ANNA UNIVERSITY, CHENNAI

UNDERGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: B.Tech., Textile Technology **Regulations:** 2025

Abbreviations:

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

BS – Basic Science (Mathematics, Physics, Chemistry)

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

SD – Skill Development

SL – Self Learning

CDP – Capstone Design Project

OE – Open Elective

L – Laboratory Course

T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

IPW – Internship cum Project Work

DIC – Department Introductory Course

TCP – Total Contact Period(s)

Program Outcomes

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

10. **Management & Finance**: Apply management and economic principles in projects and teamwork.
11. **Lifelong Learning**: Engage in continuous learning, adapt to new technologies, and think critically.

Program Specific Outcomes:

PSO 1: Design and develop quality textile products for various industrial sectors.

PSO 2: Utilize modern machinery, process control techniques, and software tools for efficient textile production, testing, and quality assurance.

PSO 3: Integrate sustainable practices and technological innovations in textile processing
and also address environmental and safety standards

Semester – I							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	MA25C01	Applied Calculus	T	3-1-0	4	4	BS
2.	TT25C01	Introduction to Textile Technology	T	2-1-0	3	3	ES (PC)
3.	PH25C01	Applied Physics – I	LIT	2-0-2	4	3	BS
4.	CY25C01	Applied Chemistry – I	LIT	2-0-2	4	3	BS
5.	UC25H01	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
6.	EN25C01	English Essentials – I	T	2-0-0	2	2	HUM
7.	CS25C02	Computer Programming: Python	LIT	2-0-2	4	3	ES (PC)
8.	ME25C04	Makerspace	L	0-0-4	4	2	SD
9.	UC25A01	Life Skills for Engineers – I	---	1-0-2	3	1	HUM
10.	UC25A02	Physical Education – I	---	0-0-4	4	1	HUM
11.		NCC / NSS / NSO/ YRC	---	---	---	---	---
Total Credits					**33**	**23**	

Semester – II							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	MA25C02	Linear Algebra	T	3-1-0	4	4	BS
2.	CY25C04	Applied Chemistry (Tech) – II	T	2-0-0	2	2	BS
3.	ME25C01	Engineering Drawing	LIT	2-0-4	6	4	ES (G)
4.	ME25C02	Engineering Mechanics	T	3-1-0	4	4	ES (G)
5.	PH25C06	Applied Physics (Tech) – II	T	2-1-0	3	3	BS
6.	EE25C01	Basic Electrical & Electronics Engineering	T	3-0-0	3	3	ES (G)
7.	UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
8.	ME25C05	Re-Engineering for Innovation	L	0-0-4	4	2	SD
9.	EN25C02	English Essentials – II	LIT	1-0-2	3	2	HUM
10.	UC25A03	Life Skills for Engineers – II	---	1-0-2	3	1	HUM
11.	UC25A04	Physical Education – II	---	0-0-4	4	1	HUM
12.		Foreign Language^	LIT	1-0-2	3	1	--
				Total Credits	**40**	**28**	

^ Deutsch / Japanese / Korean

Semester – III							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	MA25C13	Probability and Statistics	T	3-1-0	4	4	BS
2.	TT25C02	Characteristics of Textile Fibres	LIT	3-0-2	5	4	ES (PC)
3.	TT25C03	Technology of Yarn Spinning I	LIT	3-0-2	5	4	ES (PC)
4.	TT25C04	Technology of Weaving I	LIT	3-0-2	5	4	ES (PC)
5.	MG25302	Fundamentals of Economics and Management	T	3-0-0	3	3	ES (PC)
6.	EN25C03	English Communication Skills Laboratory – I	L	0-0-2	2	1	HUM
7.	-	Skill Development Course – I	LIT	1-0-2	3	2	SD
				Total Credits	**27**	**22**	

Semester – IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	HT25C01	Technology of Man-made Fibre Production	T	3-0-0	3	3	ES (PC)
2.	TT25C05	Technology of Yarn Spinning II	LIT	2-0-2	4	3	ES (PC)
3.	TT25C06	Technology of Weaving II	LIT	2-0-2	4	3	ES (PC)
4.	TT25C07	Technology of Knitting and Nonwoven	T	3-0-0	3	3	ES (PC)
5.	TT25C08	Woven Fabric Structure	T	3-0-0	3	3	ES (PC)
6.	TT25401	Analysis of Woven Fabrics	L	0-0-4	4	2	ES (PC)
7.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
8.	-	Skill Development Course – II	LIT	1-0-2	3	2	SD
9.	-	Industry Internship (4 weeks)*	IPW	---	---	---	SD
			Total Credits		**26**	**20**	

*Four weeks industrial training/internship carries two credits. Industrial training/internship during IV Semester Summer Vacation will be evaluated in V semester

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Textile Chemical Processing - I	LIT	3-0-2	5	4	ES (PC)
2.		Garment Technology	LIT	2-0-2	4	3	ES (PC)
3.		Fibre and Yarn Quality Evaluation	LIT	2-0-2	4	3	ES (PC)
4.		Programme Elective – I	T	3-0-0	3	3	ES (PE)
5.		Programme Elective – II	T	3-0-0	3	3	ES (PE)
6.		Skill Development Course – III	LIT	1-0-2	3	2	SD
7.		Industry Oriented Course – I	LIT	1-0-2	3	1	SD
8.		Open Elective – I	T	3-0-0	3	3	
9.		Industry Internship (4 weeks)*	IPW	---	---	2	SD
				Total Credits	**29**	**25**	
For Honours Degree							
1.		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – I	T	3-0-0	3	3	
2.		Honours Elective – II	T	3-0-0	3	3	
For Minor Degree							

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Minor Elective – I	T	3-0-0	3	3	
2.		Minor Elective – II	T	3-0-0	3	3	

*Four weeks industrial training/internship carries two credits. Industrial training/internship during IV Semester Summer Vacation will be evaluated in V semester

Semester – VI							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.		Textile Chemical Processing – II	LIT	2-0-2	4	3	ES (PC)
2.		Technical Textiles	T	3-0-0	3	3	ES (ET)
3.		Fabric and Garment Quality Evaluation	LIT	3-0-2	5	4	ES (PC)
4.		Financial Management for Textile and Apparel Industry	T	3-0-0	3	3	ES (PC)
5.		Programme Elective – III	T	3-0-0	3	3	ES (ET)
6.		Open Elective (Check open elective I & II)	T	3-0-0	3	3	--
7.		Industry Oriented Course – II	LIT	1-0-2	3	2	SD
8.		Self-Learning Course	--	--	--	1	--
Total Credits					**24**	**22**	
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – III	T	3-0-0	3	3	
2.		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	
2.		Minor Elective – IV	T	3-0-0	3	3	

Semester – VII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.		Total Quality Management in Textile Industry	T	3-0-0	3	3	ES (PC)
2.		Compliances in Textile Industry	T	3-0-0	3	3	ES (PC)
3.		Clothing Comfort	T	3-0-0	3	3	ES (PC)
4.		Engineering Entrepreneurship Development	LIT	2-0-2	4	3	HUM
5.		Climate Change and Sustainability	T	2-0-0	2	2	HUM
6.		Programme Elective – IV	T	3-0-0	3	3	ES (PE)
7.		Programme Elective – V	T	3-0-0	3	3	ES (PE)
8.		Project Management	T	2-0-0	2	2	HUM
9.		Summer Internship	--	---	---	1	SD
Total Credits					**23**	**23**	
For Honours Degree							
1.		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – V	T	3-0-0	3	3	
2.		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	
2.		Minor Elective – VI	T	3-0-0	3	3	

Semester – VIII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1		Project Work / Internship cum Project Work	PW / IPW	0-0-16	16	8	SD
Total Credits					**16**	**8**	

PROGRAMME ELECTIVE COURSES – STREAMS

TEXTILE CHEMICAL PROCESSING	GARMENT TECHNOLOGY	TECHNICAL TEXTILES	APPAREL MANAGEMENT	TEXTILE MANUFACTURE
Polymer Chemistry	Apparel Machineries and Equipment	Automotive and Transportation Textiles	Enterprise Resource Planning in Garment Industry	Process Control in Spinning
Wet Processing Machinery	Apparel Production Planning and Process Control	Medical Textiles	Supply Chain Management in Garment Industry	Process Control in Weaving
Environmental Management in Textiles	Industrial Engineering in Apparel Industry	Nanotechnology in Technical Textiles Applications	Garment Costing	Mechanics of Textile Machinery
Quality Control in Textile Wet Processing	Pattern Making	Smart Textiles and Garments	Human Resource Management	Structural Mechanics of Yarn
Color Science and Shade Matching	Fashion Designing	Protective Textiles	Operations Research for Textile Industry	Specialty Fabrics
Sustainable Textile Processes	Garment and Denim Processing	High-Performance Textiles	Export and Import Management	Textile Mill Management
Effluent Treatment and Management		Textile Reinforced Composites	Apparel Marketing and Merchandising	Home Textiles
			Retail and Visual Merchandising	

Semester I

MA25C01	Applied Calculus	L	T	P	C
		3	1	0	4

Course Objectives:

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

Differential Calculus: Functions, graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph.

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

Functions of Several Variables: Partial derivatives, Chain rule, Total derivative, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers, Application problems in engineering.

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

Integral Calculus: Fundamental theorem of Calculus, Indefinite integrals and the Net Change Theorem, Improper integrals, Arc Length, Area of Region, Area of surface of revolution.

Activities: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).

Multiple Integrals: Iterated integrals and Fubini's theorem, Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates.

Activities: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).

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

Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).

References:

1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons.
2. Ron Larson and David C. Falvo,(2013), Calculus: an Applied Approach. Cengage Learning.
3. Stewart, J., Clegg, D., & Watson, S. (2019). *Calculus: Early transcendentals*.
4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2018). *Thomas' calculus: Early transcendentals*. Pearson.
5. Singh, K. (2019). *Engineering mathematics through applications*. Bloomsbury Publishing.
6. Grewal, B. S. (2012). *Higher engineering mathematics.* Khanna Publishers.

E-resources:

1. https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus__Early_Transcendentals_(Stewart)/
2. https://openstax.org/books/calculus-volume-1/
3. https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx
4. SCILAB, https://www.scilab.org/

	Description of CO	**PO**	**PSO**
CO1	Explain the meaning of derivative, integral, and their geometric and physical interpretations.	---	---
CO2	Apply differentiation and integration techniques to compute maxima, minima, and area.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyze the behavior of single and multivariable functions using derivatives and partial derivatives.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize modern computational software and online platforms to deepen understanding, perform complex calculations, and visualize mathematical concepts.	PO5(2) PO11(1)	PSO2(3) PSO3(1)

TT25C01	Introduction to Textile Technology	L	T	P	C
		2	1	0	3

Course Objective:

To enable the students to learn about the basics of fibre forming, yarn production, fabric formation and coloration of fabrics.

Natural Fibres: Introduction: Definition of staple fibre, filament; Classification of natural and man-made fibres, essential and desirable properties of fibres. Production and cultivation of Natural Fibers: Cultivation of cotton, production of silk (sericulture), wool and jute – physical and chemical structure of these fibres- End uses.

Activity: Demonstration to identify the natural and manmade fibers.

Regenerated and Synthetic Fibres: Production sequence of regenerated and modified cellulosic fibres: viscose rayon, Acetate Rayon, high wet modulus and high tenacity fibres; synthetic fibres – chemical structure, fibre forming polymers, production principles.

Activity: Virtual demonstration of synthetic fiber manufacturing.

Basics of Spinning: Spinning – principle of yarn formation, sequence of machines for yarn production with short staple fibres and blends, principles of opening and cleaning machines; Introduction to direct and indirect systems of yarn numbering – calculations in English and Tex systems.

Activity: seminar on direct and indirect systems of yarn numbering.

Basics of Weaving: Woven fabric – warp, weft, weaving, path of warp; looms – classification, handloom and its parts; Introduction to basic weaving mechanisms - primary, secondary and auxiliary mechanisms; Introduction to power loom, automatic looms, shuttle less looms, special type of looms.

Activity: virtual demonstration of power loom, automatic looms, shuttle less looms, special type of looms

Basics of Knitting, Nonwoven and Braiding: Knitting – classification, principle, types of fabrics; Nonwoven process –classification, principle, types of fabrics; Introduction to braiding

Activity: identify the types of fabrics using simple methods/instruments.

Basics of Wet Processing: Introduction to dyeing, printing and finishing machineries used for this process.

Activity: virtual demonstration of printing and finishing machineries.

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

Assessment Methodology: Quiz (10%), Assignments (20%), Demonstration (20%), Internal Examinations (50%)

References:

1. Hornberer, M., Eberle, H., Kilgus, R., Ring, W., & Hermeling, H. (2008). *Clothing technology: From fibre to fabric*. Europa LehrmittelVerlag. ISBN: 3808562250 / ISBN: 978-3808562253.
2. Wynne, A. (1997). *Motivate series-textiles*. Macmillan Publications.
3. Carr, H., & Latham, B. (1994). *The technology of clothing manufacture*. Blackwell Science.
4. Klein, W. (2014). *The Rieter manual of spinning, Vol. 1*. Rieter Machine Works Ltd. ISBN 10: 3-9523173-1-4 / ISBN 13: 978-3-9523173-1-0.
5. Klein, W. (2014). *The Rieter manual of spinning, Vol. 2*. Rieter Machine Works Ltd. ISBN 10: 3-9523173-2-2 / ISBN 13: 978-3-9523173-2-7.
6. Klein, W. (2014). *The Rieter manual of spinning, Vol. 1-3*. Rieter Machine Works Ltd. ISBN 10: 3-9523173-3-0 / ISBN 13: 978-3-9523173-3-4.
7. Talukdar, M. K., Sriramulu, P. K., & Ajgaonkar, D. B. (1998). *Weaving: Machines, mechanisms, management*. Mahajan Publishers. ISBN: 81-85401-16-0.
8. Morton, W. E., & Hearle, J. W. S. (2008). *Physical properties of textile fibres*. The Textile Institute. ISBN: 978-1-84569-220-9.
9. Gohl, E. P. G. (1987). *Textile science*. CBS Publishers and Distributors. ISBN: 0582685958.
10. Kousik, C. V., & Josico, A. I. (2003). *NCUTE-chemical processing of textiles: Preparatory process and dyeing*. Quality CBT and Course Material from NCUTE.
11. Roy Choudhury, A. K. (2006). *Textile preparation and dyeing*. CRC Press. ISBN: 1578084040.

E-Resources:

https://www.textileschool.com/119/textile-an-introduction/

	Description of CO	PO	PSO
CO1	Explain the classification, properties natural fibres.	-	-
CO2	Analyse the production processes and chemical structures of regenerated and synthetic fibres.	PO1(2) PO2(3)	PSO2(1)
CO3	Identify the components of different types of looms and preparatory machines.	PO3(3)	PSO2(2)
CO4	Apply the principles in dyeing, knitting and non woven processes.	PO2(1) PO3(3)	PSO2(1)
CO5	Demonstrate knowledge of yarn formation principles, spinning machinery, and yarn	PO11(2)	PSO3(2)

	Description of CO	PO	PSO
	numbering calculations for short staple fibres and blends.		

PH25C01	Applied Physics – I	L	T	P	C
		2	0	2	3

Course Objective(s):

- To impart knowledge and expose the essentials of physics in various engineering applications.

Properties of Matter: Elasticity, Cantilever, Young's modulus (non-uniform bending), Girders: Bridges and buildings, Viscosity: Stokes method, Surface tension: drop weight method, Thermal expansion, Thermal stress, Bimetallic strips, Expansion joints

Practical: Non-Uniform bending, Young's modulus of the material, Torsional pendulum, Rigidity modulus of the wire and moment of inertia of the disc.

Activities: Virtual demonstration of thermal stress.

Oscillations: Simple Harmonic motion, Torsional pendulum, Couple per unit twist, Damped and Forced Oscillation

Waves: Waves on a stretched string, Energy and Power, standing waves, Ultrasonics, piezo, electric method, Acoustic grating, Electromagnetic waves: Maxwell equation, Production of EM waves by dipole antenna, Propagation of EM waves in free space, wave equation, Cell phone reception

Practical: Melde's string experiment – Frequency of an electrically vibrating metal tip.

Activities: Virtual demonstration of propagation of EM waves

Quantum Mechanics: Black body radiation, Photoelectric effect, de Broglie hypothesis, Schrodinger Wave equation, Particle in a box (infinite potential well - three-dimensional box), Barrier penetration and quantum tunnelling.

Practical: Photo-electric effect, Determination of Planck's constant.

Activities: Virtual demonstration of Scanning Transmission Electron Microscope

Applied Optics: Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement, pressure sensor and Temperature sensor, Einstein Co-efficient, Nd:YAG laser, CO_2 laser (construction, functioning and applications), dye laser

Practical: Ruling width of Compact disc using Laser, Thickness of a thin sheet/wire using Air wedge Method.

Activities: Demonstration of sensors and applications of Lasers

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

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

References:

1. Young, H. D., & Freedman, R. A. (2020). University physics with modern physics. Pearson.
2. Gaur, R. K., & Gupta, S. L. (2022). Engineering physics. Dhanpat Rai Publications.
3. Mathur, D. S. (2010). Elements of properties of matter. S. Chand Publishing.
4. Griffiths, D. J. (2018). Introduction to quantum mechanics. Cambridge University Press.
5. Silfvast, W. T. (2008). Laser fundamentals (2nd ed.). Cambridge University Press.

E-Resources:

1. Barrier penetration problem and Quantum tunnelling: https://archive.nptel.ac.in/courses/115/104/115104096/
2. EM waves and wireless channelling: https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. CO2 Laser: https://onlinecourses.nptel.ac.in/noc25_ph03/preview
4. Bimetallic Strips _ https://www.youtube.com/watch?v=WZQ8lvxdzDk
5. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
6. Dipole Antenna_ https://www.youtube.com/watch?v=4xF1Fq2wB1I
7. Optical Sensors_ https://auece.digimat.in/nptel/courses/video/108106173/L02.html
8. Scanning Tunnelling Electron Microscope_ https://www.youtube.com/watch?v=XNYZYbXNWQA

	Description of CO	**PO**	**PSO**
CO1	Explain the physics concepts in various applications.	---	---
CO2	Apply the principles of wave optics and laser physics in practical systems.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the behaviour of materials under different conditions.	PO2(2)	PSO1(2) PSO3(1)
CO4	Conduct experiments in groups and interpret the data.	PO4(3) PO8(1)	PSO1(2) PSO2(2)

	Description of CO	PO	PSO

CY25C01	Applied Chemistry – I	L	T	P	C
		2	0	2	3

Course Objectives:

- To provide students with a solid understanding of the chemical principles for engineering applications.
- To introduce the chemical properties of materials and how these properties influence the selection and use of materials in engineering systems.
- To impart practical applications of chemistry in commonly used engineering devices

Water Technology: Water quality parameters and standards. Industrial feed water, Remediation. Municipal water treatment. Desalination.

Practical: Analysis of alkalinity, hardness and dissolved oxygen.

Activity: Coagulation of water sample using Alum

Nano-chemistry: Classification, Size, dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches, Applications (Flipped classroom).

Practical: Preparation of nanoparticles by Sol-Gel method.

Electrochemistry: Electrochemical cell, Electrode potential., Redox reaction. Conductivity of electrolytes, Factors.

Practical: Conductometric titrations

Activity: Electrochemical cell demonstration

Corrosion & Control: Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection. Organic and Inorganic coating.

Practical:

- Corrosion study by weight loss and salt spray method.
- Potentiometry/UV-visible spectrophotometer.

Activities: Case Study on Corrosion in Pipelines and Electronics, Control measures for a corroded metal

Batteries: Conventional, Contemporary and Emerging battery storage technologies, Primary & Secondary Batteries, Battery Pack, Battery Materials, Performance Parameters, Testing, Safety aspects.

Practical: Measurement of EMF, Internal Resistance, Charge and Discharge Characteristics.

Activities: Demonstration of battery pack in e-vehicles.

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

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

References:

1. Jain, P. C., & Jain, M. (2015). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company (P) Ltd.
2. Dara, S. S. (2004). A Textbook of Engineering Chemistry. Chand Publications.
3. Sachdeva, M. V. (2011). Basics of Nano Chemistry. Anmol Publications Pvt Ltd.
4. Friedrich, E. (2014). Engineering Chemistry. Medtech.

E-Resources:

1. Water and Wastewater Engineering (Prof. Ligy Philip, IIT Madras) – https://nptel.ac.in/courses/105106202.
2. Electrochemical Energy Systems (Prof. S. Mitra, IIT Madras) – https://nptel.ac.in/courses/113106028.
3. Corrosion (Prof. Kallol Mondal, IIT Kanpur) – https://nptel.ac.in/courses/112104088
4. Chemistry of Battery Systems (Prof. V. R. Marathe, IIT Madras) – https://nptel.ac.in/courses/115106130
5. Resource on all battery types, testing, and safety – https://batteryuniversity.com/articles

	Description of CO	**PO**	**PSO**
CO1	Understand the importance of chemistry applications with underlying mechanisms.	---	
CO2	Apply the chemistry concepts in widely used devices.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the effect of various chemical parameters on performance of engineering systems.	PO2(2)	PSO1(2) PSO2(1)
CO4	Perform experimentations as a group and interpret the results.	PO4(3) PO8(1)	PSO2(2) PSO3(2)
CO5	Communicate findings through case studies and reports	PO9(1)	PSO2(2) PSO3(3)

UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

மொழி மற்றும் இலக்கியம்: 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.

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

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

தமிழர்களின் திணைக் கோட்பாடுகள்: தமிழகத்தின் தாவரங்களும், விலங்குகளும், தொல்காப்பியம் 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.

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் , சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

References:

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 C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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.

UC25H01	**Heritage of Tamils**	L	T	P	C
		1	0	0	1

Language and Literature: Language Families in India, Dravidian Languages, Tamil as aClassical 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.

Heritage - Rock Art Paintings to Modern Art – Sculpture: 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.

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

Thinai Concept of Tamils: 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.

Contribution of Tamils to Indian National Movement and Indian Culture: 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

References:

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.
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8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi, 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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)

(Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL), Reference Book.

EN25C01	English Essentials – I	L	T	P	C
		2	0	0	2

Course Objectives:

- Enhance learners' listening and speaking skills to understand and deliver speeches effectively
- Equip students with the skills to write clear, coherent, and grammatically correct texts for various purposes.
- Strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts.

Speaking Skills: Self-Introduction (Tenses, Adjectives) Expressing opinions (Subject-Verb Agreement), Participating in Conversations (Speech Acts - agreeing & disagreeing – synonyms and antonyms**)**

Suggested Activities: Self-Introduction, Just a Minute (JAM) Video recording, Situational role plays, Spell Bee, Word Substitution, Usage of Apps.

Listening Skills: Listening to Simple Conversations (Understanding tone and intent), Short Speeches / Stories, Extracting information, Pronunciation, Listening to Various Accents.

Suggested Activities: Listening and Repeating, Gap fill exercises, Note-taking

Reading Skills: Reading Strategies – (Skimming, scanning, predicting) intensive reading - short passages and long passages on suggested themes (Sentence Patterns, Prefixes and suffixes, idioms and phrases).

Activities: Reading - newspaper and digital articles, Cloze, Reading comprehension, note making and summarising,

Writing Skills: Word Substitution, Sentence Formation, Hints Development (Guided Writing), Writing Different Types of Paragraphs - (Sentence Structure) – Letter Writing / Emails (Informal)

Activities: Error Detection, Picture and poster description, Descriptive, Narrative and Comparative paragraphs, Brainstorming and Mind Mapping - Informal letters/ Emails

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

Assessment Methodology: Quiz (10%), Assignments (20%), Speaking Task (10%), Reading Task (10%), Writing Task (10%), Internal Examinations (40%).

References:

1. Miller, K. Q., & Wahl, S. T. (2023). *Business and Professional Communication: KEYS for Workplace Excellence* (5th ed.). SAGE Publications.

2. Kumar, Sanjay & Pushpalatha. (2018). *English Language and Communication Skills for Engineers*. India: Oxford University Press.
3. Sharma, S., & Mishra, B. (2024). *Communication Skills for Engineers and Scientists* (2nd ed.). PHI Learning.

E-resources:

1. Cambridge English – https://www.cambridgeenglish.org/learning-english/grammar-and-vocabulary/
2. Perfect English Grammar – https://www.perfect-english-grammar.com/
3. British Council – Learn English - https://learnenglish.britishcouncil.org/grammar
4. Speechling – https://speechling.com/
5. mePro by Pearson – https://mepro.pearson.com/
6. TED Talks – https://www.ted.com/

	Description of CO	**PO**	**PSO**
CO1	Listen and comprehend spoken English, take and draft notes.	---	---
CO2	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.	PO1(3)	PSO1(2) PSO3(3)
CO3	Analyze texts in different contexts using appropriate reading strategies.	PO2(2)	PSO2(1)
CO4	Communicate thoughts and ideas in real life situations.	PO9(2)	PSO3(2)
CO5	Develop communication skills relevant to engineering and technology.	PO11(1)	PSO3(3)

CS25C02	Computer Programming: Python	L	T	P	C
		2	0	2	3

Course Objectives:

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

Introduction to Python: Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error messages, Variables, Reserved Words, Data Types, Arithmetic operators and expressions, Built-in Functions, Importing from Packages.

Practical: Problem Analysis Chart, Flowchart and Pseudocode Practices. (Minimum three)

Control Structures: if, if-else, nested if, multi-way if-elif statements, while loop, for loop, nested loops, pass statements.

Practical: Usage of conditional logics in programs. (Minimum three)

Functions: Hiding redundancy, complexity; Parameters, arguments and return values; formal vs actual arguments, named arguments, Recursive & Lambda Functions.

Practical: Usage of functions in programs. (Minimum three)

Strings & Collections: String Comparison, Formatting, Slicing, Splitting, Stripping, Lists, tuples, and dictionaries, basic list operators, searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values.

Practical: String manipulations and operations on lists, tuples, sets, and dictionaries. (Minimum three)

File Operations: Create, Open, Read, Write, Append and Close files. Manipulating directories, OS and Sys modules, reading/writing text and numbers, from/to a file; creating and reading a formatted file (csv, tab-separated, etc.).

Practical: Opening, closing, reading and writing in formatted file format and sort data. (Minimum three)

Packages: Built-in modules, User-Defined modules, Numpy, SciPy, Pandas, Scikit-learn**.**

Practical: Usage of modules and packages to solve problems. (Minimum three), Project (Minimum Two)

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

Assessment Methodology: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)

References:

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

E-Resources:

1. Official Python Documentation – https://docs.python.org/3/
2. Python Tutorials – https://www.w3schools.com/python/
3. NumPy – https://numpy.org/doc/
4. SciPy – https://scipy.org/
5. Google's Python class – https://developers.google.com/edu/python/

	Description of CO	PO	PSO
CO1	Explain the potential usage of Python in engineering applications	---	---
CO2	To apply the concepts of Python in solving engineering problems and formulate new projects.	PO1 (2) PO5 (2)	PSO2(2) PSO3(1)
CO3	To interpret the data and effectively communicate in groups.	PO2 (3) PO8 (1) PO9 (1)	PSO3(1) PSO3(2)
CO4	Adapt new programming concepts and technologies in the profession.	PO11 (1)	PSO2(2)

ME25C04	Makerspace	L	T	P	C
		0	0	4	2

Course Objectives:

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

List of Activities

(A). Dis-assembly & Assembly Practices

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

(B). Welding Practices

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

(C). Electrical Wiring Practices

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

(D). Electronics Components / Equipment Practices

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

(E). Contemporary Systems

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

References:

1. Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books, 2014.
2. H. Lipson, Fabricated - The New World of 3D Printing, Wiley, 1st edition, 2013.
3. Code of Practice for Electrical Wiring Installations (IS 732:2019)

Course Outcomes:

	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of basic hand and power tools.	---	---
CO2	Carry out electrical wiring installations and repairs, applying safety measures in domestic applications.	PO1(3)	PSO2(1)
CO3	Develop solid innovative models through software.	PO5(2)	PSO2(2)
CO4	Adapt and follow safety protocols in the work environment.	PO11(2)	PSO3(2)

UC25A01	Life Skills for Engineers – I	L	T	P	C
		1	0	2	1

Course Objectives

- To equip engineering students with essential life skills encompassing personal and emotional development, effective management of time and stress, financial literacy, digital safety, and civic responsibility.
- To enhance self-awareness, interpersonal skills, and resilience to prepare students for the professional and personal challenges of engineering careers and life beyond academics**.**

Personal and Emotional Development: Self-Awareness & Personality, Emotional Intelligence & Empathy, Positive thinking, Right attitude, Stress & Anger Management, Goal-Setting & Time Management, Growth Mindset & Resilience.

Activities: Personality tests (MBTI, DISC), reflection journals, Empathy circle, role-playing difficult conversations, Guided mindfulness sessions, stress relief toolkit creation, Vision board creation, weekly time audit and planner, Group challenge scenarios, resilience journal.

Management Skills: Financial Literacy: Budgeting & Saving, Nutrition, Health, and Hygiene, Digital Literacy & Online Safety, Civic Responsibility & Ethics

Activities: Create a monthly budget, financial simulation game, Meal planning workshop, physical wellness challenge, Social media audit, privacy and safety scenarios, Community service, values debate.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)

References:

1. Khera, S. (2003). *You can win*. Macmillan.
2. Levesque, H. (n.d.). *Life skills 101: A practical guide to leaving home and living on your own*. (Publication year not specified)
3. Mitra, B. K. (2017). *Personality development & soft skills* (3rd impression). Oxford University Press.
4. ICT Academy of Kerala. (2016). *Life skills for engineers*. McGraw Hill Education (India) Private Ltd.

	Description of CO	PO	PSO
CO1	Understand personality traits and emotional intelligence, in interpersonal interactions.	---	---
CO2	To work and execute as a team through successful implementation of set goals.	PO7 (1) PO8 (2) PO9 (2)	PSO3(2)
CO3	Develop and implement best practices in day-to-day life, in terms of planning and execution.	PO11 (3)	PSO3(2)

UC25A02	Physical Education - I	L	T	P	C
		0	0	4	1

Course Objectives:

- To impart the fundamentals of physical education for development of students' physical, mental, and social well-being.
- To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship.

Introduction to physical education: Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid practices.

Participation of athletic events: Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles.

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

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

Weightage: Continuous Assessment: 100%

Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)

References:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). *Psychology of sports performance*. Sports Publication.

E-resources:

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

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	---
CO2	Apply basic principles of exercise science in the routine life.	PO1(3)	PSO1(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8(3)	PSO3(2)
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.	PO11(2)	PSO3(2)

Semester II

MA25C02	Linear Algebra	L	T	P	C
		3	1	0	4

Course Objectives:

- To impart foundational knowledge in linear algebra essential for analysing and solving problems in engineering applications.
- To provide the knowledge on computation using software and interpret key linear algebra concepts using software.

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

Activities: Open-Source software, exercises to test linear dependence and independence using rank, compute span and basis of a set of vectors, determine the dimension of subspaces, and illustrate the concept of subspace and basis in $\boldsymbol{R^2}/\boldsymbol{R^3}$ with visualization.

Linear Transformations and Diagonalization: Null space, Range, Dimension Theorem (statement only), Matrix representation of a linear transformation, Eigenvalues & Eigenvectors, Diagonalizability.

Activities: Open-Source software, exercises to compute the matrix representation of a linear transformation, find the null space and range of a matrix, and compute eigenvalues and eigenvectors of a matrix.

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

Activities: Open-Source software, exercises to compute inner products and vector norms.

Matrix Decomposition: Orthogonal transformation of a symmetric matrix to diagonal form - Positive definite matrices, QR decomposition, Singular Value Decomposition (SVD), Least squares solutions- simple problems (up to $3 \times 3\ matrices$).

Activities: Open-Source software, exercises to check if a matrix is positive definite, perform QR decomposition and SVD using built-in functions.

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

Assessment Methodology: Assignment (20%), Software activity (20%), Quiz (20%), Internal Examinations (40%).

References:

1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). *Linear algebra*. Pearson.
2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). *Linear algebra and its applications with MATLAB*. Pearson.
3. Bronson, R. (2011). *Schaum's outline of matrix operations*. McGraw-Hill Education.

4. Strang, G., & Thomson, R. (2005). *Linear algebra and its applications*. Brooks/Cole.
5. Lipschutz, S., & Lipson, M. (2009). *Schaum's outline of linear algebra*. McGraw-Hill.
6. Kreyszig, E. (2018). *Advanced engineering mathematics*. Wiley India.

	Description of CO	**PO**	**PSO**
CO1	Explain the fundamental concepts of Linear Algebra.	---	
CO2	Compute and interpret eigenvalues and eigenvectors.	PO1(3)	PSO1(2)
CO3	Apply inner product concepts and perform orthogonalization.	PO1 (3)	PSO1(1)
CO4	Compute least squares solutions of linear system of equations.	PO1 (2) PO2 (2)	PSO3(1)
CO5	Use MATLAB to implement and validate key linear algebra concepts	PO5 (1) PO11 (1)	PSO2(2)

CY25C04	Applied Chemistry (Tech) – II	L	T	P	C
		2	0	0	2

Course Objectives

- To impart knowledge on chemical principles used in various fields of textile technology.
- To build a foundation in applied chemistry relevant to materials, interfaces, and surface technologies.

Interface and Colloids: Interface region, Interface control, Emulsion and Foams, Surfactant action.

Activities: Demonstration of oil-water interfaces, Formation of micelles.

Oils, Fats and Soaps: Types of oils, Properties of oils, Fats – classification, Soaps and detergents.

Activities: Seminar on the saponification of edible, non-edible and essential oils.

Lubricants: Mechanism of lubrication, Preparation of Petro lubes, Characteristics, Semisolid lubricant, Solid lubricants.

Activities: Virtual demonstration of lubrication, Assignment on the lubricants used in automotive engines.

Adhesives: Adhesive action, Classification of adhesives, Factors influencing adhesive action, Synthetic adhesives.

Activities: Adherence of liquids on surfaces (Flipped Class sessions).

Colourants: Theory of colour and constitution, Classification of dyes based on application, Chemistry and synthesis of dyes.

Activities: Study of bonding of dyes with fabric (Flipped Class sessions).

Chemical Auxiliaries: Functions, Classification, Preparation, Estimation using Iodometry, Permanganometry.

Activities: Estimation of available chlorine, Determination of strength of hydrogen peroxide, potential hazards of auxiliaries.

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

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (15%), Virtual Practice (10%), Internal Examinations (50%)

References:

1. Jain, J., & Jain, S. (2015). Engineering Chemistry. Dhanpat Rai Publishing Company.
2. Dara, S. S., & Umare, S. S. (2024). A textbook of Engineering Chemistry. S. Chand & Company Ltd.

3. Sharma, B. K. (2014). Industrial Chemistry. Goel Publishing House, Krishna Prakashan Media (P) Ltd.
4. Puri, B. R., Sharma, L. R., & Pathania, S. (2020). Principles of Physical Chemistry. Vishal Publishing Co.

	Description of CO	**PO**	**PSO1**
CO1	Explain the applications of chemistry in the field of textile technology.	---	
CO2	Apply chemistry concepts in various textile applications.	PO1(3)	PSO1(2)
CO3	Analyse the systems and interpret data from the virtual studies in the field of textile technology.	PO2(2)	PSO2(2) PSO3(1)

ME25C01	Engineering Drawing	L	T	P	C
		2	0	4	4

Course Objectives:

- To impart knowledge on dimensions and drawing standards.
- To explore the orthographic projection of lines and solids.
- To provide the understanding of orthographic, isometric and perspective views.

Fundamentals: Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning. Free hand sketching of 2D & 3D objects, Conics – Ellipse, Parabola and Hyperbola.

Activities: Virtual Demonstration of Conics and Cycloids.

Orthographic Projection: First angle projection, Projection of points, straight lines and planes.

Projection of Solids: Simple Solids, Section of Solids, Development of Surfaces

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

Isometric Projection: Isometric Scale, Projection of Simple solids.

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

Perspective Projection: Simple solids projection

Activities: Virtual demonstration of perspective views.

Project: Development of 2D objects and 3D objects using CAD tools.

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

Assessment Methodology:
Project – 10%, Models - 5%, Assignments - 35% and Internal Examinations - 50%

References:

1. Natarajan, K. V. (2025). A Text Book of Engineering Graphics. Dhanalakshmi Publisher.
2. Venugopal, K., & Prabhu Raja, V. (2022). Engineering Drawing + AutoCAD. New Age International Publishers.

E-Resources:

1. CAD Software – https://www.freecadweb.org/
2. Engineering Drawing and Computer Graphics, Prof. Rajaram Lakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview

3. MIT Design Handbook: Engineering Drawing and Sketching – https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/

	CO Description	PO	PSO
CO1	Explain the advantages of engineering drawing in engineering applications	---	
CO2	Apply the concepts of projections in formulating various solid parts in engineering systems.	PO1(3)	PSO1(2)
CO3	Analyse the various view and interpret the engineering drawings.	PO2(3)	PSO1(2)
CO4	Use CAD tools for creation of various models.	PO3(1)	PSO2(2)
CO5	Critically think and develop innovative models.	PO11(1)	PSO3(1)

ME25C02	Engineering Mechanics	L	T	P	C
		3	1	0	4

Course Objectives:

- To introduce the fundamental concepts and principles of statics related to forces acting on particles and rigid bodies.
- To develop the ability to formulate and apply equilibrium equations for particles and rigid bodies in two and three dimensions.
- To enable students to analyse force systems through vector resolution and calculation of moments and couples.

Statics of Particles: Resultant of forces in a plane, Equilibrium of a particle in a plane, Addition of concurrent forces in space, Equilibrium of a particle in space.

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

Statics of Rigid Bodies: Concept of Free Body Diagram, Equivalent systems of forces, Transmissibility, Moment of a force about a point and an axis, Couples and force-couple systems, Equilibrium of rigid bodies in two and three dimensions, Principle of virtual work.

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

Moments of Inertia: First moments of areas and lines, Centroids of composite areas and lines, Theorems of Pappus-Guldinus, Second moment of area, Parallel axis theorem, Rectangular and Polar Moments of inertia of composite areas, Radius of Gyration, Product of Inertia, Principal Axes and Principal Moments of Inertia, Mass moments of inertia of thin plates.

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

Friction: Laws of friction, Coefficients of Friction, Angles of Friction, Types of Friction Problems, Wedges and Ladder friction, Belt friction.

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

Weightage:

Continuous Assessment: 40%
End Semester Examinations: 60%

Assessment Methodology:

Quiz - 10%, Assignments - 20%, Solving of GATE questions (20%) and Internal Examinations - 50%

References:

1. Beer, F. P., Johnston Jr., E. R., DeWolf, J. T., & Mazurek, D. F. (2015). Mechanics of Materials. McGraw-Hill Education.
2. Meriam, J. L., & Kraige, L. G. (2018). *Engineering Mechanics: Statics and Dynamics*. Wiley.
3. Pytel, A., & Kiusalaas, J. (2014). Engineering Mechanics (Indian Edition). Cengage Learning India.

E-resources:

1. Moment of Inertia Calculator – https://skyciv.com/free-moment-of-inertia-calculator/
2. OpenStax – University Physics Volume 1 – https://openstax.org/books/university-physics-volume-1/pages/10-4-moment-of-inertia-and-rotational-kinetic-energy
3. Engineering Mechanics, Dr. Dwarakish. G. S. – https://onlinecourses.swayam2.ac.in/ntr24_ed75/preview

	CO Description	PO	PSO
CO1	Explain the principles of statics in determination of forces acting on particles and rigid bodies.	---	---
CO2	Apply equilibrium conditions to predict the behaviour of particles and rigid bodies under various force configurations	PO1(3)	PSO1(3)
CO3	Analyse various systems through resolution of forces and moments.	PO2(2)	PSO1(2)
CO4	Demonstrate the ability to engage in adapting new techniques in the analysis of force and moments in a system.	PO11(1)	PSO2(2) PSO3(1)

PH25C06	Applied Physics (Tech) – II	L	T	P	C
		2	1	0	3

Course Objectives:

- To impart knowledge on physics concepts and explore the potential applications in the fields of engineering and technology.

Thermal Physics: Thermal Expansion- Thermal stress- Thermal resistance - Heat transfer- Thermal conductivity (Virtual demo) - Lee's disc method - Forbe's method - conduction through compound media –thermo-electric power.

Activities: Measurement of thermal conductivity of bad conductors.

Dielectric Properties: Dielectric- ferroelectric materials - Internal field – Clausius Mosotti equation – dielectric loss – Piezo, Pyro electric materials – Applications

Activities: Virtual demonstration of Piezoelectric sensor.

Optical Properties: Classification of optical materials – Luminescence-Phosphors -Polarization – Optical anisotropy - Optical processes in semiconductors – LED characteristics (Virtual demo)

Activities: Virtual demonstration of LED Characteristics

New Engineering Materials: Ceramics –Composites - fibre reinforced plastics - fibre reinforced metals – Shape memory alloys (Virtual Demo) – Biomaterials – hydroxyapatite – Bio-sensors – Polymer semiconductors – CNT (Carbon Nano Tubes)

Activities: Virtual demonstration of 3D structure of CNTs.-

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

Assessment Methodology: Quiz (10%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)

References:

1. Raghavan, V. (2007). *Materials science and engineering*. Prentice Hall of India.
2. Brijlal, & Subramaniyan, N. (2018). *Heat, thermodynamics and statistical physics*. S. Chand.
3. Askeland, D. R. (2010). *Materials science and engineering*. Brooks/Cole.
4. Kasap, S. O. (2007). *Principles of electronic materials and devices*. McGraw-Hill Education.

E-resources:

1. Thermal conductivity -Understanding Thermal Conductivity in Solids - https://youtu.be/VcFqqdGcwrw-

2. Applications of Piezo and pyro electric materials -NDLI: Lecture 40- Applications of Piezoelectric and Pyroelectric Materials
3. White LED_ https://archive.nptel.ac.in/courses/108/108/108108122/
4. Shape memory alloys: https://nescacademy.nasa.gov/video/00a31561480547248033a1c2df6f87831d

	Description of CO	**PO**	**PSO**
CO1	Explain the concepts of physics in technology stream.	---	
CO2	Apply appropriate techniques in physics to solve engineering problems.	PO1(3)	PSO1(3)
CO	Analyse physical systems and interpret data from the virtual studies in the core branches in technology streams.	PO2(2)	PSO1(2)

EE25C01	Basic Electrical and Electronics Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

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

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

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

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

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

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

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

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

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

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

Activity: Online logic gate simulators, Solving GATE questions.

Microcontrollers: Introduction, Architecture, Potential Applications.

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

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

Assessment Methodology: Quiz (5%), Assignments (25%), GATE Questions (20%), Internal Examinations (50%)

References:

1. Del Toro, V. (2022). *Electrical engineering fundamentals*. Pearson Education.
2. Hambley, A. R. (Year). *Electrical engineering: Principles and applications* (Edition if known). Publisher.
   (Note: Please provide the year and edition for complete citation)
3. Mehta, V. K., & Mehta, R. (2006). *Principles of electrical engineering and electronics*. S. Chand Publishing.

E-resources:

1. https://archive.nptel.ac.in/courses/108/106/108106172/
2. Circuit Simulator – https://www.falstad.com/circuit/

	Description of CO	PO	PSO
CO1	Understand and explain basic electrical and electronic concepts.	---	
CO2	Apply and analyse electrical circuits in real-time applications.	PO1 (3) PO2 (1)	PSO1(2)
CO3	Identify and utilise key electronic devices used in engineering applications	PO2 (2)	PSO1(2)

UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	L	T	P	C
		1	0	0	1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில், பானைத் தொழில்நுட்பம், கருப்பு சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்.

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

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

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 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.

அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி, கணித்தமிழ் வளர்ச்சி, தமிழ் நூல்களை மின்பதிப்பு செய்தல், தமிழ் மென்பொருட்கள் உருவாக்கம், தமிழ் இணையக் கல்விக்கழகம், தமிழ் மின் நூலகம், இணையத்தில் தமிழ் அகராதிகள், சொற்குவைத் திட்டம்.

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

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

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: InternationalInstitute 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 C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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) (Publishedby: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC25H02	Tamils and Technology	L	T	P	C
		1	0	0	1

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

Design and Construction Technology: 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 Nayaka rMahal, Chetti Nadu Houses, Indo, Saracenic architecture at Madras during British Period.

Manufacturing Technology: 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 Stonebeads, Glass beads, Terracotta beads, Shell beads / bone beats, Archeological evidences, Gem stone types described in Silappathikaram.

Agriculture and Irrigation Technology: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompuof 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.

Scientific Tamil & Tamil Computing: 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.

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

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

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.

ME25C05	Re-Engineering for Innovation	L	T	P	C
		0	0	4	2

Course Objectives:

- To cultivate foundational skills in prototyping, and automation for development of prototypes with real-world applications.
- To provide a comprehensive, hands-on exposure to product development through reverse engineering concepts.

Bootcamp 1: Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.

Bootcamp 2: Embedded System Programming (Open-source platforms), Practice of interfacing sensors, reading data, automation in home, healthcare and agriculture.

Reverse Engineering: Sketch and prototype alternative designs, Group brainstorming sessions, Manufacture prototype parts using 3D printing and / or workshop tools, Assemble prototype product.

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

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

References:

1. Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press.
2. Margolis, M. (2020). Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd ed.). O'Reilly Media.

E-resources:

1. GrabCAD – https://grabcad.com/
2. GitHub – https://github.com/

	Description of CO	PO	PSO
CO1	Understand the product development lifecycle, including stages such as concept generation, design, prototyping, and testing.	---	
CO2	Apply reverse engineering techniques to analyze and document existing products.	PO1 (3) PO2 (2)	PSO1(2)
CO3	Collaborate in teams to fabricate prototypes using appropriate tools.	PO5 (2) PO8 (1) PO9 (1)	PSO3(3)
CO4	Engage in independent learning and continuously adapt to emerging technologies in product design	PO11 (2)	PSO2(2)

	Description of CO	PO	PSO
			PSO3(2)

EN25C02	English Essentials – II	L	T	P	C
		1	0	2	2

Course Objectives

- Enable learners to improve fluency and accuracy in spoken and written communication.
- Develop learners' ability to articulate ideas clearly and effectively in formal and informal spoken interactions.
- Help learners construct well-organised written documents relevant to academic and workplace contexts.

Oral Communication: Types (Verbal and Nonverbal), Interpersonal and group communication, Telephonic conversation.

Suggested Activities: Short presentations, Debates, Formal Speeches (Welcome, Vote of Thanks and introducing guests), Listen and respond to short podcasts.

Business Correspondence: Email Communication, Formal Letters (Types), Business Meeting.

Suggested Activities: Email and letter writing (Complaint, request, permission), Agenda, minutes of the meeting.

Academic Writing: Paraphrasing, Summarizing, Essay Writing, Instructions and Recommendations.

Suggested Activities: Essay writing (Cause and effect, argumentative, persuasive), User guides/ manuals, policy document.

Team Work: Leadership Skills (Team building, Team Leader, Team player), Negotiation and Problem solving skills

Suggested Activities: SWOT Analysis, Brainstorming and Group discussions.

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

Assessment Methodology: Worksheets (10%), Group Activity (20%), Report Writing (20%), Internal Examinations (50%)

References:

1. Koneru Aruna. (2020). English Language Skills for Engineers. McGraw Hill Education.
2. Taylor, Shirley & Chandra .V. (2010). Communication for Business A Practical Approach. India: Pearson Longman.

3. Ian Badger, et al., (2014). Listening: B2 (Collins English for Life: Skills), Collins.
4. Raymond Murphy (2019), Grammar in Use, Cambridge University Press.

E-resources:

1. Communication for Business Success - https://open.umn.edu/opentextbooks/textbooks/8
2. TED Talks – https://www.ted.com/

	Description of CO	**PO**	**PSO**
CO1	Demonstrate effective communication skills both in academic and professional contexts.	---	
CO2	Develop engaging and meaningful business correspondence.	PO1(3)	PSO3(2)
CO3	Participate actively in group discussions by analysing critically from different views.	PO2(2) PO8(1)	PSO3(3)
CO4	Create coherent written texts and documents for various purposes.	PO9(2)	PSO3(2)
CO5	Adapt communication styles to global environments.	PO11(1)	PSO2(2)

UC25A03	Life Skills for Engineers – II	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart and cultivate analytical reasoning, innovative thinking, effective collaboration, and ethical leadership to prepare students for complex challenges in professional and personal environments.

Critical Thinking: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Activities: Two-Brainstorm Method, “30 Circles” Challenge, “Desert Survival” Simulation, Lateral thinking riddles and puzzles, "What If?" Scenario Writing, Fast vs. Slow Thinking Game, Creativity Myth Busters

Problem Solving: Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.

Activities: Case study analysis, Escape Room challenge.

Leadership: Leadership Styles & Self-Assessment, Communication & Active Listening, Decision-Making & Responsibility, Teamwork & Delegation, Empathy, Integrity & Conflict Management, Vision, Motivation & Goal-Setting.

Activities: Crisis Leadership Simulation, Tower Challenge, Leadership Dilemmas Role-Play, Team Vision Board

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)

References:

1. De Bono, E. (2017). Six thinking hats, Little, Brown Book Group.
2. Facione, P. A. (2015). Critical thinking: What it is and why it counts. Insight Assessment.
3. Kahneman, D. (2011). Thinking, fast and slow. Farrar, Straus and Giroux.
4. Whetten, D. A., & Cameron, K. S. (2016). Developing management skills. Pearson.

	Description of CO	PO	PSO
CO1	Explain the importance of leadership and management skills in life.	---	
CO2	Apply and demonstrate creative thinking techniques to generate innovative solutions.	PO7 (3)	PSO1(1) PSO2(1)
CO3	Exhibit effective collaboration and communication skills through teamwork, active listening, and conflict resolution strategies.	PO8 (2)	PSO3(3)
CO4	Integrate scientific temperament and logical reasoning into c problem solving in engineering and real-world contexts.	PO11 (2)	PSO2(1) PSO3(2)

UC25A04	Physical Education - II	L	T	P	C
		0	0	4	1

Course Objectives:

- To impart knowledge on gymnastic exercises and pressing needs for upskilling in a particular game.

Basic gymnastics exercises: Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

Upskilling in any one of the athletics: Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.

Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the I semester.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)

References:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). *Psychology of sports performance*. Sports Publication.
4. Kandappan, K. (2004). *Foundations of physical education*. Friends Publications.

E-resources:

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

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	
CO2	Apply safety principles and methods during sports activities.	PO1(3)	PSO3(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8 (3)	PSO3(2)
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.	PO11(1)	PSO3(2)

Foreign Language^

UC25F01	Deutsch – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Deutsch language, including reading, writing systems, pronunciation, and speaking.

Basics & Introduction: German alphabet and pronunciation, Basic greetings and farewells, Introducing yourself and others (Ich heiße…, Wer bist du?), Numbers 1–100 and days of the week, Personal pronouns (ich, du, er, sie…), Sentence structure (SVO word order).

Activities: Alphabet spelling game, short skits, Use color-coded cards for SVO sentences.

Grammar Essentials & Everyday Vocabulary: Present tense of regular verbs (spielen, arbeiten, machen…), Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Articles and gender (der, die, das; ein, eine), Simple questions and negation (nicht, kein), Describing people and things: adjectives and colors, Family, school, food, and common objects vocabulary.

Activities: Conjugate regular and irregular verbs, “Question Chain” game, Create a simple family tree.

Everyday Communication in German: Asking for and giving directions, Telling the time and talking about schedules, Ordering food and drinks at a café or restaurant, Talking about hobbies, weather, and daily routines, Listening to short conversations and responding appropriately, Introduction to German culture and formal/informal language use (du vs Sie).

Activities: Ordering food and drinks, Give directions, Formal / Informal greetings, Do’s and Don’ts.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. Funk, H., Kuhn, C., & Demme, S. (2015). Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag.

	CO Description	PO	PSO
CO1	Understand simple spoken Deutsch in everyday contexts.	---	
CO2	Communicate with widely used Deutsch words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Deutsch language.	PO11 (1)	PSO3(2)

UC25F02	Japanese – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation, and speaking.

Writing Systems & Basic Communication: Introduction to Hiragana: vowels, basic characters, reading & writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前、出身、年齢), Basic sentence structure: Subject–Object–Verb, Numbers 1–100, days of the week, classroom expressions.

Activities: Flashcard games and writing drills, Self-introduction, Numbers & date-matching, Greeting expressions, Listening to audio.

Grammar & Everyday Vocabulary: Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます、のみます), Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに、どこ、だれ、いつ, Vocabulary for family, food, colors, and basic actions.

Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters

Conversation & Cultural Etiquette: Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (〜はどこですか？), Ordering food and making polite requests (〜をください、〜をおねがいします), Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal speech and Japanese etiquette.

Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.

Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping, and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2011). Genki I: An integrated course in elementary Japanese. The Japan Times.
2. The Japan Foundation. (2017). Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers.

	CO Description	PO	PSO
CO1	Understand simple spoken Japanese in everyday contexts.	---	
CO2	Communicate with widely used Japanese words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.	PO11 (1)	PSO3(2)

UC25F03	Korean – I	L	T	P	C
		1	0	2	1

Course Objectives:

- To impart fundamentals of the Korean language, including reading, writing systems, pronunciation, and speaking.

Fundamentals of Korean: Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).

Activities: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.

Essential Grammar and Vocabulary: Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, Expressing possession and location, Asking simple questions (어디, 뭐, 누구).

Activities: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.

Everyday Korean Communication: Polite speech levels and honorifics introduction, Talking about time, dates, and schedules, Ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, Listening practice with short dialogues, Cultural notes on etiquette and communication.

Activities: Role-play ordering at a restaurant or buying items, Listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.

Weightage: Continuous Assessment: 100%

Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. King, R., Yeon, J., & Brown, A. (2015). Elementary Korean (2nd ed.). Tuttle Publishing.
2. Cho, Y., Lee, H., Schulz, C., Sohn, H.-M., & Sohn, S.-O. (2001). Integrated Korean: Beginning 1. University of Hawai‘i Press.

	CO Description	PO	PSO
CO1	Understand simple spoken Korean in everyday contexts.	---	
CO2	Communicate with widely used Korean words effectively.	PO9 (2)	PSO3(2) PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.	PO11 (1)	

SEMESTER III

MA25C13	Probability and Statistics	L	T	P	C
		3	1	0	4

Course Objectives: The Objectives of the course are to introduce data collection methods, classification techniques, and graphical representation of data using charts and plots, to explain the fundamental concepts of descriptive statistics, probability theory, random variables, and hypothesis testing for analyzing data and to demonstrate the application of statistical techniques such as experimental design and process control using R/Python for data-driven decision-making.

Descriptive Statistics: Collection of Data-Classification-Tabulation-Graphical Representation – Simple Bar Chart – Pie Chart -Measures of Central Tendency: Arithmetic Mean, Median and Mode – Measures of Variation: Range, Quartile Deviation - Standard Deviation and Coefficient of Variation – Five Number Summary – Box Plot Technique.

Activities: Application of descriptive statistics and data presentation methods using R/ Python programming and Analysing data using Box Plots using R/ Python programming.

Probability and Random Variables: Axioms of probability - Conditional probability – Total probability – Bayes' theorem Random variable – Distribution function – properties – Probability mass function – Probability density function – Moments - Standard Distributions - Binomial, Poisson and Normal Distributions-Problems, Uniform Distribution and Exponential Distribution (Simple Problems)

Activities*:* Application of various distributions using R/ Python programming.

Two-Dimensional Random Variables: Joint distributions – Marginal and conditional distributions – Expected values of functions of two variables– Correlation and regression (for discrete data only) - Central limit theorem – Statement and Simple Problems

Activities: Applications of Correlation and Regression using R/ Python programming.

Testing of Hypothesis: Large sample tests for single mean and difference of means – Small samples tests based on t and F distributions (single mean, difference of means, paired t- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit.

Activities: Application of Student – t test, F test, Chi –s square test using R/ Python programming.

Design of Experiments: Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD)

Activities: Application and visualization of One-way ANOVA and Two -way ANOVA using R/ Python programming.

Weightage: Continuous Theory Assessment: 20%, Continuous Lab Assessment: 20%, End Semester Examinations: 60%

Assessment Methodology: Quiz - 10%, Assignments - 20%, Lab Manual - 15%

Lab Examination - 15%, Internal Examinations - 40%

References:

1. Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education Inc, 9th edition, 2024.
2. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2021.
3. Johnson R. A., Miller & Freund's, "Probability and Statistics for Engineers", 9th Edition, Pearson Education, Delhi, 2020.
4. Charles Henry Brase and Corrinne Pellillo Brase, "Understandable Statistics: Concepts and Methods", Cengage Learning, 12th Edition, 2018.
5. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", 6th Edition, Pearson Education, Asia, 2012.
6. Anderson, T. W, "An Introduction to Multivariate Statistical Analysis", 3rd edition, John Wiley and Sons, 2009.

E-resources:

1. NPTEL – Descriptive Statistics with R Software - https://onlinecourses.nptel.ac.in/noc22_mg87/preview
2. MIT OCW – Introduction to Probability and Statistics (18.05, Spring 2022) - https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/
3. MIT OCW – Statistics for Applications (18.650, Fall 2016) - https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/
4. Control Charts – Coursera: https://www.coursera.org/learn/stability-and-capability-in-quality-improvement#modules

	CO Description	PO Mapping	PSO
CO1	Understand concepts of descriptive statistics, probability theory and testing of hypothesis.	-	-
CO2	Apply probability distributions and statistical methods to solve engineering problems	PO1(3)	PSO1(1)
CO3	Analyze data using correlation, regression, and probability models.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize hypothesis testing, ANOVA for data-driven decision-making.	PO5 (3) PO11 (2)	PSO2(2)

TT25C02	Characteristics of Textile Fibres	L	T	P	C
		3	0	2	4

Course Objective: To enable the students to learn the structure, morphology and physical characteristics of textile fibres.

Structure and Properties of Fibres: Study of morphological structures of fibers; physical properties of fibres; identification of fibres and blend analysis; order and disorder in the fibre structure; molecular conformations – planar zig-zag, helical, lamellar and spherulite conformations.

Practical:

1. Identification of natural, regenerated and synthetic fibres
2. Determination of denier of synthetic fibres
3. Determination of the blend proportion of binary and tertiary blends

Activities: Collection and classification of fibres, build the models for various conformations of polymer chain, solving of GATE questions.

Moisture Characteristics: Theories of moisture sorption; moisture absorption behavior of natural and man-made fibres; determination of moisture regain; influence of fibre structure, humidity and temperature on the moisture absorption; conditioning of fibres – mechanism of conditioning and factors influencing conditioning; moisture diffusion in fibres; heat of sorption – integral and differential, their relation; factors influencing heat of sorption; measurement of heat of sorption

Practical: Determination of moisture regain and moisture content of fibres.

Activities: RH measurement using wet and dry bulb, solving of GATE questions.

Tensile and Elongation Characteristics: Tensile characteristics – strength, elongation, work of rupture, initial modulus, work factor, yield point and determination of yield point; stress-strain relations of natural and man-made fibres; influence of fibre structure, humidity and temperature on tensile characteristics; time effects- study of creep phenomena; elastic recovery and its relation to stress and strain of fibres; mechanical conditioning of fibres and its influence on elastic recovery; load cycling and extension cycling-their effect on properties; introduction about torsional and flexural rigidity of fibres

Practical: Analysis of stress strain graph and determination of yield point for various fibres.

Activities: determination and comparison of various fibres for work of rupture, specific stress, modulus, specific strain from the stress-strain graph, solving of GATE questions

Optical, Frictional, And Thermal Characteristics: Reflexion and lustre - objective and subjective methods of measurement; refractive index and its measurement; birefringence, factors influencing birefringence; absorption and dichroism; friction – static, limiting and kinetic friction, its measurement, comparison of fibres, directional friction in wool; thermal properties of fibres – thermal conductivity, thermal expansion and contraction, first and second order transition temperatures; static electricity in textile fibres.

Practical: Analysis of thermal conductivity, thermal expansion and contraction of various fibres.

Activities: comparison of specific heat, thermal conductivity and resistivity of various fibres from the graph, solving of GATE questions.

Structure Investigation Techniques: Transmission and Scanning electron microscopes, X - ray diffractometer, Thermo Gravimetric Analyser, Differential Scanning Calorimetry, Fourier Transform Infra-Red Spectrometer - principle and analysis of fibres; dichroism techniques; chemical element and end group analysis; molecular orientation – estimation methods.

Practical: Analysis of TGA and DSC thermograms of various fibres.

Activities: comparison of T_g, melting and crystallinity of various fibres and suggestions for applications, solving of GATE questions.

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

Assessment Methodology for continuous assessment (50%): Theory: 30%, practical 10%, activity 10% (Assignments, seminar, quiz, objective type test, project model)

References:

1. Morton W.E., and Hearle J.W.S., “Physical Properties of Textile Fibres”, The Textile Institute, Washington D.C., 2008, ISBN978-1-84569-220-95
2. Mishra S. P. “Fibre science and Technology”, New age international publisher, 2010
3. Mukhopadhyay S. K., “Advances in Fibre Science”, The Textile Institute,1992, ISBN: 1870812379
4. Meredith R., “Mechanical Properties of Textile Fibres”, North Holland, Amsterdam, 198 6, ISBN: 1114790699, ISBN-13:9781114790698
5. Hearle J.W.S., “Polymers and Their Properties: Fundamentals of Structures and Mechanics Vol1”, Ellis Horwood, England, 1982, ISBN:047027302X|ISBN-13:9780470273029
6. Greaves. P. H., and Saville B.P., “Microscopy of Textile Fibres”, Bios Scientific, U.K., 1995, ISBN: 1872748244 | ISBN-13:9781872748245
7. Hearle J. W. S., and Peters. R. H., “Fibre structure”, Elsevier Ltd, 1963, ISBN: 1483212211| ISBN-13:9781483212210

E-Resources: https://nptel.ac.in/courses/116102026

CO Mapping with PO & PSO:

CO's	CO Description	PO	PSO
CO1	Understand the structure, morphology, and properties of textile fibres.	–	–
CO2	Apply knowledge of moisture properties to assess fibre performance under different environmental and processing conditions.	PO1(3), PO4(3)	PSO1(2)
CO3	Analyze the tensile, elongation, optical, thermal, and frictional characteristics of fibres in relation to their performance and applications.	PO2(3), PO4(3)	PSO2(2)
CO4	Evaluate fibre structural characteristics and select suitable fibres for specific textile and industrial applications.	PO3(3), PO5(3), PO7(1)	PSO3(2)

TT25C03	Technology of Yarn Spinning I	L	T	P	C
		3	0	2	4

Course Objectives:

To enable the students to learn

- The theory of various operations carried out at different stages of pre-spinning processes
- The construction and working of machinery used for preparatory
- Learn material passage in the spinning preparatory machines
- Identify the parts of machine and carryout production, draft and twist calculations

Introduction to Ginning and Spinning Machine: Description and working of different types of gins; ginning performance on yarn quality; Sequence of spinning machinery for producing carded, combed and blended yarns in short staple spinning system; numbering systems for textile materials and conversions.

Practical: Construction details and material passage in ginning machine

Activities: collection of different yarns and identification of yarn type, deriving constants in yarn numbering system and preparation of table for yarn numbering system, norms for raw materials, solving of GATE questions.

Blowroom Machinery: Blow room - objectives, principle and description of opening and cleaning, blending machines, piano feed regulator, scutcher, chute feed, metal detectors, foreign matter detectors; cleaning efficiency, production calculations.

Practical:

(1) Construction details and material passage in blow room machines
(2) Gearing arrangement, calculation of rotating speed of working elements, cleaning efficiency and production of blow room machines

Activities: sketching and naming the parts, salient features of modern blow room machines, preparation and comparison of specifications for opening and cleaning machines for conventional and modern machines, norms for blow room process, solving of GATE questions.

Carding Machine: Objectives and principle of carding operations; study of carding machine; auto-levelling; card clothing and its maintenance; draft and production calculation

Practical:
(1) Construction details, material passage, wire point arrangements and settings of carding machine
(2) Draft and production calculations in the carding machine

Activities: sketching and naming the parts, salient features of modern carding machines, preparation and comparison of specifications for various carding machines for conventional and modern machines, preparation of card settings for various counts, norms for carding process, solving of GATE questions.

Comber: Study of comber preparatory machines; objectives and principles of combing; sequence of combing operation; study of combing machine; combing efficiency and production calculation

Practical:
(1) Construction details and material passage of comber
(2) Combing cycle, draft and production calculations of comber

Activities: sketching and naming the parts, salient features of modern preparatory and comber machine, norms for combing preparatory and combing process, solving of GATE questions.

Draw frame and Roving Frame: Draw frame – objectives and material passage in draw frame; drafting systems used in modern draw frames; auto-levelling; draft and production calculation; objectives and material passage in roving frame; bobbin builder mechanism; draft, twist and production calculations; safety measures at pre-spinning processes – equipment's used, safety practices.

Practical:

1. Construction details, material passage, draft and production calculations of drawing machine
2. Construction details, material passage, draft, twist and production calculations of roving machine
3. Study of builder mechanism of roving machine
4. Determination of actual roller speed, eccentricity of roller and top arm loading
5. Production of samples of draw sliver and rove.

Activities: sketching and naming the parts, salient features of modern draw frame and simplex, sketching of builder mechanism and differential mechanism, norms for draw frame, solving of GATE questions.

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

Assessment Methodology for continuous assessment (50%) : Theory: 30%, practical 10% , activity 10% (Assignments, seminar, quiz, objective type test, project model)

References

1. Klein W., “The Rieter Manual of Spinning, Vol.1-Technology of short staple spinning”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-1-4 / ISBN 13 978-3-9523173-1-0..
2. Klein W., “The Rieter Manual of Spinning, Vol.2-Blowroom & carding”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-2-2 / ISBN 13 978-3-9523173-2-7.
3. Klein W., “The Rieter Manual of Spinning, Vol.3-Spinning preparation”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN 10 3-9523173-3-0 / ISBN 13 978-3-9523173-3-4.
4. Carl A. Lawrence., “Fundamentals of Spun Yarn Technology”, CRC press, 2003,ISBN 1- 56676-821-7
5. Eric Oxtoby, “Spun Yarn Technology “, Butterworth, Boston, London, 1987, **ISBN:**0408014644 9780408014649
6. Lord P.R., “Yarn Production: Science, Technology and Economics”, The Textile Institute, Manchester, 1999.
7. Iredale John A., “Yarn Preparation: A Handbook”, Intermediate Technology, London,1992, ISBN:1853390429.
8. Doraiswamy I., Chellamani P., and Pavendhan A., “Cotton Ginning, Textile Progress”, The Textile Institute, Manchester, 1993.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc19_te07/preview
2. https://www.textileschool.com/9981/basics-of-yarn-spinning/
3. https://textilevaluechain.in/news-insights/advancements-in-yarn-spinning-technologies
4. https://onlinecourses.nptel.ac.in/noc23_te07/preview

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand the fundamental principles of yarn spinning, fibre preparation, and basic spinning operations.	–	–
CO2	Apply the principles of yarn manufacturing processes such as opening, carding, drawing, and roving to achieve desired fibre preparation and process control.	PO1(3)	PSO1(3)
CO3	Analyze the performance of spinning processes and machinery in terms of yarn quality, process efficiency, and production parameters.	PO2(3), PO4(2)	PSO2(2)
CO4	Evaluate and select appropriate spinning techniques, machinery, and process parameters to produce yarns with specified quality characteristics.	PO3(3), PO5(2)	PSO1(3), PSO2(2)

TT25C04	Technology of Weaving I	L	T	P	C
		3	0	2	4

Course Objective: This course introduces students to impart fundamental knowledge and practical skills in yarn winding, warping, sizing, and drawing-in processes used in textile manufacturing. The course emphasizes process control, fault analysis, machine mechanisms and productivity enhancement to ensure quality and efficiency in yarn preparation for weaving.

Winding: Objectives of winding; principles of drum and precision winding machines; material passage in ordinary cone winding machine; tensioning devices - uniform build of yarn package - control of balloons; Yarn traverse - types of drums – half accelerated and fully accelerated drums; Classification of yarn faults and their removal; yarn clearing – mechanical, optical and electronic clearers; knotters and splicers, material passage and working principle of modern automatic cone winding machines and weft winding machines; winding calculations – production and efficiency in cone winding and pirn winding machines;

Practical:

1. Study of ordinary cone winding machine
2. Analysis of yarn faults
3. Control of production, package density, yarn faults in cone / cheese winding machine
4. Study of pirn winding machine
5. Study of automatic cone winding machines

Activities: comparison of salient features of conventional and automatic winding machine, solving of GATE questions.

Process Control in Winding: Faults in cones/chesses - causes and remedies; modifications required for winding synthetic and blended yarns; winding for colouration; quality of knots and splices; winding performance; productivity; maintenance; quality control; material handling.

Activities: sketching of various knots and splices, preparation of maintenance schedule for winding machines, preparation of pictographs of yarn faults, solving of GATE questions.

Warping: Objectives of warping - material flow in modern high speed beam warping machine; creels and tensioning devices used in warping machines; sectional warping machines – objectives and material flow in sectional warping machine; Defects in warp beams – causes and remedies; beam warping calculations – production and weight of warp beam; Sectional warping calculations -number of sections, number of patterns per section, width of warp and total number of ends in the warp.

Activities: specifications and salient features of conventional and modern warping machines, pattern preparation in sectional warping, solving of GATE questions.

Sizing: Sizing - objectives of sizing - sizing ingredients and recipe preparation for different types of fibres; size preparation equipment; sizing machines – material flow in multi cylinder sizing machine - size level, size viscosity, drying temperature, stretch and moisture controls in sizing; sizing filament yarns; concept of single end sizing and combined dyeing and sizing; energy conservation in sizing; sizing defects; sizing calculations – production, size pick up percentage, efficiency, sized yarn count and weight of sized warp.

Practical:

1. Study of warping machine
2. Study of sectional warping machine
3. Study of sizing machine

Activities: preparation and comparison of size paste for various yarns, sketching and naming the parts of modern sizing machines, solving of GATE questions.

Process control in Warping and sizing: Process control in warping - production calculation, machine and labour productivity, hard waste, efficiency, production, creel capacity, number of back beams in warping; sectional warping - calculation – creel capacity; Control systems used in sizing machine

Activities: Tabulate the causes for warping and sizing defects, principles of control mechanism used in modern sizing machines, solving of GATE questions.

Drawing-in and denting: Drawing-in and denting operation - manual and automatic drawing- in, leasing, knotting and pinning machines; selection and care of reeds, healds and drop pins; control of cross ends and extra ends

Practical: Study of drawing – in, denting and tying

Activities: Sketching of various parts of drawing-in and denting machine, reed count calculations.

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

Assessment Methodology for continuous assessment (50%) : Theory: 30%, practical 10% , activity 10% **(**Assignments, seminar, quiz, objective type test, project model)

References:

1. John A. Iredale “Yarn Preparation: A Hand Book”, Textile Institute, Manchester,1992, ISBN:1853390429.
2. MilindVasudeoKoranne, “Fundamentals of Yarn Winding”, Woodhead Publishing,India, 2013,ISBN: 978-1-78242-068-2.
3. Goswami B.C., Anadjiwala R.D. and Hall D.M.., “Textile Sizing”, Marcel Dekker, NewYork, 2004,ISBN: 0-8247-5053-5.
4. Baneerjee.P.K., “Principles of Fabric Formation”, CRC Press, London,2014, ISBNNumber:13:978-1-4665-5445-0.
5. Abhijit Majumdar, Apurba Das, R.Alagirusamy and V.K.Kothari., “Process Control in Textile Manufacturing”, Wood Head Publishing Limited, Oxford, 2013, ISBN: 978-0- 85709-027-0.
6. Lord P.R. and Mohammed M.H., "Weaving – Conversion of Yarn to Fabric", Merrow Publication, 1992.

E-Resources:

1. https://nptel.ac.in/courses/116102005
2. https://nptel.ac.in/courses/116102012
3. https://nptel.ac.in/courses/116102019
4. Swayam courses on weaving

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand the principles, objectives, machine mechanisms, and calculations involved in winding, warping, sizing, and drawing-in processes.	–	–
CO2	Apply winding, warping, sizing, and drawing-in techniques to prepare yarns suitable for weaving operations and perform production calculations.	PO1(3), PO2(2)	PSO1(3)
CO3	Analyze yarn faults, process parameters, machine performance, and quality control measures in yarn preparation processes.	PO2(3), PO4(2)	PSO2(3)
CO4	Evaluate process control systems, productivity, maintenance practices, and defect-remedial measures in winding, warping, and sizing operations.	PO3(3), PO5(2), PO7(1)	PSO2(3), PSO3(2)
CO5	Select and optimize suitable yarn preparation methods, machinery, and process parameters to enhance weaving efficiency, product quality, and sustainability.	PO3(3), PO5(3), PO10(2)	PSO1(2), PSO2(2), PSO3(3)

MG25302	Fundamentals of Economics and Management	L	T	P	C
		3	0	0	3

Course Objectives: The course aims to equip students with the skills to apply economic theories to business decisions, focusing on efficiency, inflation, national income, and sustainable development goals. The objective of this course is to provide a comprehensive foundation in management functions including planning, organising, and controlling, while simultaneously integrating essential engineering, economic and management principles.

Fundamentals of Economics and Cost: Introduction to Scope of Engineering Economics - Circular Flow in an Economy - Demand and Supply dynamics - Types of Efficiency - Cost Concepts - Types of Cost - Short-run and Long-run.

Activities: Illustrating demand and supply dynamics in handloom and textile industry

Production control: Output Relationship - Make or Buy Decision (Criteria and Approaches) - Inventory Models - Purchase Model - Manufacturing Model (With or Without Shortages) - Depreciation Methods - Problems in Straight Line and Diminishing Balance Method.

Activities: Illustrating cost and product functions in textile industry.

Pricing Strategies and Capital Budgeting: Pricing Practices and Strategies - Revenue Concepts - CVP Analysis - Problems in Break-Even Analysis - Value Analysis - Pay-back Period - Net Present Value (NPV) and Internal Rate of Return (IRR) - Project Management Techniques - PERT - CPM Models - Case Analysis.

Activities: Real-world illustrations from the textile industry for captial budgeting.

Foundations of Management, Planning and Organising: Definition of Management - Science or Art - Types of managers - Managerial roles and skills - Evolution of Management - Current trends and issues in Management - Nature and purpose of planning - Planning process - Types of planning - Objectives - Setting objectives - Policies - Planning premises - Planning Tools and Techniques

Activities: Plan a departmental activity event.

Organisational Structure: Nature and purpose of organizing - Formal and informal organization - Organization chart - Organization structure - Types - Line and staff authority - Departmentalization - Delegation of authority - Centralization and decentralization - Job Design - Types of Business organization - Sole proprietorship, partnership, company (public and private sector enterprises)

Activities: Classify organisational structures present in public and private sectors in handloom and textile industry.

Directing, Controlling, and Organizational Behavior : Foundations of individual and group behaviour - Motivation theories and techniques - Job satisfaction and enrichment - Leadership types and theories - Communication process, barriers, and effective communication - IT in Communication - System and process of controlling - Budgetary and non-Budgetary control techniques - Use of computers and IT in Management control - Productivity problems and management - Direct and preventive control - Reporting.

Activities: Evaluate different leadership styles in an textile organisation of your choice.

Weightage: Continuous Assessment: 100%, End Semester Examinations: 60%.

Assessment Methodology: Written Test I & II (60%), Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)

References:

1. Paul A. Samuelson, William D. Nordhaus, Sudip Chaudhuri and Anindya Sen, Economics, Tata McGraw-Hill, 20th edition, 2019.
2. Panneerselvam. R., "Engineering Economics", PHI Learning Private Limited, 2013, ISBN: 978-8120348370, 2nd Edition.
3. Metha P.L, "Managerial Economics – Analysis, Problems and Cases", Sultan Chand & Sons, 2016 (Reprint 2020), ISBN: 978-9351610595, 21st Edition.
4. Zahid A. Khan et al., "Principles of Engineering Economics with Applications", Cambridge University Press, 2018, ISBN: 978-1108458856, 2nd Edition. Drucker, P. F.
5. "The Practice of Management." Harper Business, 2006 (Reissue), ISBN: 978-0060878979, Reprint Edition.
6. Harold Koontz and Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 2023, ISBN: 978-9353168148, 11th Edition.
7. Stephen A. Robbins, David A. Decenzo, and Mary Coulter, "Fundamentals of Management", Pearson Education, 2020, ISBN: 978-0135175156, 11th Edition.

E-Resources:

1. NPTEL (National Programme on Technology Enhanced Learning) Comprehensive Management & Engineering courses.https://nptel.ac.in/
2. NPTEL (SWAYAM Archive) Managerial Economics (IIT Kharagpur/Roorkee). https://archive.nptel.ac.in/courses/110/101/110101005/, Strategic Management & Leadership. https://archive.nptel.ac.in/courses/110/108/110108047/
3. MIT OpenCourseWare (OCW) Leadership, Organizational Change, and Strategy (Free Lecture Notes & Materials) https://ocw.mit.edu/search/?t=Management
4. Investopedia free simulations and calculators for NPV, IRR, and Break-Even Analysis. https://www.investopedia.com/calculator/
5. UN Sustainable Development Knowledge Platform Resources on SDGs and Circular Economy. https://sdgs.un.org/

CO Code	CO Description	PO Mapping	PSO
CO1	Interpret the fundamental concepts of micro and macroeconomics, including demand-supply dynamics and the circular flow of income.	PO1(1)	-
CO2	Analyze cost-output relationships and apply engineering economic techniques (Depreciation, Inventory Models) to minimize operational costs.	PO1(3) PO2(2)	PSO1(1)
CO3	Apply capital budgeting methods (NPV, IRR) and project management techniques (PERT/CPM) to evaluate project feasibility and scheduling.	PO11(3) PO2(2)	PSO1(1)
CO4	Understand the impact of macro-economic policies and interpret the role of Sustainable Development Goals (SDGs) in modern business.	PO7(2)	-
CO5	Analyze organizational structures and planning processes to determine the most effective management hierarchy for a given business context.	PO6(2)	-
CO6	Apply theories of motivation, leadership, and communication to manage teams effectively and solve organizational behavioral issues.	PO9(2) PO10(2)	-

EN25C03	English Communication Skills Laboratory– I	L	T	P	C
		0	0	2	1

Course Objectives: The objectives of the course are to foster students' confidence and fluency in professional and social communication and to bridge the gap between academic English and industry expectations.

List of Activities

A. Elements of Effective Speaking and Listening

(i) Sharing life experience/ turning point in their life – SATORI

(ii) Situational Conversation – eg. Talking to a Senior about Internship Tips

(iii) Welcoming a Guest Speaker at a Seminar

(iv) Pictography to represent data using images or symbols

(v) B2-C1 Listening exercises include lectures, interviews, and discussions.

B. Mastering Presentations

(i) Presentation Skills – Non-verbal communication

(ii) Mini-Presentations: Topics like "My Dream Project," "Engineering in 2050," 3-minute technical pitches with logical flow

(iii) Technical Presentations with PPT

C. Group Discussion Strategies:

(i) Introduction to Group Discussions - Key skills for effective participation

(ii) Phases in a GD and Conversational Phrases in GD.

(iii) Group Discussions – Abstract and Factual topics

D. Resume & LinkedIn Optimization

(i) Building LinkedIn Profile – Drafting headlines and summaries

(ii) Social Media Optimisation

(iii) Preparing Video Resume

E. Podcast-Based Language Learning:

(i) Listening to podcast (motivational, career oriented, success stories)

(ii) Podcast Preparation – Purpose – Topic – Structure – Recording Tips - Publication of the Podcast

F. Mock Interviews and Communication Strategies:

(i) Listening – Job interview

(ii) Speaking – Mock interviews

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

Internal Assessment: 1. Listening (20 marks)
2. Video Resume (20 marks)
3. Creating a Podcast (30 marks)
4. Mock interview (30 marks)

End Semester Assessment: 1. Presentation with PPT (50 marks)
2. Group Discussion (50 marks)

References:

1. Floyd Kory, “Interpersonal Communication”, McGraw Hill Publication, 2023.
2. Bharadwaj Apoorva, “Leadership Communication Skills for Intercultural Management: Strategies for Effective Intercultural Management (Contemporary Themes in Business and Management)”, Routledge India; 1st edition, 2024.
3. Helen Spencer-Oatey and DomnaLazidou**, “**Making Working Relationships Work: The TRIPS Toolkit for Handling Relationship Challenges and Promoting Rapport”,Castledown Publishers,2023.
4. Presentations - Cambridge
5. Speaking Extra
6. Listening Extra – Miles Craven by Cambridge University Press
7. CVs, Resumes, and LinkedIn: A Guide to Professional English – Springer International Publishing

E-resources:

1. Train your mind to perform under pressure- Simon Sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2. Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
3. Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0

CO Mapping with PO & PSO:

	Description of CO	PO	PSO1
CO1	Communicate effectively in everyday professional situations with confidence		
CO2	Deliver well-organised and effective presentations.	PO9(3)	PSO1(1) PSO3(2)
CO3	Participate in group discussions and express ideas clearly and confidently.	PO8(2) PO9(3)	PSO3(2)
CO4	Create professional video resumes and participate in interviews effectively.	PO9(2)	PSO3(3)
CO5	Create, record and publish motivational podcasts.	PO9(2) PO11(1)	PSO2(2) PSO3(3)

HT25C01	Technology of Man-made Fibre Production	L	T	P	C
		3	0	0	3

Course Objective: The students able to learn different methods of production of manmade fibres and post spinning operations

Polymer Preparation: Synthetic fibres – Monomers, source of monomers-structural principles of polymeric fibres; Polymer rheology-Newtonian and non-Newtonian fluids – shear flow, capillary flow and elongational flow behavior; Melt instabilities.

Activities: structure of monomers and polymers for manmade fibres, comparison of flow behavior of various polymers, solving of GATE questions.

Melt Spinning: Melt Spinning- polymer selection and preparation, fibre spinning-process variables; structure formation, polyester, polyamide and polypropylene fibres; integrated processes; post spinning operations, properties and applications of fibres.

Activities: Process sequence and process control of spinning of various melt spun yarns recent developments in melt spun fibres, solving of GATE questions.

Solution Spinning: Solution spinning- polymer selection and preparation; principle of fibre spinning- wet spinning, dry spinning and process variables, structure and morphology; post spinning operations, properties and applications of acrylic, polyurethane and regenerated cellulose fibres;

Activities: Process sequence and process control of spinning of various solution spun yarns recent developments in solutions spun fibres, Solving of GATE questions

High performance and Speciality fibre Spinning: Liquid crystal polymers spinning; Gel spinning; dry jet wet spinning; electrospinning; Profile and hollow fibres.

Activities: Process sequence and process control of spinning of highperformance fibres applications of high performance fibres, solving of GATE questions.

Drawing and Spin Finish: Draw behavior of thermoplastic polymers; Neck drawing, drawing systems, influence of drawing on structure and properties of various fibres; spin finish – requirements, compositions and methods of application.

Activities: parameters for POY, FOY, HOY, spin finish formulations for various fibres, solving of GATE questions.

Heat Setting and Texturing: Heat setting, nature of heat set- temporary and permanent; influencing parameters on heat setting, influence of heat setting on various fibre properties; texturizing principles- thermal, chemical, mechanical and thermo-mechanical; properties of textured yarns; applications.

Activity: Process parameters of production of different textured yarns, Process parameters of heat setting of thermoplastic fibres, images of various textured yarn, recycling of textiles, solving of GATE questions.

Course Outcomes:

Upon completion of the course, the student shall know about the

CO1: Synthesis of polymers and flow behaviour of polymers

CO2: Melt spinning of polymers and influencing factors

CO3: Solution spinning of polymers, developments in spinning and structure formation

CO4: Drawing and spin finish application of fibres and filaments

CO5: Heat setting and its influence on fibre properties and principles of texturising process.

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

Assessment Methodology for continuous assessment (40%) : Theory: 28% + activity 12% (Assignments, seminar, quiz, objective type test, project model)

References:

1. Kothari V. K., “Textile Fibres: Development and Innovations”, Vol. 2, Progress in Textiles, IAFL Publications, New Delhi, 2000, ISBN: 81-s901033-0-X.
2. Gupta V. B., and Kothari V. K., (Editors), “Manufactured Fibre Technology”, Kluwer Academic Publishers, 1997, ISBN 0412-54030-4.
3. Vaidya A. A., “Production of Synthetic Fibres”, Prentice Hall of India Pvt. Ltd., New Delhi, 1988.ISBN: 0876925786 / ISBN: 9780876925782.
4. Hearle J W S, Hollick L, Wilson D K., “Yarn Texturing Technology”, Woodhead publishing, 2001, ISBN: 978-1-85573-575-0
5. Cook J. G., “Handbook of Textile Fibres: Vol. 2: Man Made Fibres”, The Textile Inst., 5th Ed., 1984, ISBN: 1855734850.
6. Srinivasa Murthy H. V., “Introduction to Textile Fibres”, Textile Association, India, 1987.
7. Nakasjima (English edition, edited by Kajiwara K. and McIntyre J. E.), “Advanced Fibre Spinning Technology”, Wood head Publication Ltd., England, 1994, ISBN:1855731827

E-Resources: Swayam courses on manmade fibres.

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand the synthesis of polymers and the flow behaviour of polymer melts and solutions used in fibre production.	–	–
CO2	Apply the principles of melt spinning and identify the factors influencing fibre formation and spinning performance.	PO1(3), PO2(2)	PSO1(2)
CO3	Analyze solution spinning processes, recent developments in spinning technologies, and fibre structure formation mechanisms.	PO2(3), PO4(2)	PSO2(2)
CO4	Evaluate the effects of drawing and spin-finish applications on the properties and performance of fibres and filaments.	PO3(3), PO5(2)	PSO2(2), PSO3(1)
CO5	Evaluate and select appropriate heat-setting and texturising processes to achieve desired fibre characteristics and end-use performance.	PO3(3), PO5(3), PO7(1)	PSO3(2)

TT25C05	Technology of Yarn Spinning II	L	T	P	C
		2	0	2	3

Course Objectives:

To enable the students to learn

- Theory of yarn formation by different spinning systems
- Construction of yarn spinning machines and prepare yarn using ring and rotor spinning machine

Ring Spinning - I: Principle of yarn formation in ring frame - drafting, twisting and winding; mechanism of cop building, top arm loading; calculations of draft, twist, production; influence of fibre characteristics on yarn quality and machine performance

Practical:

1. Material passage and construction details of ring spinning machine
2. Identification of components of ring frame
3. Gearing arrangement and draft, twist and production calculations of ring spinning machine
4. Study of builder mechanism of ring spinning machine

Activities: norms for spinning process, spinning calculations using spreadsheet, solving of GATE questions.

Ring Spinning – II: Design features of important machine elements of ring frame – ring, traveller, spindle, drive arrangement; automations; condensed yarn spinning – principle, different methods and yarn properties; comparison with ring spun yarn; ring yarn defects – causes and remedies, preparation of spin plan.

Practical:

1. Selection of draft, twist, winding parameters and changing in the machine
2. Production of yarn using ring spinning machine

Activities: Spin plan for various counts using spreadsheet, Process variables in builder mechanism, solving of GATE questions.

Rotor Spinning: Principle of open end spinning; principle of yarn production by rotor spinning system; design features of important elements used in rotor spinning; techno economic study of rotor spinning; influence of fibre characteristics on yarn quality and machine performance; rotor yarn defects – causes and remedies

Practical:

1. Material passage and construction details of rotor spinning machine
2. Draft, twist and production calculations in rotor spinning machine
3. Production of yarn using rotor spinning machine

Activities: Process parameter of production of different rotor yarns, solving of GATE questions.

Other Spinning Systems: Friction, air-vortex, two nozzle air-jet, self-twist, core, wrap, adhesive, electrostatic, disc spinning systems – principle, raw material requirement, yarn structure, properties and applications.

Activities: comparison of yarn structures, properties and applications, solving of GATE questions.

Plying and Fancy Yarn Spinning: Merits of plying of yarns; methods followed for plying – TFO, ring twisting; selection of twist level for plying; calculation of resultant count of plied yarns; fancy yarns- types, method of production; property requirements and production of sewing threads; safety measures in spinning mill.

Practical:

1. Material passage and construction details in TFO machine
2. Twist, production and ply yarn count calculation in TFO Production of doubled yarn using TFO

Activities: Collections of fancy yarns, safety measures, recycling.

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

Assessment Methodology for continuous assessment (50%) : Theory: 30%, practical 10% , activity 10% (Assignments, seminar, quiz, objective type test, project model)

References:

1. Klein W., and Stalder H., “The Rieter Manual of Spinning, Vol.4”, Rieter Machine Works Ltd.,Winterthur, 2014, ISBN: 10 3-9523173-4-9 / ISBN: 13 978-3-9523173-4-1.
2. Stalder H., “The Rieter Manual of Spinning, Vol.5”, Rieter Machine Works Ltd.,Winterthur,2014, ISBN: 10 3-9523173-5-7 / ISBN: 13 978-3-9523173-5-8.
3. Stalder H., “The Rieter Manual of Spinning, Vol.6”, Rieter Machine Works Ltd.,Winterthur,2014, ISBN: 10 3-9523173-6-5 / ISBN: 13 978-3-9523173-6-5.
4. Oxtoby E., “Spun Yarn Technology”, Butterworth Publications, London, 1987.
5. James Brayshaw., and Everett Backe., “Short-staple Ring Spinning, Textile Progress”, TheTextile Institute, Manchester, 1999, ISBN: 0890898979 | ISBN-13:9780890898970
6. Iredale J., “Yarn Preparation: A Handbook”, Intermediate Technology, 1992, ISBN:5. 1853390429| ISBN-13: 9781853390425
7. Lawrence C. A., “Advances in Yarn Spinning Technology”, Wood Head publishing, 2010,ISBN:1845694449 | ISBN-13: 9781845694449

E-Resources: https://onlinecourses.nptel.ac.in/noc24_te07/preview

CO	Description of CO	PO	PSO
CO1	Understand the theory of yarn formation, constructional features of ring spinning systems, and calculate draft, twist, and production parameters.	–	–
CO2	Apply the principles of ring and compact spinning systems to analyze the functions of spinning elements and process parameters.	PO1(3), PO2(2)	PSO1(3)
CO3	Analyze the mechanism of yarn formation in rotor spinning systems and determine draft, back doubling, twist, and production characteristics.	PO2(3), PO4(2)	PSO2(2)
CO4	Evaluate different spinning systems based on yarn formation principles, production limitations, yarn structure, and quality characteristics.	PO3(3), PO5(2)	PSO2(3), PSO3(1)
CO5	Evaluate and select suitable methods for the production of ply yarns and fancy yarns to meet specific end-use requirements.	PO3(3), PO5(3), PO10(2)	PSO1(2), PSO3(2)

TT25C06	Technology of Weaving II	L	T	P	C
		2	0	2	3

Course Objectives: This course introduces students to provide fundamental understanding of weaving principles, loom mechanisms and yarn preparation for shuttle and shuttle less loom. The course equips students with practical knowledge of modern shedding, weft insertion, secondary motions and process control, with emphasis on fabric quality, loom efficiency, and special weaving techniques for conventional and auto looms.

Introduction to Weaving: Classification of looms; warp and weft preparation for high speed looms; yarn quality requirements for high speed automatic shuttle looms and shuttle less looms; principle of weaving, passage of material in a plain power loom; Objectives of primary, secondary and auxiliary motions; driving in a plain power loom; timing of motions.

Activities: Images of components of shuttle looms

Shedding Mechanisms: Shed geometry and shedding requirement; types of shed; shedding mechanisms – objectives and working of negative and positive tappet shedding mechanisms, dobby & jacquard shedding mechanism, electronic dobby & jacquard shedding mechanisms; depth of shed – altering depth of shed; heald reversing mechanisms-limitations of various shedding mechanisms

Practical:

1. Determination of depth of shed and heald shaft movements in tappet shedding mechanism
2. Study of dobby shedding mechanisms
3. Preparation of pattern cards for dobby shedding mechanism and adjust the depth of shed
4. Study of jacquard shedding mechanisms

Activities: Develop models for various types of shedding mechanism, cam profiles for various weaves, sketching the mechanisms of dobby and jacquard

Picking and Beat Up Mechanism: Picking – objectives and working of over pick and under pick mechanisms in plain power loom; shuttle checking devices, shuttle flight and timing; principles and mechanisms of weft insertions by rigid and flexible rapier, projectile, air jet and water jet shuttle less looms; selvedges in shuttle less looms – types and principles of formation; multi-phase weaving; objectives and working of crank- crank arm and cam beat up mechanisms; sley eccentricity – definition and eccentricity for different widths of looms .

Practical:

1. Study of picking mechanisms in looms
2. Study of beat-up mechanisms in looms
3. Determination of sley eccentricity in shuttle loom

Activities: Drives for picking and beat up mechanism, Energy calculations, Yarn requirements

Secondary Motions: Take – up motions – objectives and working of 7 wheel, worm & worm wheel take-up motions – determination of pick space; let – off motions – objectives and working of negative, semi-positive and positive type let-off motions; oscillating back rest – objectives and working;

Practical:

1. Study of let-off mechanisms
2. Study of take-up mechanisms
3. Determination of pick space through various take-up mechanism

Activities: secondary motions in modern looms

Auxiliary Motions: Functions and working of weft feeler, weft replenishment mechanisms, three try motion, weft accumulators, shuttle protector, weft cutter and self threading shuttle; warp protector mechanisms – objectives and working of loose reed and fast reed types; warp stop motion – objectives, drop wires, working of mechanical and electrical type warp stop motions; Weft stop motion – objectives and working of side weft fork & centre weft fork motions; quick style change; temples – objectives and functions of different types of temples; brake – objectives and working ;

Practical:

1. Study of warp protector motions
2. Study of warp and weft stop motions
3. Study of weft replenishment mechanism in pirn changing automatic loom
4. Study of temples and brake

Activities: Drive arrangement for auxiliary motions, auxiliary motions in modern looms

Drop box and Terry looms: Drop box looms – objectives and working of 2x1 and 4x1 drop box changing mechanisms; card saving device – pattern cards preparation for producing different coloured weft patterns; pick-at-will motion- principle; terry looms - 3 pick terry structure – working of terry motion;

Practical:

1. Study of drop box motion
2. Preparation of pattern cards for producing weft colour patterns in 4 X 1 drop box motion
3. Study of terry mechanism

Activities: prepare a pattern card for controlling drop box mechanism.

Process Control in weaving: Techno economics of shuttle less loom weft insertion systems; loom monitoring and control; loom stoppages and efficiency; fabric defects – causes, remedies and value loss; fabric shrinkage in loom – causes and control; synthetic weaving - modifications to be made for the preparation of warp and weft yarns - changes to be made in looms for weaving synthetic fabrics; safety measures in loom shed

Practical: Understanding of the loom requirements from the given sample

Activities: Images of various fabric defects, production plan, maintenance schedule for weaving machines

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

Assessment Methodology for continuous assessment (50%) : Theory: 30%, practical 10% , activity 10% (Assignments, seminar, quiz, objective type test, project model)

References:

1. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., “Weaving: Machines, Mechanisms, Management”, Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
2. Marks R. and Robinson T.C., “Principles of Weaving”, The Textile Institute, Manchester, 1989, ISBN: 0 900739 258
3. “Weaving: The knowledge in Technology”, Papers Presented at the Textile Institute Weaving Conference 1998, Textile Institute, ISBN: 18770372182
4. Lord P.R. and Mohamed M.H., “Weaving: Conversion of Yarn to Fabric”, Merrow, 1992, ISBN: 090409538X
5. Ormerod A. and Sondhelm W.S., “Weaving: Technology and operations”, Textile Institute, 1995, ISBN: 187081276X
6. Baneerjee.P.K., “Principles of Fabric Formation”, CRC Press, London,2014, ISBNNumber:13:978-1-4665-5445-0.
7. Abhijit Majumdar, Apurba Das, R.Alagirusamy and V.K.Kothari., “Process Control in Textile Manufacturing”, Wood Head Publishing Limited, Oxford, 2013, ISBN: 978-0-85709-027-0.
8. Sabit Adanur, “Handbook of Weaving”, Technomic Publishing Co. Inc., 2001
9. Lord P.R. and Mohammed M.H., "Weaving – Conversion of Yarn to Fabric", Merrow Publication, 1992.

E-Resources: https://nptel.ac.in/courses/116102005

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand advanced weaving technologies, loom mechanisms, and preparatory processes involved in fabric production.	–	–
CO2	Apply weaving principles and loom operational parameters to achieve required fabric quality and production efficiency.	PO1(3), PO2(2)	PSO1(3)
CO3	Analyze the performance of different weaving systems, looms, and process parameters in relation to productivity, fabric quality, and manufacturing efficiency.	PO2(3), PO4(2)	PSO2(2)
CO4	Evaluate and select suitable weaving technologies, loom configurations, and process parameters for manufacturing fabrics with specified performance and quality requirements.	PO3(3), PO5(2)	PSO1(3), PSO2(2), PSO3(1)

TT25C07	Technology of Knitting and Nonwoven	L	T	P	C
		3	0	0	3

Course Objectives: To enable the students to learn the fundamentals and types of knitting and nonwoven

Fundamentals of Knitting: Comparison of fabric properties-woven, knitted and bonded fabrics; classification of knitting processes – weft knit & warp knit; yarn quality requirements for knitting; general definitions and principles of knitting; types of knitting needles – Bearded, Latch& Compound needle; elements of knitted loop structure

Activities: Analyze the structural and functional differences between woven, knitted and bonded fabrics based on their properties.

Weft Knitting: Basic circular & weft knitted structures and their production -plain, rib, interlock and purl; fundamentals of formation of knit, tuck and float stitches; Types of weft knitted structure- end uses; flat-bed knitting; weft knitted fabric defects; factors affecting the formation of loop.

Activities: Compare different types of weft knitted fabrics and evaluate their suitability for various end uses**.**

Warp Knitting: Basic principles- guide bar movement mechanism; elements of warp knitted loop open and closed laps; tricot and raschel warp knitting machines; warp knitted fabrics–structures (inlay and pillar structure) and end uses; warp knitted fabric defects.

Activities: Seminar on warp knitting machines in terms of working principles, fabric structures, and applications.

Web Preparation for Nonwoven: Introduction; principle, machines and processes for web preparation - dry laid, wet laid, air laid; quality control of webs; web preparation by polymeric solution.

Activities: Analyze different web preparation techniques and evaluate their influence on web structure and properties

Bonding of Nonwoven: Bonding methods- principles and machine; processes for mechanical, thermal and chemical bonding; process parameters; application; testing of nonwoven.

Activities: Reproduce and analyze bonding methods in nonwovens.

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

Assessment Methodology: Assignment (20%), Quiz (20%), case study (20%), Internal Examinations (40%)

References

1. Spencer D.J., “Knitting Technology”, III Ed., Textile Institute, Manchester, 2001, ISBN:1855733331.
2. Samuel Raz., “Flat Knitting: The new generation”, Meisenbach GmbH, Bamberg,1997, ISBN:3-87525-054-0.
3. 2.SamuelRaz., “Warp Knitting production”, Melliand Textilberichte, GmbH, Rohrbacher, 1987, ISBN:3-87529-022-4
4. Lunenschloss J., Albrecht W. and David Sharp., “Nonwoven Bonded Fabrics”, Ellis Horwood Ltd., New York, 1985, ISBN: 0-85312-636-4.
5. Mrstina V. and Feigl F., “Needle Punching Textile Technology”, Elsevier, New York, 1990,ISBN: 0444988041 | ISBN-13: 9780444988041
6. Ajgaonkar D.B., “Knitting technology”, Universal Publishing Corporation, Mumbai,1998, ISBN:0818502738/ISBN:9780818502736
7. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach, “Circular Knitting”, Meisenbach GmbH, Bamberg, 1995, ISBN:3-87525-066-4.
8. Dharmadhikary R. K., Gilmore T. F., Davis H. A. and Batra S. K., “Thermal Bonding of Nonwoven Fabrics”, Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995, ISBN:1870812786.
9. Jirsak O. and Wadsworth L. C., “Nonwoven Textiles”, Textile Institute, Manchester,1999, ISBN: 0 89089 9788.
10. Russell S., “Hand Book of Nonwovens”, Textile Institute, Manchester, 2004, ISBN: 1855736039.

E-Resources

1. https://nptel.ac.in/courses/116102056
2. https://nptel.ac.in/courses/116102008
3. https://nptel.ac.in/courses/116102014

CO Mapping with PO & PSO:

CO’s	CO Description	PO Mapping	PSO Mapping
CO1	Understand the types of knitting machines, needles and their performance characteristics.	_	-
CO2	Apply warp knitting mechanisms and principles to explain the formation of warp knitted structures.	PO2(3), PO3(2)	PSO1(2), PSO2(1)
CO3	Analyze the design and construction of basic weft knitted structures and their performance characteristics.	PO3(3), PO4(2)	PSO2(2)
CO4	Evaluate nonwoven web formation techniques based on material properties, process parameters and end-use applications.	PO3(3), PO5(2)	PSO2(2), PSO3(1)
CO5	Create suitable nonwoven fabric solutions by selecting appropriate bonding techniques for specific applications.	PO5(3), PO11(2)	PSO2(2), PSO3(2)

TT25C08	Woven Fabric Structure	L	T	P	C
		3	0	0	3

Course Objective: To enable the students to learn about different structures of woven fabric and design the structure for different applications

Elementary Weaves: Introduction – methods of representing weave on point paper, construction of design, draft, and lifting plan, types of draft, heald calculation, order of denting; elementary weaves – plain, twill, satin, sateen and their derivatives – loom requirements.

Activities: Collect fabric samples with different weave structure & generic names, 3D visualization, Computer aided textile designing.

Special Weaves I: Ordinary and brighten honey comb; huck-a-back and its modifications; mock Leno; crepe weaves; colour and weave effects; Bedford cords - plain and twill faced, wadded; welts and piques, wadded piques, draft and peg plan for these weaves; loom requirements.

Activities: Collect fabric samples with different weave structure & generic names, 3D visualization, Computer aided textile designing

Special Weaves II: Backed fabrics warp and weft, reversible and non-reversible fabrics; extra warp and extra weft figuring - single and double colour — loom requirements.

Activities: Collect fabric samples with different weave structure & generic names, 3D visualization, Computer aided textile designing

Pile Fabrics and Velveteen: Pile fabrics; warp pile - wire pile, terry pile, loose backed; weft pile – plain back and twill back velveteen, lashed pile, corduroy, and weft plush – loom requirements.

Activities:: Collect fabric samples with different weave structure & generic names, 3D visualization, Computer aided textile designing

Special Fabrics: Double cloth, types of stitches; Damasks; Gauze and Leno principles – loom requirements; trade name of popular structures.

Activities:: Collect fabric samples with different weave structure & generic names, 3D visualization, Computer aided textile designing

References

1. Grosicki Z. J., “Watson’s Textile Design and Colour”, Vol.1, Woodhead Publications, Cambridge England, 2004.

2. Grosicki Z. J., “Watson’s Advanced Textile Design and Colour”, Vol.II, Butterworths, London, 1989.
3. Grammar of Textile Design by H. NISBET, F.T.I.
4. Wilson J., “Handbook of Textile Design”, Textile Institute, Manchester, 2001, ISBN: 1 85573 5733.
5. Horne C.E., “Geometric Symmetry in Patterns and Tilings”, Textile Institute, Manchester, 2000, ISBN: 1 85573 4923.
6. Seyam A. M., “Structural Design of Woven Fabrics, Theory and Practice”, Textile Institute, Manchester, 2002, ISBN: 1 87037 2395.
7. GeornerD., “Woven Structure and Design, part 1: Single Cloth Construction”, WIRA, U.K., 1986, ISBN: 0900820179 | ISBN-13: 9780900820175
8. GeornerD., “Woven Structure and Design, Part 2: Compound Structures”, WIRA,U.K., 1989, ISBN: 090366951X | ISBN-13: 9780903669511
9. Jan Shenton., “Woven Textile Design”, Laurence King Publishing, 2014, ISBN: 178067337X | ISBN-13: 9781780673370.

E-Resources

1. https://textileschool4u.blogspot.com/2013/12/welts-and-piques.html
2. https://textileapex.com/what-are-stitched-double-cloths-classification-of-stitched-doublecloths/
3. https://www.slideshare.net/slideshow/fabric-structure-53197193/53197193
4. https://textilelibrary.wordpress.com/2011/04/20/lecture-notes-of-weaving-technology-ii/
5. https://www.sciencedirect.com/science/article/abs/pii/B9780081024973000052

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand the fundamental concepts of woven fabric structure, including yarn systems, weave types, and fabric construction parameters.	--	--
CO2	Apply knowledge of weave structures and fabric construction parameters to determine their influence on fabric properties and end-use requirements.	PO1 (3)	PSO1 (2)
CO3	Analyze woven fabric designs and structures with respect to strength, durability, appearance, and performance characteristics.	PO2 (3) PO5 (2)	PSO2 (2)
CO4	Evaluate woven fabric structures and select appropriate weave patterns, yarns, and construction parameters for specific apparel and textile applications.	PO3 (2) PO7 (1)	PSO3 (2)

TT25401	Analysis of Woven Fabrics	L	T	P	C
		0	0	4	2

Course Objective: To enable the students to learn about different structures of woven fabric and design the structure for different applications.

List of Experiments: Analysis of weave and construction details (Design, Draft, lifting plan, thread density, warp, weft count, crimp, GSM) of commercially available woven fabrics with

1. Plain weave and its derivatives
2. Twill and its derivatives
3. Herringbone
4. Diamond
5. Sateen and satin weaves
6. Damask
7. Honeycomb weaves
8. Huck-a-back weave
9. Mock leno weave
10. Double cloth
11. Terry weaves
12. Bedford cord weaves
13. Crepe

List of Equipment for a Batch of 30 Students

1. Counting glass - 15 Nos.
2. GSM Cutter - 4 Nos.
3. 1 Meter Scale - 2 Nos.
4. Beesley's Balance - 5 Nos.

CO Mapping with PO & PSO:

CO	Description of CO	PO	PSO
CO1	Understand the structure and classification of woven fabrics, including weave types, fabric geometry, and construction parameters.	-	-
CO2	Apply appropriate methods and calculations to determine fabric parameters such as cover factor, crimp, yarn density, and fabric thickness.	PO1(3), PO2(2)	PSO1(3)
CO3	Analyze the influence of fabric structure and construction parameters on performance characteristics such as strength, durability, air permeability, and comfort.	PO2(3), PO4(2)	PSO2(2)
CO4	Evaluate and design woven fabric structures for specific applications by selecting suitable weave patterns, yarn parameters, and construction techniques.	PO3(3), PO5(2)	PSO1(3), PSO2(2), PSO3(1)

EN25C04	English Communication Skills Laboratory–II	L	T	P	C
		0	0	2	1

Course Objectives: The objectives of the course are to build students' advanced communication skills for workplace readiness and develop intercultural competence for effective collaboration in global and virtual teams. Prepare students for competitive exams with focused skill-building and test-oriented practice.

List of Activities

Stage Ready – Impactful Public Speaking.

(i) Simulate a formal event such as an academic conference, convocation, or awards ceremony, where students roles including Master of Ceremonies (MC), Role as a dignitary, and a Commentator

(ii) Visual Prompt Storytelling: Use random images to create spontaneous stories, focusing on plot, setting, and character,

(iii) **Digital Presentation - Record** a short video explaining a project or technical concept, using slides, voiceover, and visual aids (to be uploaded using google classroom or drive link)

Professional and Application-Oriented Writing

(i) Résumé Preparation: Design ATS-friendly résumés tailored to various job descriptions, using action verbs and quantifiable impact. ·

(ii) Design engaging content for poster presentation relevant to their domain.

Receptive Skills in Workplace Communication·

(i) Reading articles related to their domain and discuss in groups

(ii) Visit company websites, make inferences and present in the class

(iii) Listen to recorded mock interviews and take detailed notes. Summarise key points and action items in a professional format and make a presentation.

Intercultural Communication

(i) Assertive vs Aggressive communication

(ii) Role play activities – workplace communication in intercultural/crosscultural contexts

From Campus to Career: Industry Skills and Global Exam Preparation

(i) Participate in HR interviews using AI tools or peer interviewers, responding to behavioural questions using methods like STAR (Situation, Task, Action, Result)

(ii) Practice Verbal Ability in competitive exams like UPSC, SSC, CDS, TNPSC, etc.

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

Internal Assessment Methodology: 1. Oral story telling using visual prompts (30 marks)
2. Poster presentation (40 marks)
3. ATS resume writing (30 marks)

End Semester Assessment:

1. Interview (50 marks)
2. Verbal Ability test (50 marks)

(Students must bring the resume but evaluation must be done based on the performance in the interview)

References:

1. Lucas, Stephen, and Paul Stob. The Art of Public Speaking. Thirteenth edition, McGraw- Hill Education, 2020.
2. Abrahams, Matt. Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot. Simon & Schuster, 2023.
3. Beshara, Tony. Powerful Phrases for Successful Interviews, Rev. ed., McGraw-Hill, 2023.
4. Papalia, Anna. Interviewology: The New Science of Interviewing. Harper Business, 2024.
5. Verbal Ability and Reading Comprehension by Ajay Singh McGraw Hill Education 2020

E-resources:

1. Purdue OWL – Online Writing Lab (Academic and professional writing help) https://owl.purdue.edu/
2. Canva Resume Builder (Creative, ATS-friendly resume design) https:/www.canva.com/resumes/
3. BBC Learning English – Pronunciation https://www.bbc.co.uk/learningenglish/english/features/pronunciation
4. India Bix website

CO Mapping with PO & PSO:

	Description of CO	PO	PSO1
CO1	Understand basic industry-related reading materials.	-	-
CO2	Design and present a domain specific poster	PO9(3)	PSO1(2) PSO3(3)
CO3	Deliver effective digital presentations	PO9(3)	PSO2(1)
CO4	Communicate appropriately in intercultural/cross cultural contexts	PO9(3) & PO11(1)	PSO3(3)
CO5	Perform in interviews and competitive exams successfully	PO9(3)	PSO3(1)