AERO MODELLING		**3**
AM 1	Aero Modelling Capsule	3
GENERAL SERVICE KNOWLEDGE		**2**
GSK 4	Latest Trends & Acquisitions	2
AIR CAMPAIGNS		**6**
AC 1	Air Campaigns	6
PRINCIPLES OF FLIGHT		**6**
PF 1	Principles of Flight	3
PF 2	Forces acting on Aircraft	3
NAVIGATION		**5**
NM 1	Navigation	2
NM 2	Introduction to Met and Atmosphere	3

TOTAL : 45 PERIODS

SEMESTER - IV

24CEPL403 - SDG NO. 6,7,9,12,13	SOM AND FMM LABORATORY	L	T	P	CP	C
		0	0	4	4	2

OBJECTIVES:
- To analyze the mechanical properties of materials through tensile, torsion, impact, hardness, and Deflection tests.
- To evaluate fluid flow characteristics by determining discharge coefficients, friction factors, and pump/turbine performances.

CYCLE - I - STRENGTH OF MATERIALS   **30**

LIST OF EXPERIMENTS

1. Tensile Test on Mild Steel Rod Using Universal Testing Machine (UTM).
2. Double Shear Test Using Universal Testing Machine (UTM).
3. Torsion Test on Mild Steel Rod Using Torsion Testing Machine..
4. Hardness Testing of Metals Using Rockwell and Brinell Hardness Testing machines.
5. Tensile Test on Helical Spring.
6. Izod Impact Test on Mild Steel specimen.
7. Charpy Impact Test on Mild Steel specimen.
8. Deflection Test on Beams (Cantilever and Simply Supported Beams).
9. Measurement of strain Using Strain Gauge.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No	List of Equipment	Qty.
1	Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity	1
2	Torsion Testing Machine (60 NM Capacity)	1
3	Impact Testing Machine (300 J Capacity)	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads (2500 N)	1
7	Strain measuring Instrument using Rosette Strain Gauge	1

CYCLE - II - FLUID MECHANICS AND MACHINERY   **30**

LIST OF EXPERIMENTS

1. Determination of Coefficient of Discharge for a Venturi Meter.
2. Determination of Coefficient of Discharge for an Orifice Meter.

3. Determination of Friction Factor in a Pipe System.
4. Performance Analysis and Characteristic Curves of a Gear / Vane Pump.
5. Performance Analysis and Characteristic Curves of a Reciprocating Pump.
6. Performance Analysis and Characteristic Curves of a Centrifugal Pump/Submersible Pump.
7. Performance Analysis and Characteristic Curves of Hydraulic Turbines (Pelton Wheel and Francis Turbines).

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	List of Equipment	Qty.
1.	Orifice meter setup	1
2.	Venturi meter setup	1
3.	Pipe Flow analysis setup	1
4.	Gear pump setup	1
5.	Reciprocating pump setup	1
6.	Centrifugal pump/submersible pump setup	1
7.	Hydraulic Turbine (Pelton Wheel, Kaplan, and Francis Turbines).	1

TOTAL: 60 PERIODS

OUTCOMES

Upon completion of the course, the student will be able to:

1. Explain and perform different destructive testing's such as Tension test, Shear test, Impact test, Hardness test to estimate the strength under externally applied loads with due consideration to safety. (K3)
2. Estimate and compare the elastic constants such as Young's modulus and Rigidity modulus of the given specimen through Deflection testing and spring testing with standard values. (K3)
3. Measure the flow rate of fluid using different flow measuring devices and calculate the friction loss and other minor losses in a pipe flow. (K3)
4. Predict the basic performance characteristics of hydraulic Pumps and Turbines. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	2	-	-	-	-	-	-	-	2	2
CO2	2	-	-	2	-	-	-	-	-	-	-	2	2
CO3	2	-	-	2	-	-	-	-	-	-	-	2	2
Co4	2	-	-	2	-	-	-	-	-	-	-	2	2

SEMESTER - IV

24MEPT401 - SDG NO. 4,6,9,14	DYNAMICS & METROLOGY LABORATORY WITH THEORY	L	T	P	CP	C
		1	0	4	5	3

OBJECTIVES:

- To gain knowledge in use and calibration of Vernier calipers, micrometers, height gauges, depth micrometers, bore gauges, telescopic gauges, and comparators.
- To gain practical knowledge about Dynamics of various mechanisms & to find physical properties of masses like Radius of gyration and Moment of Inertia etc.,
- To understand how certain measuring devices are used for dynamic testing.
- To measure various parameters accurately using different measuring instruments for Quality Inspection in Industries.
- To identify and classify different measuring tools and explain accuracy and precision

MODULE - I   LINEAR MEASUREMENTS   2+8

Vernier Caliper and its types – Micrometer – Vernier Height Gauge – Depth Micrometer – Bore Gauge – Telescopic Gauge – Comparators.

LIST OF EXPERIMENTS:

1. Calibration and use of Vernier Caliper – using gauge blocks
2. Calibration and use of Micrometer - using gauge blocks
3. Calibration and use of Vernier Height Gauge - using gauge blocks
4. Calibration and use of depth Micrometer.
5. Calibration and use of Bore Gauge.
6. Calibration and use of Telescopic Gauge.
7. Measurement of linear dimensions using Comparators.
8. Measurement of angles using Sine Bar.

MODULE - II   THREAD MEASUREMENTS   2+8

Introduction - Thread measurement and its types.

LIST OF EXPERIMENTS:

1. Non-contact (Optical) measurement using Toolmaker's microscope.
2. Non-contact (Optical) measurement using Profile projector.

3. Measurement of screw thread parameters using Screw thread Micrometers.
4. Measurement of screw thread parameters using a floating Carriage Micrometer.

MODULE - III GEAR MEASUREMENT & MEASUREMENT USING SENSORS   2+8

Gear measurement and its types. Types of sensors used in measurement.

LIST OF EXPERIMENTS:

1. Measurement of gear parameters using Gear Tooth Vernier Caliper.
2. Measurement of Force using Load Cell.
3. Measurement of Torque.
4. Measurement of Temperature using Thermocouple.

MODULE - IV MASS MOMENT OF INERTIA AND CAM   2+8

Determination of Mass moment of inertia-Kinematics of Eccentric Cam

LIST OF EXPERIMENTS:

1. Determination of Mass Moment of Inertia using Compound pendulum.
2. Determination of Mass moment of inertia of Connecting Rod with Fly wheel.
3. Determination of Mass moment of inertia and Centrifugal force of the sliding masses, using the Turn Table apparatus.
4. Determination of Mass Moment of Inertia using bifilar suspension.
5. Determination of Mass Moment of Inertia using Trifilar suspension.
6. Eccentric Cams – Motion curves and study of jump phenomenon.

MODULE - V FREE VIBRATION - TORSIONAL VIBRATION - FORCED VIBRATION   2+8

Free Transverse Vibration-Natural frequency-Critical speed of shafts - Torsional vibration –Forced Vibration- Transmissibility

LIST OF EXPERIMENTS:

1. Single degree of freedom Spring Mass System – Determination of natural frequency.
2. Transverse vibration of Cantilever beam.
3. Transverse vibration of Simply supported beam.
4. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
5. Determination of Torsional natural frequency of single Rotor system – Undamped.

6. Determination of Torsional natural frequency of Double Rotor systems – Undamped.
7. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
8. Determination of transmissibility ratio using vibrating table.

MODULE - VI CENTRIFUGAL GOVERNORS AND
GYROSCOPIC EFFECTS   2+8

Governors– Gravity controlled governors-Porter and Proell Governors-Effect of Gyroscopic forces and couples on spinning disc-Balancing of rotating masses and reciprocating masses.

LIST OF EXPERIMENTS:
1. Determination of range of speed of Watt Governor.
2. Determination of range of speed of Porter Governors.
3. Determination of range of speed of Proell Governors.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Balancing of rotating masses.
6. Balancing of reciprocating masses.

TOTAL : 60 PERIODS

OUTCOMES

Upon completion of the course, the student will be able to:
1. Determine mass moment of inertia of mechanical elements, Natural frequency of Longitudinal, Transverse & Torsional Undamped Vibration and Critical speed of shafts.(K3)
2. Study the governor effect & range, gyroscopic effect on Disc and Balancing of masses. (K3)
3. Find out the various linear, angular measurements , various profiles of small mechanical components using light illumination devices various and physical & dynamic properties like Tolerance, force , temperature using LVDT, Load cell and Thermocouples. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	-	1	1	-	1	2	-	3	2
CO2	3	2	2	-	-	1	1	-	1	2	-	3	2
CO3	3	2	2	-	-	1	1	-	1	2	-	3	2

SEMESTER - IV

24METP401 - SDG NO. 4	APTITUDE SKILLS	L	T	P	CP	C
		0	0	2	2	0

PROBLEM SOLVING TECHNIQUES USING C PROGRAMMING – PHASE 1

OBJECTIVES:
- Build a strong foundation in C programming concepts and problem-solving techniques.
- Develop the ability to write efficient and modular code.
- Enhance understanding of data structures, memory management, and algorithms for optimized solutions.

MODULE - I   FOUNDATIONS OF PROGRAMMING   12
- Understanding Programming Languages: Why they are essential and their various types.
- Operators in C: Exploring assignment, arithmetic, relational, and logical operators.
- Tokens and Identifiers: Learning about keywords, naming conventions, and best practices.
- Control Structures in C: Choosing the right structure for efficient programming:
- Selective Control (Decision-making statements)
- Iterative Control (Loops for repetition)
- Unconditional Control (Jump statements)

MODULE - II   DATA TYPES, NUMBER SYSTEMS, AND FUNCTIONS   12
- Operators in Depth: Understanding increment, decrement, and short-circuit operators.
- Number Systems & Conversions: Mastering different number systems, conversions, and format specifiers.
- Data Types in C: Exploring signed and unsigned types (int, float, char) and their usage.
- Functions in C:
- Importance of modular programming.
- Writing and using functions effectively.

MODULE - III   POINTERS, ARRAYS, AND PROBLEM-SOLVING   21
- Pointers in C:

- Understanding memory management.
- How pointers enable direct hardware communication.
- Arrays in C:
- Efficiently storing multiple elements.
- Single-dimensional and multi-dimensional arrays.
- Problem-Solving Techniques:
- Tackling challenges related to arrays and strings.
- Optimizing algorithms for efficiency.

TOTAL: 45 PERIODS

REFERENCES:
1. Let Us C – Yashavant Kanetkar
2. Programming in ANSI C – E. Balagurusamy
3. The C Programming Language – Brian W. Kernighan and Dennis M. Ritchie
4. C: How to Program – Paul Deitel and Harvey Deitel
5. Problem Solving and Program Design in C – Jeri R. Hanly and Elliot B. Koffman

LIFE SKILLS, RANGER AND ROVER & BIS STANDARDS - PHASE 2

OBJECTIVES:
- Implement strategies to learn career and managerial skills for career growth.
- Understand the standards relevant to Mechanical.

MODULE - I   JEEVAN KAUSHAL 2.0 – CAREER SKILLS AND MANAGERIAL SKILLS   14

Group Discussion Skills - Meaning and Methods of Group Discussion - Procedure of Group Discussion - Group Discussion - Simulation - Group Discussion - Common Errors.

Managerial Skills - Basic Managerial Skills - Planning for effective management - How to organize teams? - Recruiting and retaining talent - Delegation of tasks - Learn to coordinate - Conflict management - Self- management Skills - Understanding self-concept - Developing self- awareness - Self-examination - Self-reflection and Introspection - Self- regulation.

Entrepreneurial Skills - Basics of Entrepreneurship - Meaning of entrepreneurship – Classification and types of entrepreneurships - Traits and competencies of entrepreneur -. Creating Business Plan - Problem identification and idea generation - Idea validation - Pitch making.

Managing Personal Finance - Budgeting - Setting personal goals - Estimate likely expenses Monitor spending to obtain the most value for the available funds - Saving and Investing - Advantages of saving money - Concept of present and future value of money.

MODULE - II   RANGER AND ROVER   10

Scouting for Boys: Scout Craft, Campaigning.

Knots: Managing of rope, types of ropes and uses, Basic Knots: - Clove Hitch, Reef Knot, Fisherman knot, Sheet bend, Bowline, Sheep shank, whippings.

Growing Together: Understanding the growth context.

Intergenerational Dialogue: How to enhance learning and cooperation across generations.

**MODULE III   STANDARDS AND APPLICATIONS OF MECHANICAL
                TESTING AND FERROUS & NON-FERROUS METALS   6**

Mechanical testing of metals: Brief introduction of Indian standards on destructive testing of metals. Important test methods explained in brief like scope, principle of test, test piece dimensions, method of test, representation of the results and report of the test. Test covered are tensile test, hardness tests- Vickers, Brinell, Rockwell and Charpy impact test

Applications of ferrous and non-ferrous metals: Brief introduction of important standards on ferrous and non-ferrous products. Examples of various applications of ferrous and non-ferrous metals. i.e. Steel Tubes & Pipes, Structural steel, wear and abrasion resistant steel, Weathering steel, Galvanized steel, automotive steel, precoated and painted steel, stainless steel, low nickel stainless steel, alloy steel, cold heading steel, aluminium for castings, EC grade aluminium, copper rods for electrical purpose, Copper sheets, non-ferrous metals standards for trade on exchanges etc . Terminology standards of ferrous and non-ferrous metals.

TOTAL: 30 PERIODS

REFERENCES:

1. Curriculum and Guidelines for Life Skills (Jeevan Kaushal) 2.0, UGC, New Delhi.
2. A World Built on Standards: A Textbook for Higher Education, Published by: Danish Standards Foundation, 2015.
3. SO / IEC Guide 59, BIS Standards Formulation Manual, 2nd Revision, 2022.

ONLINE RESOURCES

1. https://lms.scout.org/courses/show/214175?force_course_hub=true
2. https://lms.scout.org/courses/show/214194?force_course_hub=true

OUTCOMES

Upon completion of this course, the students will be able to:

1. Understand and apply the fundamentals of C programming for problem-solving. (K2)
2. Utilize control structures, operators, and functions to write modular programs. (K2)
3. Implement pointers and arrays for efficient memory and data management. (K2)
4. Solve real-world problems by designing and optimizing algorithms. (K2)
5. Demonstrate career and managerial skills. (K2)
6. Explain the principles of standardized mechanical testing methods and illustrate the applications of ferrous and non-ferrous metals in accordance with relevant Indian standards. (K2)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	1	-	-	-	1	-	2	-	-
CO3	2	2	2	2	-	-	-	-	1	-	2	-	-
CO4	2	2	2	2	1	-	-	-	1	-	2	-	-
CO5	-	-	-	-	-	3	-	-	1	-	2	2	2
CO6	-	-	-	-	-	3	-	-	1	-	2	2	2

SEMESTER - IV

24MEID401 - SDG NO. 4,11,15	INNOVATIVE DESIGN LAB - II	L	T	P	CP	C
		0	0	2	2	1

OBJECTIVES:

- To empower students to transform innovative ideas into viable venture blueprints through structured entrepreneurial exploration and opportunity framing.
- To provide experiential learning in adaptive product evolution by focusing on user-centric redesign, iterative testing, and technical refinement.
- To develop proficiency in assessing market traction, decoding customer behavior, and aligning product strategy with investment-readiness metrics.

- To instill a foundation of ethical entrepreneurship by integrating inclusive design principles, sustainability values, and responsible leadership.
- To enable data-driven innovation by leveraging field research, applying performance analytics, and integrating emerging technologies for solution optimization.
- To facilitate multidisciplinary problem-solving through advanced engineering integration, MVP systemization, and standards-compliant validation.

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involved in a life-long learning process for the students, focusing on the practical execution and refinement of entrepreneurial ventures.
2. The project work must involve the continuous development, iterative enhancement, and potential launch of an entrepreneurial solution. It must also include appropriate elements of the following: compliance with advanced engineering standards, iterative design analysis, enhanced prototyping, robust experimentation, real-world user feedback collection, data correlation, and advanced software/hardware development for the solution.
3. Projects can be individual work or group projects, with a maximum of Three students. In case of a group project, each student must submit an individual project report clearly specifying their unique contributions to the collective work.
4. On completion of the project, the student shall submit a detailed project report encompassing the evolution of their venture, technical implementation, market validation, and future roadmap. The project shall undergo a formal review process, after which the report will be evaluated. Students shall appear for a mandatory viva-voce examination on the project, approved jointly by the Coordinator and the respective project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination): 20 marks (Focus on refined problem statement, advanced MVP design, and detailed development plan)
2. Second evaluation (Immediately after second internal examination): 30 marks (Focus on prototype/MVP implementation, initial testing, and preliminary market validation results)

3. Final evaluation (Last week of the semester): 50 marks (Focus on the complete refined solution, comprehensive market validation, growth strategy, final project report, and viva-voce)

Note: All three evaluations are mandatory for course completion and for awarding the final grade.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
1. Apply structured entrepreneurial exploration to convert innovative ideas into venture blueprints, incorporating user-centric and iterative design approaches. (K4)
2. Assess customer behavior and market traction to align product strategies with ethical and sustainable entrepreneurship principles. (K5)
3. Integrate multidisciplinary knowledge, field data, and emerging technologies to optimize and validate engineered solutions. (K6)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	-	-	-	2	2
Co3	3	3	2	-	-	-	-	2	-	-	-	2	2

Imagine the Future and
Make it happen!

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

Sairam SDG ACTION PROGRAM

Together let's build a better world where there is NO POVERTY and ZERO HUNGER. We have GOOD HEALTH AND WELL BEING QUALITY EDUCATION and full GENDER EQUALITY everywhere. There is CLEAN WATER AND SANITATION for everyone. AFFORDABLE AND CLEAN ENERGY which will help to create DECENT WORK AND ECONOMIC GROWTH. Our prosperity shall be fuelled by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES. RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet. CLIMATE ACTION will reduce global warming and we will have abundant, flourishing LIFE BELOW WATER, rich and diverse LIFE ON LAND. We will enjoy PEACE AND JUSTICE through STRONG INSTITUTIONS and will build long term PARTNERSHIPS FOR THE GOALS.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

Together we can...

Sai Prakash Leo Muthu

Chairman & CEO – Sairam Institutions