

GOJAN SCHOOL OF BUSINESS AND TECHNOLOGY

AN AUTONOMOUS INSTITUTION

APPROVED BY AICTE | AFFILIATED TO ANNA UNIVERSITY | ACCREDITED BY NAAC

GOJAN COLLEGE ROAD, EDAPALAYAM, REDHILLS, CHENNAI - 600052



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U.G. Regulation 2026

Curriculum

B.Tech. Pharmaceutical Technology

Academic Planning Committee

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GOJAN SCHOOL OF BUSINESS AND TECHNOLOGY

(AN AUTONOMOUS INSTITUTION, AFFILIATED TO ANNA UNIVERSITY)

Programme: B.Tech. Pharmaceutical Technology

Regulations: 2026

Abbreviations:

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

Program Outcomes

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

PSO 1: Graduates will be equipped with the knowledge and skills to implement and monitor quality control (QC) and quality assurance (QA) procedures in the pharmaceutical industry, ensuring that pharmaceutical products meet all safety and efficacy standards.

PSO 2: Graduates will be capable of contributing to pharmaceutical research, particularly in areas such as novel drug delivery systems, biotechnology applications, and biopharmaceuticals, with the ability to conduct independent or collaborative research projects.

Program Educational Objectives (PEO)

Graduates will be able to:

PEO 1: Graduates will possess a strong foundation in pharmaceutical sciences, enabling them to effectively apply technical knowledge and skills to the development, manufacturing, and regulation of pharmaceutical products.

PEO 2: Graduates will be dedicated to lifelong learning, managing up with developments in pharmaceutical sciences, and engaging in professional development activities.

PEO 3: Graduates will be prepared for employment in pharmaceutical, healthcare, and allied sectors or pursue higher studies, research, and entrepreneurship.

Semester – I							
S. No	Course Code	Course Name	Course Type [#]	Periods/ Week		Credits	Category
				L-T-P	TCP*		
1.	26ENT101	English Essentials – I	T	2-0-0	2	2	HUM
2.	26MAT101	Applied Calculus	T	3-1-0	4	4	BS
3.	26TAT101	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.	26PHI101	Applied Physics – I	LIT	2-0-2	4	3	BS
5.	26CYI101	Applied Chemistry – I	LIT	2-0-2	4	3	BS
6.	26PTT101	Basics of Pharmaceutical Technology	T	2-1-0	3	3	ES (PC)-DIC
7.	26CSI001	Computer Programming: Python	LIT	2-0-2	4	3	ES (PC)
8.	26MEL002	Makerspace	L	0-0-4	4	2	SD
9.	26UCT101	Life Skills for Engineers – I	T	1-0-0	1	1	HUM
TOTAL					27	22	

Semester – II							
S. No	Course Code	Course Name	Course Type	Periods/ Week		Credits	Category
				L-T-P	TCP		
1.	26MAT201	Linear Algebra	T	3-1-0	4	4	BS
2.	26PTT201	Thermodynamics for Pharmaceutical Technologists	T	2-1-0	3	3	ES (PC)
3.	26ECT001	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES (G)
4.	26TAT201	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
5.	26PHT202	Applied Physics (Tech) – II	T	2-1-0	3	3	BS
6.	26BTI201	Cell Biology	LIT	3-0-2	5	4	ES (PC)
7.	26ENI201	English Essentials – II	LIT	1-0-2	3	2	HUM
8.	26MEL001	Re-Engineering for Innovation	L	0-0-4	4	2	SD
9.	26UCT201	Life Skills for Engineers – II	T	1-0-0	1	1	HUM
10.	26UCT202	Foreign Language- Japanese	T	1-0-0	1	1	HUM
TOTAL					28	24	

Semester – III							
S. No	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.	26MAT302	Computational Differential Equations	T	3-1-0	4	4	BS
2.	26PTT301	Pharmaceutical Biochemistry	T	3-0-0	3	3	ES (PC)
3.	26PTT302	Human Anatomy and Physiology	T	3-0-0	3	3	ES (PC)
4.	26PTI301	Pharmaceutical Chemistry	LIT	3-0-2	5	4	ES (PC)
5.	26PTI302	Physical Pharmaceutics	LIT	3-0-2	5	4	ES (PC)
6.	26ENL301	English Communication Skills Laboratory – I	L	0-0-2	2	1	HUM
7.		Skill Development Course – I	LIT	1-0-2	3	2	SD
8.	26PTL301	Biochemistry and Physiology Lab	L	0-0-4	4	2	ES (PC)
TOTAL				29	23		

Semester – IV							
S. No	Course Code	Course Name	Course Type [#]	Periods/Week		Credits	Category
				L-T-P	TCP*		
1.	26PTI401	Pharmaceutical Microbiology	LIT	3-0-2	5	4	ES (PC)
2.	26BTI401	Molecular Biology	LIT	3-0-4	7	5	ES (PC)
3.	26PTI402	Chemical Process Calculations & Fluid Flow Operations	LIT	3-0-2	5	4	ES (PC)
4.	26PTT401	Pharmaceutical Analysis	T	3-0-0	3	3	ES (PC)
5.	26PTI403	Dosage forms Technology	LIT	3-0-4	7	5	ES (PC)
6.	26ENL401	English Communication Skills Lab – II	L	0-0-2	2	1	HUM
7.		Skill Development Course – II	LIT	1-0-2	3	2	SD
8.	26PTT402	Introduction to Standards in Pharmaceutical Technology	T	1-0-0	1	1	ES (PC)
9.	26PTL501	Industry Internship	L	-	-	-	IPW
TOTAL				33	25		

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.	26PTI501	Pharmacology and Toxicology	LIT	3-0-2	5	4	ES (PC)
2.	26PTT501	Unit Operations in Pharmaceutical Industries	T	3-1-0	4	4	ES (PC)
3.	26PTT502	Medicinal Chemistry	T	3-1-0	4	4	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.	26PTL501	Industry Internship	L	-	-	2	IPW
Total Credits					23	23	
Four weeks industrial training/internship carries two credit. Industrial training/Internship during IV Semester Summer Vacation will be evaluated in V semester.							
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							
1.		Minor Elective – I	T	3-0-0	3	3	
2.		Minor Elective – II	T	3-0-0	3	3	

Semester – VI							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	26PTT601	Heat and Mass Transfer Operations	T	3-1-0	4	4	ES (PC)
2.	26PTI601	Biopharmaceutics and Pharmacokinetics	LIT	3-0-2	5	4	ES (PC)
3.	26GET601	Climate Change and Sustainability	T	2-0-0	2	2	HUM
4.		Programme Elective – III	T	3-0-0	3	3	ES (PE)
5.		Open Elective	T	3-0-0	3	3	ES (OE)
6.		Industry Oriented Course – II	LIT	1-0-2	3	1	SD
7.		Self-Learning Course	---	---	0	1	---
8.	26PTL702	Research Internship/ Research Project	L	-	-	2	IPW
Total Credits					20	20	
Four weeks industrial training/internship carries two credits. Industrial training/Internship during VI Semester Summer Vacation will be evaluated in VII semester.							
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SDC
(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.	26GEI701	Engineering Entrepreneurship Development	LIT	2-0-2	4	3	HUM
2.	26PTT701	Instrumental Methods of Pharmaceutical Analysis	T	3-1-0	4	4	ES (PC)
3.		Programme Elective – IV	T	3-0-0	3	3	ES (PE)
4.		Programme Elective – V	T	3-0-0	3	3	ES (PE)
5.	26BAT701	Project Management	T	2-0-0	2	2	HUM
6.	26PTT702	Drug Regulatory Affairs	T	3-0-0	3	3	ES (PC)
7.	26PTL701	Instrumental Methods of Pharmaceutical Analysis Lab	L	0-0-4	4	2	ES (PC)
8.	26PTL702	Research Internship/ Research Project	L	-	-	2	SD
Total Credits					23	22	
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.	26PTPW801	Project Work / Internship cum Project Work	PW / IPW	0-0-16	16	8	SD
Total Credits					16	8	

Total Credits of the Programme: 167

PROGRAMME ELECTIVE COURSES – STREAMS

Pharmaceutical Manufacturing Technology	Drug Discovery and Development	Pharmaceutical Management	Quality Control and Quality Assurance	Digital Pharma and Smart Technologies
Pharmaceutical Packaging Technology	Cheminformatics and Bioinformatics	Pharmaceutical Project Management	Validation in Pharmaceutical Industries	Metabolic Engineering
Process Development, Optimisation and Technology Transfer	Computer Aided Drug Design	Quality Management Systems in Pharmaceutical Industries	Quality Assurance in Pharmaceutical Industry	Systems Biology
Pharmaceutical Process Engineering	Herbal Technology	Pharmaceutical Production Management	Statistical Quality and Process Control	Digital Health Technologies
Lean manufacturing	Technology of Fine Chemicals and Bulk drugs	Safety and Disaster Management	Auditing and Compliance	Digital twins (AI-ML)
Novel Drug Delivery Systems	Clinical Research and Pharmacovigilance	Strategic and Operations Management	Process Analytical Technology in Pharmaceutical Manufacturing	3D bioprinting
Sustainable Development of Pharmaceuticals	Regulatory Toxicology	Pharmaceutical Supply Chain Management	Biological Spectroscopic Techniques	Medical Devices, BioMEMS and Microfluidics

Registration of Programme Elective Courses from Verticals:

Programme Elective Courses will be registered in Semesters V, VI and VII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Programme Electives from a particular vertical or from different verticals. Further, only one Programme Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E./B.Tech (Honours) or Minor degree also.

PROGRAMME ELECTIVE COURSES- PHARMACEUTICAL MANUFACTURING TECHNOLOGY							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.	26PT001	Pharmaceutical Packaging Technology	T	3-0-0	3	3	ES (PE)
2.	26PT002	Process Development, Optimisation and Technology Transfer	T	3-0-0	3	3	ES (PE)
3.	26PT003	Pharmaceutical Process Engineering	T	3-0-0	3	3	ES (PE)
4.	26PT004	Lean manufacturing	T	3-0-0	3	3	ES (PE)
5.	26PT005	Novel Drug Delivery Systems	T	3-0-0	3	3	ES (PE)
6.	26PT006	Sustainable Development of Pharmaceuticals	T	3-0-0	3	3	ES (PE)

PROGRAMME ELECTIVE COURSES- DRUG DISCOVERY AND DEVELOPMENT							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.	26PT007	Cheminformatics and Bioinformatics	T	3-0-0	3	3	ES (PE)
2.	26PT008	Computer Aided Drug Design	T	3-0-0	3	3	ES (PE)
3.	26PT009	Herbal Technology	T	3-0-0	3	3	ES (PE)
4.	26PT010	Technology of Fine Chemicals and Bulk drugs	T	3-0-0	3	3	ES (PE)
5.	26PT011	Clinical Research and Pharmacovigilance	T	3-0-0	3	3	ES (PE)
6.	26PT012	Regulatory Toxicology	T	3-0-0	3	3	ES (PE)

PROGRAMME ELECTIVE COURSES- PHARMACEUTICAL MANAGEMENT							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.	26PT013	Pharmaceutical Project Management	T	3-0-0	3	3	ES (PE)
2.	26PT014	Quality Management Systems in Pharmaceutical Industries	T	3-0-0	3	3	ES (PE)
3.	26PT015	Pharmaceutical Production Management	T	3-0-0	3	3	ES (PE)
4.	26PT016	Safety and Disaster Management	T	3-0-0	3	3	ES (PE)
5.	26PT017	Strategic and Operations Management	T	3-0-0	3	3	ES (PE)
6.	26PT018	Pharmaceutical Supply Chain Management	T	3-0-0	3	3	ES (PE)

PROGRAMME ELECTIVE COURSES- QUALITY CONTROL AND QUALITY ASSURANCE							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.	26PT019	Validation in Pharmaceutical Industries	T	3-0-0	3	3	ES (PE)
2.	26PT020	Quality Assurance in Pharmaceutical Industries	T	3-0-0	3	3	ES (PE)
3.	26PT021	Statistical Quality and Process Control	T	3-0-0	3	3	ES (PE)
4.	26PT022	Auditing and Compliance	T	3-0-0	3	3	ES (PE)
5.	26PT023	Process Analytical Technology in Pharmaceutical Manufacturing	T	3-0-0	3	3	ES (PE)
6.	26PT024	Biological Spectroscopic Techniques	T	3-0-0	3	3	ES (PE)

PROGRAMME ELECTIVE COURSES- DIGITAL PHARMA AND SMART TECHNOLOGIES							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.	26PT025	Metabolic Engineering	T	3-0-0	3	3	ES (PE)
2.	26PT026	Systems Biology	T	3-0-0	3	3	ES (PE)

3.	26PT027	Digital Health Technologies	T	3-0-0	3	3	ES (PE)
4.	26PT028	Digital twins (AI-ML)	T	3-0-0	3	3	ES (PE)
5.	26PT029	3D bioprinting	T	3-0-0	3	3	ES (PE)
6.	26PT030	Medical Devices, BioMEMS and Microfluidics	T	3-0-0	3	3	ES (PE)

OPEN ELECTIVES							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.		Renewable Energy Technologies	T	3-0-0	3	3	OE
2.		Reverse Engineering	T	3-0-0	3	3	OE
3.		Sustainable Manufacturing	T	3-0-0	3	3	OE
4.		Foundation of Robotics	T	3-0-0	3	3	OE
5.		Fundamentals of Aeronautical Engineering	T	3-0-0	3	3	OE
6.		Remote Sensing Concepts	T	3-0-0	3	3	OE
7		Foundation of Robotics	T	3-0-0	3	3	OE
8		Urban Agriculture	T	3-0-0	3	3	OE
9		Nano Technology	T	3-0-0	3	3	OE
10		IPR for Pharma Industry	T	3-0-0	3	3	OE
11		Energy Conservation and Management	T	3-0-0	3	3	OE
12		Foundation Skills in Integrated Product Development	T	3-0-0	3	3	OE
13		Assistive Technology	T	3-0-0	3	3	OE

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same Programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other Programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other programmes)

Fintech and Block Chain	Entrepreneurship	Public Administration	Business Data Analytics	Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Datamining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management For Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

NPTEL COURSES							
S. No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T- P	TCP		
1.		Food Oils and Fats: Chemistry and Technology	T				ES (PE)
2.		Dairy and Food Process and Products Technology	T				ES (PE)
3		Fundamentals of Food Process Engineering	T				ES (PE)
4		Thermal Operations in Food Process Engineering: Theory and Applications	T				ES (PE)
5		Epigenetics	T				ES (PE)
6		Mechanical Characterization and Modelling of Tissues	T				ES (PE)
7		Drug Delivery: Principles and Engineering	T				ES (PE)
8		Fundamentals of Micro and Nanofabrication	T				ES (PE)
9		Introduction to Proteogenomics	T				ES (PE)
10		Introduction to Developmental Biology	T				ES (PE)
11		Transport Phenomena in Biological Systems	T				ES (PE)
12		Biomedical Instrumentation	T				ES (PE)
13		Human Physiology	T				ES (PE)
14		Biological Engineering	T				ES (PE)
15		Next Generation Sequencing Technologies : Data Analysis and Applications	T				ES (PE)
16		Computational Neuroscience	T				ES (PE)
17		Cell and Molecular Biology	T				ES (PE)
18		Genome Editing and Engineering	T				ES (PE)
19		Genetic Engineering: Theory And Application	T				ES (PE)
20		Thermal Processing of Foods	T				ES (PE)

21		Medicinal Chemistry of Antimicrobial Agent	T				ES (PE)
22		General Pharmacotherapeutics	T				ES (PE)
23		Principles of Chemical Reaction Engineering	T				ES (PE)
24		Advanced Thermodynamics	T				ES (PE)
25		Novel Drug Delivery Systems	T				ES (PE)
26		Pharmacognosy and Phytochemistry	T				ES (PE)
27		Artificial Intelligence in Drug Discovery and Development	T				ES (PE)
28		Pharmaceutical Dosage Forms	T				ES (PE)
29		Pharmaceutical Crystal Engineering for Design, Development and Scale-up for Pharmaceutical Solids	T				ES (PE)
30		Pharmacological and Toxicological Screening Methods	T				ES (PE)
31		Research Methods in Health Promotion	T				ES (PE)
32		Experimental Methods in Fluid Mechanics	T				ES (PE)
33		Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries	T				ES (PE)
34		Fundamentals of Protein Chemistry	T				ES (PE)
35		Organic Chemistry in Biology and Drug Development	T				ES (PE)

B.Tech. PHARMACEUTICAL TECHNOLOGY

S. No	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HUM	04	05	01	01		02	05		18
2	BS	10	07	04						21
3	ES (G, PC, PE, ET)	06	10	16	22	18	11	15		98
4	SD	02	02	02	02	03	01	02	08	22
5	SL						01			01
6	OE						03			03
7	IPW					02	02			04
Total		22	24	23	25	23	20	22	8	167

Academic Planning Committee

Dr SURESH RAJ L

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Semester - I

26ENT101	ENGLISH ESSENTIALS – I	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- Develop effective speaking skills through self-introduction, conversations, and expressing opinions with appropriate grammar.
- Enhance listening skills by understanding conversations, speeches, and different accents while improving pronunciation.
- Strengthen reading skills by applying reading strategies and interpreting various texts with improved vocabulary and comprehension.
- Develop writing skills by composing meaningful paragraphs, informal letters, and emails using correct grammatical structures.
- Foster life skills such as goal setting, time management, teamwork, positive thinking, and professional etiquette for overall personality development.

UNIT I	SPEAKING SKILLS	6 (H)
	Self-Introduction (Adjectives), Expressing Opinions (Subject-Verb Agreement), Participating in Conversations (Speech Acts – agreeing & disagreeing – synonyms and antonyms) Parts of Speech, Articles Activities: Self-Introduction, Just a Minute (JAM) Video Recording, Situational Role Plays, Spell Bee, Word Substitution, Usage of Apps.	
UNIT II	LISTENING SKILLS	6 (H)
	Listening to Simple Conversations (Understanding Tone and Intent), Short Speeches / Stories, Extracting Information, Pronunciation, Listening to Various Accents, Tenses. Activities: Listening and Repeating, Gap Fill Exercises, Notetaking.	
UNIT III	READING SKILLS	6 (H)
	Reading Strategies – (Skimming, Scanning, Predicting), Intensive Reading – Short Passages and Long Passages on Suggested Themes (Sentence Patterns, Prefixes and Suffixes, Idioms and Phrases). Active and Passive Voice Activities: Reading – Newspaper and Digital Articles, Cloze, Reading Comprehension, Note Making and Summarising.	
UNIT IV	PARAGRAPH DEVELOPMENT AND COMPOSITION	6 (H)
	Word Substitution, Sentence Formation, Hints Development (Guided Writing), Writing Different Types of Paragraphs (Sentence Structure), Letter Writing / Emails (Informal), Direct and Indirect Speech Activities: Error Detection, Picture and Poster Description, Descriptive, Narrative and Comparative Paragraphs, Brainstorming and Mind Mapping, Informal Letters / Emails.	
UNIT V	LIFE SKILLS FOR SUCCESS	6 (H)
	Daily Routine, Hobbies and Interests, Goal Setting, Good Manners and Etiquette, Time Management, Healthy Lifestyle, Friendship and Teamwork, Positive Thinking. Activities: Talking about hobbies and good manners.	
TOTAL: 30 HOURS		
Weightage : Continuous Assessment :40%, End Semester Examinations :60%		
Assessment Methodology: Internal Examinations, Activities (Quiz, Writing Task, Speaking Task)		

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/learningenglish/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/>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Apply vocabulary and grammar appropriately to read and communicate in written and spoken forms and comprehend spoken English, take and draft notes.	K2
CO2	Listen and comprehend spoken English, take and draft notes.	K2
CO3	Analyze texts in different contexts using appropriate reading strategies.	K2
CO4	Write clear, coherent and technically accurate documents for industry and academic.	K2
CO5	Develop communication skills relevant to engineering and technology to effectively convey thoughts and ideas in real life situations.	K2

CO-PO/PSO MAPPING

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

26MAT101	APPLIED CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To learn the concepts of functions, limits, continuity, differentiation, and optimization of single-variable functions.
- To learn partial differentiation techniques for analyzing multivariable functions and solving optimization problems.
- To learn integration techniques for evaluating definite, indefinite, and improper integrals.
- To learn the applications of integral calculus in finding areas, arc lengths, surface areas, and related engineering quantities.
- To learn double integrals and triple integrals for evaluating areas, volumes, and solving multivariable integration problems.

UNIT I	DIFFERENTIAL CALCULUS	9+3 (H)
	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 theorems. Activities: Visualization of the functions, Maxima and Minima of a function using open-source software (Geogebra).	
UNIT II	FUNCTIONS OF SEVERAL VARIABLES	9+3 (H)
	Partial derivatives, Total derivative, Euler's theorem, Jacobian, Taylor series functions of two variables, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers. Activities: Maxima and Minima of a function of two variables using open-source software (Geogebra).	
UNIT III	INTEGRAL CALCULUS – I	9+3 (H)
	Definite and Indefinite integrals – Substitution rule – Techniques of Integration: Integration by parts, Trigonometric integrals, Integration of rational functions by partial fraction, Improper integrals. Activities: Calculate integration values using python.	
UNIT IV	APPLICATIONS OF INTEGRALS	9+3 (H)
	Fundamental theorem of Calculus, The Net Change Theorem, Arc Length, Area of Region, Area of surface of revolution. Activities: Determination of area of the region using python.	
UNIT V	MULTIPLE INTEGRALS	9+3 (H)
	Iterated integrals and Fubini's theorem, Change of order of integration, Change of variables between Cartesian and polar co-ordinates, Volume as Triple Integration. Activities: Double and triple integrals using python.	
TOTAL: 60 HOURS		
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.		
Assessment Methodology: Internal Examinations, Activities (Quiz, Assignment: Application - Oriented Problem Solving Using Software).		
Textbooks:		
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. Page 9 of 47
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.

References:

1. Singh, K. (2019). Engineering mathematics through applications. Bloomsbury Publishing.
2. Grewal, B. S. (2012). Higher engineering mathematics. Khanna Publishers.
3. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and Python (Modules I–V). O'Reilly Media.
4. Ordinary Differential Equations with SCILAB by Gilberto E. Urroz.

E-Resources:

1. <https://people.math.wisc.edu/~angenent/Free-Lecture-Notes/free221.pdf>
2. https://www.youtube.com/watch?v=FK8yUzr_YuI
3. https://www.youtube.com/watch?v=gQ-u_HlSKNk\

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Explain the concepts of functions, limits, continuity, derivatives, and Mean Value Theorems.	K2
CO2	Apply partial derivatives, Jacobians, Taylor series, and Lagrange's multipliers to solve problems involving functions of several variables.	K3
CO3	Apply various integration techniques to evaluate definite, indefinite, and improper integrals.	K3
CO4	Explain the Fundamental Theorem of Calculus and its applications in finding arc lengths, areas, and surface areas of revolution.	K2
CO5	Apply multiple integration techniques and coordinate transformations to evaluate double and triple integrals and compute volumes.	K3

CO-PO/PSO MAPPING

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

26TAT101	தமிழர் மரபு/ HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

பாடநெறி நோக்கங்கள்:

- செவ்வியல் தமிழ் இலக்கியத்தின் வரலாறு மற்றும் வளர்ச்சியைப் பற்றி அறிந்துகொள்ளுதல்.
- தமிழர்களின் பாரம்பரியக் கலைகள், சிற்பக்கலை மற்றும் இசை மரபுகளைப் பற்றி கற்றறிதல்.
- தமிழர்களின் வீர விளையாட்டுகள் மற்றும் நாட்டுப்புறக் கலைகளைப் பற்றி அறிந்துகொள்ளுதல்.
- தமிழ் இலக்கியக் கோட்பாடுகள் மற்றும் தமிழர்களின் அறநெறி, ஒழுக்க நடைமுறைகளைப் பற்றி கற்றறிதல்.
- இந்தியப் பண்பாட்டிற்கும் சித்த மருத்துவத் துறைக்கும் தமிழர்களின் பங்களிப்பைப் பற்றி அறிந்துகொள்ளுதல்.

COURSE OBJECTIVES:

- To study about the history of classical Tamil literature.
- To learn about the traditional arts, sculptures and music of Tamils.
- To learn about the martial sports and folk arts of Tamils.
- To study about Tamil literary concepts and moral practices of Tamils.
- To know the contribution of Tamils in Indian culture and siddha medicine.

UNIT I	மொழி மற்றும் இலக்கியம்/ LANGUAGE AND LITERATURE	3 (H)
	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 சமணப் பெளத்த சமயங்களின் தாக்கம், பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள், சிற்றிலக்கியங்கள், தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி, தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. Language Families in India, Dravidian Languages, Tamil as a Classical Language, Classical Literature in Tamil, Secular Nature of Sangam Literature, Distributive Justice in Sangam Literature, Management Principles in Thirukural, Tamil Epics and Impact of Buddhism & Jainism in Tamil Land, Bakthi Literature Azhwars and Nayanmars, Forms of minor Poetry - Development of Modern literature in Tamil, Contribution of Bharathiyar and Bharathidhasan.	
UNIT II	மரபுக் கலைகள்/ HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3 (H)
	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. Hero stone to modern sculpture, Bronze icons, Tribes and their handicrafts, Art of temple car making, Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments, Mridhangam, Parai, Veenai, Yazh and Nadhaswaram, Role of Temples in Social and Economic Life of Tamils.	
UNIT III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்/ FOLK AND MARTIAL ARTS	3 (H)
	தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். Folk and Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	
UNIT IV	தமிழர்களின் திணைக் கோட்பாடுகள்/ THINAI CONCEPT OF TAMILS	3 (H)
	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. 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.	
UNIT V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு/ CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	3 (H)
	இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு. 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.	
TOTAL: 15 HOURS		
Weightage : Continuous Assessment :40%, End Semester Examinations :60%		
Assessment Methodology: Internal Examinations, Activities (Quiz, Assignments).		

Textbooks:

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. Page 9 of 47
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.

References/ தமிழ் நூல்கள்:

1. தமிழக வரலாறு, மக்களும் பண்பாடும் – மா. மா. பிள்ளை. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்.
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். விகடன் பிரசுரம்.
3. கீழடி: வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் – தமிழ்நாடு அரசு தொல்லியல் துறை வெளியீடு.
4. பொருறை: ஆற்றங்கரை நாகரிகம் – தமிழ்நாடு அரசு தொல்லியல் துறை வெளியீடு.

English Books:

1. Pillay, K. K. Social Life of Tamils. Joint Publication of Tamil Nadu Textbook and Educational Services Corporation (TNTB & ESC) and Roja Muthiah Research Library (RMRL). (In Print).
2. Singaravelu, S. Social Life of the Tamils: The Classical Period. International Institute of Tamil Studies.
3. Subatamanian, S. V. & Thirunavukkarasu, K. D. Historical Heritage of the Tamils. International Institute of Tamil Studies.
4. Valarmathi, M. The Contributions of the Tamils to Indian Culture. International Institute of Tamil Studies.
5. Keeladi: Sangam City Civilization on the Banks of the River Vaigai. Joint Publication of the Department of Archaeology, Government of Tamil Nadu and Tamil Nadu Textbook and Educational Services Corporation.
6. Pillay, K. K. Studies in the History of India with Special Reference to Tamil Nadu. Published by the Author.
7. Porunai Civilization. Joint Publication of the Department of Archaeology, Government of Tamil Nadu and Tamil Nadu Textbook and Educational Services Corporation.
8. Balakrishnan, R. Journey of Civilization: Indus to Vaigai. Roja Muthiah Research Library (RMRL).

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Remember the classification of Tamil language and the history of Tamil literature.	K2
CO2	Explain about Arts, sculptures, Handicrafts and Music of Tamils.	K2
CO3	Explain about the folk arts and Martial sports.	K2
CO4	Remember the Thinaï concepts of Tamil and literacy and trade practices of Tamils.	K2
CO5	Summarize the contribution of Tamils to Siddha medicine and Indian culture.	K2

CO-PO/PSO MAPPING

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

26PHI101	APPLIED PHYSICS I	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the structure and properties of crystalline materials and crystal imperfections.
- To understand the mechanical properties of materials and their engineering applications.
- To understand the principles of oscillations, ultrasonic waves, and their applications.
- To understand the fundamental concepts of quantum mechanics and their applications in modern physics.
- To understand the principles of fiber optics and lasers and their applications in engineering and communication systems.

UNIT I	CRYSTAL PHYSICS	9 (H)
	Crystal Parameters, Unit cell, Bravais Lattice, Lattice Planes, Miller indices, d-spacing in cubic lattice, Calculation of atoms per unit cell, Atomic Radius, Coordination number, Packing factor for SC, BCC, FCC and HCP, Crystal Imperfections. Activities: Virtual Demonstration of SC, BCC, FCC and HCP Crystal Structures. Practical: Ultrasonic Interferometer	
UNIT II	PROPERTIES OF MATTER	9 (H)
	Elasticity, Cantilever, Young's modulus (non-uniform bending), Girders: Bridges and buildings, Viscosity: Stokes method, Surface tension: drop weight method. Activities: Virtual Demonstration of Stokes Method. Practical: Youngs Modulus – Cantilever.	
UNIT III	WAVES AND OSCILLATIONS	9 (H)
	Oscillations: Simple Harmonic motion, Torsional pendulum, Couple per unit twist, Damped and Forced Oscillation. Waves: Ultrasonics, Piezo-electric Method, Acoustic grating Activities: Virtual Demonstration of SHM Practical: Determination of Rigidity modulus of the wire and Moment of Inertial of the disc by torsional pendulum.	
UNIT IV	QUANTUM MECHANICS	9 (H)
	Black body radiation, de Broglie hypothesis, Schrodinger Wave equation (Time dependent and independent), Particle in a box (infinite potential well - three-dimensional box), Barrier penetration and quantum tunnelling. Activities: Virtual Demonstration of Scanning Transmission Electron Microscope. Practical: Determination of Planck's constant by Photoelectric effect.	
UNIT V	APPLIED OPTICS	9 (H)
	Interference: Air wedge (Theory & Application), Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement and pressure sensor, Einstein Co-efficient, Nd:YAG laser, CO2 laser (construction, functioning and applications). Activities: Virtual Demonstration of Application of laser. Practical: Determination of ruling width of compact disc using laser.	
TOTAL : 45 HOURS		
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%		
Assessment Methodology: Internal Examinations, Practical, Activity (Quiz, Assignment)		

References:

1. Pillai S.O., "Solid State Physics", New Age International Publications, New Delhi, 6th Edition, 2010.
2. Arumugam M., "Engineering Physics", Anuradha Agencies, Kumbakonam, 2nd Edition, 2005.
3. Young, H. D., & Freedman, R. A. (2026). University physics with modern physics. Pearson. 16th Edition, 2026.
4. Gaur, R. K., & Gupta, S. L. 8th Edition, 2022 Engineering physics. Dhanpat Rai Publications.
5. Mathur, D. S. 12th Edition, 2022 Elements of properties of matter. S. Chand Publishing.
6. Griffiths, D. J. 4th Edition, 2024 Introduction to quantum mechanics. Cambridge University Press.
7. 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
3. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>
4. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
5. Dipole Antenna_ <https://www.youtube.com/watch?v=4xF1Fq2wB1I>
6. Optical Sensors_ <https://auece.digimat.in/nptel/courses/video/108106173/L02.html>
7. Scanning Tunnelling Electron Microscope
<https://www.youtube.com/watch?v=XNYZYbXNWQA>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Explain crystal structures, lattice parameters, Miller indices and crystal imperfections used in engineering materials	K2
CO2	Apply concepts of elasticity, viscosity, surface tension and thermal properties in engineering applications.	K3
CO3	Analyze simple harmonic, damped and forced oscillations in mechanical systems.	K4
CO4	Interpret quantum mechanical concepts such as wave mechanics, particle in a box and quantum tunnelling.	K2
CO5	Explain crystal structures, lattice parameters, Miller indices and crystal imperfections used in engineering materials	K2

CO-PO / PSO MAPPING

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

26CYI101	APPLIED CHEMISTRY – I	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the principles of water quality, treatment methods, and desalination for domestic and industrial applications.
- To understand the synthesis, properties, and engineering applications of nanomaterials.
- To understand the principles of electrochemical systems, electrode processes, and electrolyte conductivity.
- To apply suitable principles and methods used to control corrosion..
- To understand the principles, working of batteries and green energy technologies.

UNIT I	WATER TECHNOLOGY	9 (H)
	Water quality parameters and standards. Requisites for Industrial feed water, Internal and External treatment of hard water, Municipal water treatment, Desalination of water by reverse osmosis. Practical: Analysis of hardness/alkalinity in given water sample Activity: Coagulation of water sample using Alum.	
UNIT II	NANO-CHEMISTRY	9 (H)
	Classification, Size dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches including laser ablation, Chemical -vapour deposition method, Sol-gel method, Electro-deposition method and Electro spinning method, Applications of nano materials. Practical: Preparation of nanoparticles by Sol-Gel method. Activity: Preparation of Barium Sulphate (BaSO ₄) Nanoparticles by Chemical Precipitation Method.	
UNIT III	ELECTROCHEMISTRY	9 (H)
	Electrochemical cell, Electrode potential. Redox reaction. Nernst equation, Measurement of EMF of a cell, Conductivity of electrolytes, Factors affecting conductivity Practical: • Conductometric titrations (Strong acid Vs Strong base) • Conductometric titrations (Mixture of acids Vs strong base) Activity: Demonstration of Electrochemical cell.	
UNIT IV	CORROSION & CONTROL	9 (H)
	Types of Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection by sacrificial anodic protection and impressed current cathodic protection method, Organic and Inorganic coating. Practical: Corrosion study by weight loss method. Activities: Case study on Corrosion in pipelines, Control measures for a corroded metal.	
UNIT V	BATTERIES & GREEN ENERGY SOURCES	9 (H)
	Conventional, Contemporary and Emerging battery storage technologies, Primary battery -Alkaline battery, Secondary Batteries -Lead acid battery, Recent development of solar cells, Hydrogen – oxygen fuel cells. Batteries used in e-vehicles, Lithium-ion battery and sodium metal hydride battery. Practical: Measurement of EMF using potentiometer. Activities: Demonstration of Lead acid battery	
TOTAL : 45 HOURS		

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%
Assessment Methodology: Internal Examinations, Practical, Activities (Quiz, Assignments).
Textbooks: 1. Jain, P. C., & Jain, M. Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2025. 2. Agarwal, S. Engineering Chemistry: Fundamentals and Applications (2nd ed.). Cambridge University Press, 2019. 3. Sivasankar, B. Engineering Chemistry (6th ed.). Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2019. References: 1. Dara, S. S., & Umare, S. S. A Textbook of Engineering Chemistry (12th ed.). S. Chand Publishing, 2018. 2. Sachdeva, M. V. Basics of Nano Chemistry. Anmol Publications Pvt. Ltd., 2011. 3. Emich, F. Engineering Chemistry. Scientific International Pvt. Ltd. (formerly Medtech Publications in some syllabi), 2014. 4. Atkins, P. W., de Paula, J., & Keeler, J. Atkins' Physical Chemistry (12th ed.). Oxford University Press, 2023. 5. Linden, D., Reddy, T. B., et al. (Eds.). Handbook of Batteries (5th ed.). McGraw-Hill Education, 2019. 6. Fontana, M. G. Corrosion Engineering (3rd ed.). McGraw-Hill Education, 1986. E-Resources: 1. Water and Wastewater Engineering – Prof. Ligy Philip, IIT Madras (NPTEL) https://nptel.ac.in/courses/105106202 2. Electrochemical Energy Systems – Prof. S. Mitra, IIT Madras (NPTEL) https://nptel.ac.in/courses/113106028 3. Corrosion – Prof. Kallol Mondal, IIT Kanpur (NPTEL) https://nptel.ac.in/courses/112104088 4. Chemistry of Battery Systems – Prof. V. R. Marathe, IIT Madras (NPTEL) https://nptel.ac.in/courses/115106130

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand water quality parameters, treatment methods, and their engineering significance in industrial and municipal treatment.	K2
CO2	Understand the principles of nano chemistry, synthesis methods and application of nanomaterials in various field.	K2
CO3	Understand electrochemical laws, electrode reactions, and factors affecting the conductivity of electrolytes.	K2
CO4	Apply suitable procedure to control corrosion by electrochemical methods, organic coating and inorganic coating.	K3
CO5	Understand the working principles of primary and secondary battery with their electrode reactions and green sources of energy for sustainable development.	K2

CO-PO/PSO MAPPING

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	3	-	-	-	-	2	3	2
CO2	3	2	2	2	2	1	-	-	-	-	2	2	3
CO3	3	3	1	2	2	—	-	-	-	-	2	2	2
CO4	3	3	3	2	2	2	1	-	-	-	2	2	2
CO5	3	2	2	2	2	3	1	-	-	-	3	2	3
AVG	3	2	2	2	2	2	1	-	-	-	2	2	2

26PTT101	BASICS OF PHARMACEUTICAL TECHNOLOGY	L	T	P	C
		2	1	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of pharmaceutical technology and emerging trends in sustainable pharmaceutical manufacturing.
- To investigate the principles of pharmaceutical dosage forms emphasizing the role of sustainable and biodegradable materials in formulation development.
- To elucidate the pharmaceutical unit operations involved in pharmaceutical agent production.
- To examine the physicochemical properties of drug substances and interpret using computational tools for product development.
- To execute the principles of pharmaceutical quality systems to ensure the quality and safety of pharmaceutical products.

UNIT I	INTRODUCTION TO PHARMACEUTICAL TECHNOLOGY	9 (H)
	Evolution of Pharmacy and Pharmaceutical Sciences, Definition, scope, and significance of Pharmaceutical Technology, Overview of the global and Indian pharmaceutical industry, Emerging trends in pharmaceutical manufacturing and healthcare innovation, Drug development lifecycle: Discovery to marketing, Introduction to sustainable pharmaceutical development. Activity: Case study analysis on recent pharmaceutical innovations and successful drug development.	
UNIT II	SUSTAINABLE DOSAGE FORMS AND EXCIPIENTS	9 (H)
	Basic pharmaceutical terms: API, excipients. Dosage forms - Classification of dosage forms: solid, liquid, semisolid, sterile, Conventional dosage delivery systems: Controlled-release, sustained-release, targeted & site-specific drug delivery and novel drug delivery systems, Functional and eco-friendly excipients, Biodegradable excipients and natural polymers, Circular economy concepts in pharmaceutical formulation. Activity: Virtual demonstration on API, excipient and their significance on dosage.	
UNIT III	PHARMACEUTICAL UNIT OPERATIONS AND SMART MANUFACTURING	9 (H)
	Principles and industrial applications of pharmaceutical unit operations – Mixing, Milling, Drying, Granulation, Coating, Tablet compression and capsule filling stages - Filtration and sterilization techniques, Waste minimization and resource optimization in manufacturing. Activity: Virtual demonstration on various equipment for Pharmaceutical Unit Operations.	
UNIT IV	PHYSICOCHEMICAL & STABILITY ASPECTS OF PRODUCT DEVELOPMENT	9 (H)
	Solubility and pKa, Polymorphism and its implications, Drug-excipient compatibility studies, Stability testing: real-time and accelerated; Shelf-life estimation, Computational tools in formulation development – Accelerated stability testing of pharmaceutical products. Activity: Calculation and interpretation of solubility and pKa.	
UNIT V	PHARMACEUTICAL QUALITY SYSTEMS AND SUSTAINABLE INDUSTRIAL PRACTICES	9 (H)
	Quality, GMP, Introduction to Quality Control (QC) and Quality Assurance (QA), Good Manufacturing Practices (GMP), overview, Validation and documentation basics - Packaging and labelling requirements, Environmental, Social and Governance (ESG) principles in pharmaceutical industries. Activity: Report preparation on Quality Control and Quality Assurance.	
TOTAL: 45 HOURS		
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%		
Assessment Methodology: Internal Examinations, Activities (Quiz, Assignments, Flipped Class).		

Textbooks:

1. Allen, L. V. Jr. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, 11th Edition, Wolters Kluwer, 2023.
2. Sinko, P. J., & Singh, Y. Martin's Physical Pharmacy and Pharmaceutical Sciences, 8th Edition, Wolters Kluwer, 2023.
3. Beg, S., & Hasnain, M. S. Pharmaceutical Quality by Design: A Practical Approach, Academic Press, 2023.

References:

1. Carter, S. J. (2008). Cooper and Gunn's dispensing for pharmaceutical students. CBS Publishers.
2. Popovich, L. V. N. G., & Ansel, H. C. (2011). Ansel's pharmaceutical dosage form and drug delivery system. Lippincott Williams and Wilkins.
3. Thombre, N., Mahajan, H., Chaudhari, S., Shaikh, K., & Karuppaiyan, K. (2022). Concepts of industrial pharmacy-I. Pharma Career Publications.
4. Aulton, M. E., & Taylor, K. M. G. (2018). Aulton's pharmaceutics: The design and manufacture of medicines. Elsevier.
5. Khar, R. K., Vyas, S. P., Ahmad, F. J., & Jain, G. K. (2020). Lachmann Lieberman's theory and practice of industrial pharmacy (4th ed.). CBS Publisher and Distributor.
6. Gennaro, A. R. (2005). Remington: The science and practice of pharmacy. Lippincott Williams.

E-resources:

1. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems A standard textbook covering dosage forms, excipients, drug delivery systems, and pharmaceutical calculations.
2. Aulton's Pharmaceutics: The Design and Manufacture of Medicines Excellent reference for pharmaceutical unit operations, formulation development, GMP, QC, and QA concepts.
3. [World Health Organization \(WHO\) GMP Guidelines](#). Useful for GMP, validation, quality assurance, manufacturing practices, and pharmaceutical regulations.
4. [Indian Pharmacopoeia Commission \(IPC\)](#). Important Indian reference source for pharmaceutical standards, quality control, and drug specifications.
5. [U.S. Food and Drug Administration \(FDA\) – Drug Development and Approval Process](#).

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand basic pharmaceutical terminologies, APIs, excipients, dosage forms, and their significance in pharmaceutical formulations.	K2
CO2	Understand different dosage forms and the principles of pharmaceutical formulation and drug delivery systems.	K2
CO3	Understand the principles and applications of pharmaceutical unit operations used in manufacturing processes.	K2
CO4	Understand knowledge of preformulation studies, physicochemical properties, stability testing, and stages of drug development.	K2
CO5	Understand the importance of quality control (QC), quality assurance (QA), GMP, validation, documentation, and the role of Pharmaceutical Technology in ensuring safe and effective pharmaceutical products.	K2

CO-PO/PSO MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	2	2	1	1	-	-	2	2	2
CO2	3	3	3	2	2	2	1	1	-	-	2	2	3
CO3	3	3	3	3	3	2	2	2	-	-	2	3	2
CO4	3	3	2	3	3	2	1	1	-	-	3	3	3
CO5	3	3	2	3	2	3	3	2	-	-	3	3	2
AVG	3	2.5	2	2	2	2	1.5	1	-	-	2	2	2

26CSI001	COMPUTER PROGRAMMING : PYTHON	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To introduce the fundamentals of Python programming, problem-solving techniques, algorithms, flowcharts, data types, operators, and basic program development.
- To enable students to develop Python programs using decision-making, looping constructs, and user-defined functions.
- To develop the ability to manipulate strings and effectively use Python sequence data types such as lists, tuples, dictionaries, and sets with exception handling.
- To equip students with the knowledge of file handling, modules, packages, and Python libraries for data processing and problem-solving.
- To enable students to design and develop Python applications that interact with databases using SQL operations and database connectivity.

UNIT I	INTRODUCTION TO PYTHON	9 (H)
	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)	
UNIT II	CONTROL STRUCTURES AND FUNCTION	9 (H)
	if, if-else, nested if, multi-way if-else if statements, while loop, for loop, nested loops, pass statements, Hiding redundancy, complexity; Parameters, arguments and return values; formal vs actual arguments, named arguments, Recursive & Lambda Functions. Practical: Usage of conditional logics in programs, functions in programs. Minimum two).	
UNIT III	STRINGS AND SEQUENCE TYPES	9(H)
	String Comparison, Formatting, Slicing, Splitting, Stripping, Lists, tuples, dictionaries and set, basic list operators, searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values, Exception Handling. Practical: String manipulations and operations on lists, tuples, sets, and dictionaries. (Minimum two).	
UNIT IV	FILE OPERATIONS AND PACKAGES	9 (H)
	Create, Open, Read, Write, Append and Close files. reading/writing text and numbers, from/to a file; creating and reading a formatted file (csv, tab-separated, etc.), Built-in modules, User-Defined modules, Numpy, SciPy, Pandas, Scikitlearn. Practical: Opening, closing, reading and writing in formatted file format and sort data. Usage of modules and packages to solve problems. (Minimum three) .	
UNIT V	PYTHON WITH DATABASE CONNECTIVITY	9 (H)
	Introduction to Python Database API (DB-API), Data, Database, Database Management System (DBMS), File System vs DBMS, Database Users, Database Architecture, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Table Creation, Data Insertion, Update, Delete and Query Operations. Establishing Database Connections, Creating Tables using Python. Practical: Usage of Python with database connectivity (Minimum two), Project.	
TOTAL : 45 HOURS		
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%		
Assessment Methodology: Internal Examinations, Practical, Activities (Assignment Programs,		

Project).
References: 1. Eric Matthes (2023). Python Crash Course: A Hands-On, Project-Based Introduction to Programming (3rd edition), No Starch Press. 2. Charles R. Severance (2016). Python for Everybody: Exploring Data in Python 3(1st edition), Create Space 3. John V. Guttag (2021). Introduction to Computation and Programming Using Python: With Application to Understanding Data (3rd edition), MIT Press 4. Wes McKinney(2022). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter (3rd edition), O'Reilly Media. 5. Al Sweigart (2025). Automate the Boring Stuff with Python: Practical Programming for Total Beginners (3rd edition), No Starch Press. 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/

COURSE OUTCOME

COURSE OUTCOME	DISCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM’S LEVEL
CO1	Understand the fundamental concepts of Python programming, including syntax, variables, data types, operators, control structures, and built-in functions for developing simple programs.	K2
CO2	Apply control structures, functions, parameter passing mechanisms, and lambda expressions to design and implement modular Python programs.	K3
CO3	Apply string manipulation techniques and sequence data structures such as lists, tuples, dictionaries, and sets to solve computational problems effectively.	K3
CO4	Apply file handling operations, modules, and packages to develop reusable and maintainable Python applications.	K3
CO5	Understand database concepts and apply Python database connectivity techniques to create, manipulate, and retrieve data from relational databases.	K2

CO-PO/PSO MAPPING

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

26MEL002	MAKERSPACE	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

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

ACTIVITY A	DIS-ASSEMBLY & ASSEMBLY PRACTICES	6(H)
	(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.	
ACTIVITY B	WELDING PRACTICES	6 (H)
	(i) Welding Procedure, Selection & Safety Measures. (ii) Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes. (iii)Hands-on session of preparing base material & Joint groove for welding. (iv)Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Steel plates / pipes, for fabrication of a simple part.	
ACTIVITY C	ELECTRICAL WIRING PRACTICES	6 (H)
	(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.	
ACTIVITY D	ELECTRONICS COMPONENTS / EQUIPMENT PRACTICES	6 (H)
	(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.	
ACTIVITY E	CONTEMPORARY SYSTEMS	6 (H)
	(i) Demonstration of Solid Modelling of components. (ii) Demonstration of Assembly Modelling of components. (iii)Fabrication of simple components / parts using 3D Printers. (iv)Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.	
TOTAL: 30 HOURS		
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%		
Assessment Methodology: Internal Examinations, Activities (Project, Assignment).		
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 OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Demonstrate proper use and handling of basic hand and power tools for disassembly, assembly, and fabrication.	K3
CO2	Apply safety measures and execute basic electrical wiring installations, connections, and repairs for domestic applications.	K3
CO3	Create solid and assembly models of components using software and fabricate them using 3D printing technology.	K6
CO4	Adapt and follow safety protocols and professional practices in a workshop/laboratory work environment.	K3

CO-PO/PSO MAPPING

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	2	-	-	-	-	1	3	2
CO2	3	2	2	2	2	3	-	-	-	-	2	3	2
CO3	2	2	3	1	3	1	-	-	-	-	1	3	3
CO4	2	1	2	1	1	3	2	2	3	2	3	3	2
AVG	3	2	2	2	2	2	2	2	3	2	2	3	2

26UCT101	LIFE SKILLS FOR ENGINEERS I	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To develop self-awareness, emotional intelligence, and empathy for enhancing personal and interpersonal effectiveness.
- To equip students with positive thinking, stress management, and resilience skills for maintaining emotional well-being.
- To enable students to apply goal setting, time management, and teamwork skills for achieving personal and collaborative success.
- To develop financial literacy and healthy lifestyle practices for responsible decision-making and sustainable well-being.
- To promote digital literacy, online safety, ethical values, and civic responsibility for becoming responsible digital citizens and contributing positively to society.

UNIT I	KNOW YOURSELF	3 (H)
	Self-awareness and personality - understanding what makes you, you - Emotional intelligence and empathy - understanding your feelings and other people's feelings Activities: Take a simple personality test (such as MBTI or DISC) and discuss the results - Write in a reflection journal after each topic - Take part in an “empathy circle” - listening to a classmate's story without judging it - Practise a difficult conversation through role-play	
UNIT II	MASTER YOUR MINDSET	3 (H)
	Positive thinking and the right attitude - choosing a helpful mindset - Stress management and anger management - staying calm under pressure - Growth mindset and resilience - learning from mistakes and bouncing back Activities: Try a guided mindfulness (calm-breathing) session - Build your own personal “stress relief toolkit” - Keep a resilience journal, writing down one setback and how you handled it	
UNIT III	PLAN YOUR LIFE, WORK WITH OTHER	3 (H)
	Goal-setting and time management - deciding what matters and making time for it Activities: Create a vision board for your goals - Track your own time for a week and build a weekly planner -Take part in a group challenge that tests teamwork under pressure.	
UNIT IV	MANAGE YOUR MONEY AND HEALTH	3 (H)
	Financial literacy - budgeting and saving money - Nutrition, health, and hygiene - looking after your body Activities: Create a simple monthly budget for yourself - Play a financial simulation game to practise saving and spending decisions - Take part in a meal-planning workshop - Try a short physical wellness challenge.	
UNIT V	STAY SAFE, BE A GOOD CITIZEN	3 (H)
	Digital literacy and online safety - using the internet wisely and safely - Civic responsibility and ethics - doing the right thing for your community Activities: Run a social media audit on your own accounts - Work through privacy and online-safety scenarios - Take part in a community service activity - Join a class debate on values and ethics	
TOTAL: 15 HOURS		
Weightage: Continuous Assessment: 100%		
Assessment Methodology: Internal Examinations, Activities (Flipped Class &Quiz).		
Textbooks:		

1. ICT Academy of Kerala. Life Skills for Engineers. McGraw Hill Education (India) Private Limited, 2016.
2. Mitra, B. K. Personality Development and Soft Skills (2nd Edition). Oxford University Press, 2019.

References:

1. Khera, S. You Can Win. Macmillan Publishers India Ltd., Revised Edition, 2022.
2. Levesque, H. Life Skills 101: A Practical Guide to Leaving Home and Living on Your Own. Latest Edition.
3. Covey, S. R. The 7 Habits of Highly Effective People (30th Anniversary Edition). Simon & Schuster, 2020.
4. Goleman, D. Emotional Intelligence: Why It Can Matter More Than IQ (25th Anniversary Edition). Bloomsbury Publishing, 2020.

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Explain the concepts of self-awareness, personality, emotional intelligence, and empathy to enhance personal and interpersonal effectiveness	K2
CO2	Apply positive thinking, stress management, anger management, growth mindset, and resilience strategies to improve emotional well-being..	K3
CO3	Apply goal-setting, time management, and teamwork skills to achieve personal and collaborative objectives effectively..	K3
CO4	Analyze personal financial decisions, budgeting practices, and healthy lifestyle choices for sustainable well-being..	K4
CO5	Analyze digital safety practices, online ethics, and civic responsibilities to promote responsible digital citizenship and community participation.	K4

CO-PO/PSO MAPPING

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

Semester - II

26MAT201	LINEAR ALGEBRA	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To provide a strong foundation in matrices, rank, and systems of linear equations for solving engineering problems.
- To develop an understanding of vector spaces, subspaces, basis, dimension, and linear dependence for mathematical modelling and analysis.
- To enable the analysis of linear transformations, eigenvalues, eigenvectors, and diagonalization for simplifying linear systems.
- To develop the ability to apply inner product concepts, norms, and orthogonalization techniques in vector analysis and engineering applications.
- To provide knowledge of matrix decomposition techniques and least-squares methods for solving computational and engineering problems.

UNIT I	MATRICES AND SYSTEM OF LINEAR EQUATIONS	9+3 (H)
	Matrices – Row echelon form – Rank of a matrix – System of linear equations - Consistency – Gauss elimination method – Cayley Hamilton Theorem. Activities: Rank of Matrices and Cayley Hamilton theorem by using Open-source software (SCILAB).	
UNIT II	VECTOR SPACES	9+3 (H)
	Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension, Dimension of Subspaces. Activities: Test linear dependence and independence, the dimension of subspaces by using Open-source software (SCILAB).	
UNIT III	LINEAR TRANSFORMATIONS AND DIAGONALIZATION	9+3 (H)
	Null space, Range, Dimension Theorem (statement only), Matrix representation of a linear transformation, Eigenvalues & Eigenvectors, Diagonalizability. Activities: compute eigenvalues and eigenvectors of a matrix by using Open-source software (SCILAB).	
UNIT IV	INNER PRODUCT SPACES	9+3 (H)
	Inner product, Norms, Cauchy, Schwarz inequality, Gram, Schmidt orthogonalization, Simple problems (up to $\mathbb{R}^3$). Activities: Compute inner products and vector norms by using Open-source software (SCILAB).	
UNIT V	MATRIX DECOMPOSITION	9+3 (H)
	Positive definite matrices, QR decomposition, Singular Value Decomposition (SVD), Least squares solutions- Simple problems (up to 3×3 matrices). Activities: Use open-source software (SCILAB) to compute QR decomposition and Singular Value Decomposition (SVD) of matrices using built-in functions.	

TOTAL : 60 HOURS

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

Assessment Methodology: Internal Examinations, Activities (Quiz, Assignment: Application -Oriented Problem Solving Using Software).

Textbooks:

1. Friedberg, S. H., Insel, A. J., & Spence, L. E., *Linear Algebra*, 5th Edition, Pearson, 2022.
2. Strang, G., *Introduction to Linear Algebra*, 6th Edition, Wellesley-Cambridge Press, 2023.

References:

1. Lay, D. C., Lay, S. R., & McDonald, J. J., *Linear Algebra and Its Applications*, 6th Edition, Pearson, 2021.
2. Anton, H. & Rorres, C., *Elementary Linear Algebra: Applications Version*, 12th Edition, Wiley, 2019.
3. Poole, D., *Linear Algebra: A Modern Introduction*, 5th Edition, Cengage Learning, 2019.
4. Nicholson, W. K., *Linear Algebra with Applications*, 2nd Edition, Lyryx Learning, 2022.

5. Kreyszig, E., *Advanced Engineering Mathematics*, 11th Edition, Wiley India, 2018.

E-Sources:

1. MIT OpenCourseWare, *Linear Algebra*, Massachusetts Institute of Technology. Available: <https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/>
2. NPTEL, *Linear Algebra*, Indian Institute of Technology. Available: <https://nptel.ac.in>
3. SCILAB Official Documentation. Available: <https://help.scilab.org>
4. SCILAB Open Source Software Platform. Available: <https://www.scilab.org>
5. Khan Academy, *Linear Algebra*. Available: <https://www.khanacademy.org/math/linear-algebra>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand matrices, rank, systems of linear equations, Gaussian elimination, and the Cayley Hamilton theorem.	K2
CO2	Apply vector space concepts, basis, dimension, and linear dependence and independence to solve linear algebra problems.	K3
CO3	Apply linear transformations, eigenvalues, eigenvectors, and diagonalization to analyze linear algebraic systems.	K3
CO4	Apply inner products, norms, the Cauchy–Schwarz inequality, and Gram–Schmidt orthogonalization to solve problems involving orthogonality.	K3
CO5	Apply QR decomposition, Singular Value Decomposition (SVD), and least-squares methods to solve computational and linear algebra problems.	K3

CO-PO/PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	-	-	-	-	1	1	-	-
CO2	3	2	-	-	1	-	-	-	-	-	1	1	1	-
CO3	3	2	-	-	1	-	-	-	-	-	1	-	1	-
CO4	3	2	-	-	1	-	-	-	-	-	1	1	1	-
CO5	3	3	-	-	3	-	-	-	-	-	2	2	2	-
AVG	3	2	-	-	1	-	-	-	-	-	1	1	1	-

26MET201	THERMODYNAMICS FOR PHARMACEUTICAL TECHNOLOGIST	L	T	P	C
		2	1	0	3

COURSE OBJECTIVES:

- To introduce the fundamental concepts of energy, heat, work, and application of the first law of thermodynamics in closed and open systems.
- To provide knowledge on thermodynamic properties of fluids, equations of state, entropy, and basic thermodynamic cycles.
- To explain thermodynamic potentials, free energy functions, spontaneity criteria, Maxwell relations, and phase equilibrium concepts.
- To understand thermodynamic principles involved in phase transformations, solutions, colligative properties, and solubility behavior.
- To introduce chemical equilibrium concepts, acid–base equilibria, equilibrium constants, reaction conversion, and pH analysis.

	ENERGY AND THE FIRST LAW OF THERMODYNAMICS	9(H)
UNIT I	Heat, work and energy – forms of energy – forms of work. First law of thermodynamics – energy balance equation. Batch system energy balance – internal energy and enthalpy changes. Application problems. Enthalpy changes in chemical and biochemical reactions – Kirchhoff's law. Open systems – simple applied problems. Activities: Household Energy Audit (Individual): Understand energy conversion in household appliances, and calculate daily electrical energy consumption.	
	THERMODYNAMIC PROPERTIES OF FLUIDS	9(H)
UNIT II	PVT behavior of pure fluids – ideal gas equation of state – real gas equations of state (conceptual treatment). Second law of thermodynamics – entropy and entropy changes – applied problems. Concept of heat engine, refrigeration and heat pump (qualitative description only).	
	FREE ENERGY	9(H)
UNIT III	Helmholtz free energy, Gibbs free energy – criteria for spontaneity. Reversible processes – Maxwell relations (fundamental property relations). Phase equilibria for single component – Clausius Clapeyron equation – latent heat of phase transformation. Activities: Derivation Exercise: Derive one Maxwell relation from a given thermodynamic potential	
	THERMODYNAMICS OF PHYSICAL PROCESSES	9(H)
UNIT IV	Phase transformations – pure substances and multicomponent systems. Solutions of nonelectrolytes – ideal and non ideal solutions, partitioning between liquid phases. Colligative properties and isotonicity calculations. Solubility – solubility as an equilibrium constant, ideal solubility, temperature dependence of solubility.	
	THERMODYNAMICS OF CHEMICAL PROCESSES	9(H)
UNIT V	Acid–base equilibria. Equilibrium criteria for homogeneous chemical reactions – evaluation of equilibrium constant – effect of temperature and pressure on equilibrium constant. Calculation of equilibrium conversion and yields for single and multiple reactions. pH measurement. Activities: Laboratory Demonstration / Virtual Lab: Determine pH of a buffer solution and relate it to the Henderson–Hasselbalch equation.	
TOTAL : 45 HOURS		
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%		
Assessment Methodology: Assignments , Solving of competitive exams questions, Internal Examinations .		

Text Books

1. .M. Smith, H.C. Van Ness, M.M. Abbott and M.T. Swihart, Introduction to Chemical Engineering Thermodynamics, 8th Edition, McGraw Hill Education, 2018.
2. Y.V.C. Rao, Chemical Engineering Thermodynamics, Universities Press, 2005.
3. P.K. Nag, Engineering Thermodynamics, 6th Edition, McGraw Hill Education, 2017.
4. G. Van Wylen, R.E. Sonntag and C. Borgnakke, Fundamentals of Classical Thermodynamics, 8th Edition, Wiley, 2016..

Reference Books

1. Ira N. Levine, Physical Chemistry, 6th Edition, McGraw Hill Education, 2011.
2. Peter Atkins and Julio de Paula, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018.
3. J. M. Prausnitz, R. N. Lichtenthaler and E. Gomes de Azevedo, Molecular Thermodynamics of Fluid-Phase Equilibria, 3rd Edition, Prentice Hall, 1998.
4. Sandler Stanley I., Chemical, Biochemical, and Engineering Thermodynamics, 5th Edition, Wiley, 2017.
5. K.V. Narayanan, A Textbook of Chemical Engineering Thermodynamics, PHI Learning, 2013.
6. H.B. Callen, Thermodynamics and an Introduction to Thermostatistics, 2nd Edition, Wiley, 1985.

E-Resources

1. NPTEL – Chemical Engineering Thermodynamics- <https://nptel.ac.in/courses>
2. MIT Open Course Ware – Thermodynamics and Physical Chemistry Resources <https://ocw.mit.edu/>
3. McGraw Hill Connect – Engineering Thermodynamics Learning Resources. <https://www.mheducation.com>
4. Royal Society of Chemistry (RSC) Education Resources – Thermodynamics and Equilibrium <https://edu.rsc.org>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand the concepts of heat, work, energy, and the First Law of Thermodynamics for energy balance analysis.	K2
CO2	Understand the thermodynamic properties of fluids, equations of state, entropy, and the Second Law of Thermodynamics.	K2
CO3	Understand the concepts of free energy, thermodynamic potentials, Maxwell relations, and phase equilibrium.	K2
CO4	Understand the thermodynamics of phase transformations, solutions, colligative properties, and solubility equilibria.	K2
CO5	Understand the principles of chemical thermodynamics, acid-base equilibria, chemical equilibrium, and pH measurement.	K2

CO-PO/PSO MAPPING

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

26ECT001	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart foundational knowledge of DC electrical circuits, including basic electrical quantities, circuit laws, and series-parallel network analysis.
- To introduce the fundamental concepts of AC circuits, electromagnetic induction, sinusoidal signals, and three-phase systems.
- To develop an understanding of the construction, working principles, characteristics, and applications of electrical machines.
- To impart knowledge of semiconductor devices, timers, and operational amplifiers and their basic applications.
- To introduce the principles of digital electronics, logic circuits, arithmetic circuits, multiplexers, demultiplexers, and microcontrollers.

UNIT I	DC FUNDAMENTALS	9 (H)
	Basic Concepts - Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Voltage Divider and Current Divider Rules, Series and parallel network reduction, Kirchhoff's law. Activities: Virtual Demonstration of electrical laws & circuits, Hands-on Bread boarding, Solving GATE questions	
UNIT II	AC FUNDAMENTALS	9 (H)
	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. Activities: Virtual Demonstration of electromagnetic induction, Measurement of instantaneous and RMS values of AC signals, Solving GATE questions.	
UNIT III	ELECTRICAL MACHINES	9 (H)
	DC Machines- Construction and working principle of DC Generators and DC motors, EMF and Torque equations, types, characteristics, and applications, Construction and working principle of Single Phase Transformer. AC Machines- Synchronous Generators, Single Phase Induction Motors, Special Machines- Working Principle of Stepper Motor, BLDC Motor and its Applications. Activities: Virtual demonstration of step-up and step-down transformers, Virtual working BLDC	
UNIT IV	SEMICONDUCTOR DEVICES	9 (H)
	PN junction diodes, Zener Diode, BJT & JFET, Introduction to 555 Timers, Operational Amplifiers-Inverting & Non Inverting. Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Solving GATE questions.	
UNIT V	DIGITAL ELECTRONICS AND MICROCONTROLLERS	9 (H)
	Boolean algebra, Basic and Universal Gates, Adders – half adder and full adder, multiplexers, demultiplexers. Microcontrollers: Introduction, Block Diagram, Potential Applications. Activities: Online logic gate simulators, Solving GATE questions.	
TOTAL: 45 HOURS		
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%		

Assessment Methodology: Internal Examinations, Activity (Quiz and GATE Questions).

Textbooks

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020
2. S. K, Bhattacharya, “Basic Electrical and Electronics Engineering”, Second Edition, Pearson Education, 2017.

References:

1. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill Education, 2019
2. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, 2002.
3. Moris Mano “Digital Design and Digital Logic and Computer Design”, 2024.

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM’S LEVEL
CO1	Understand and explain basic electrical and electronic concepts.	K2
CO2	Analyse and interpret the fundamental principles of DC and AC circuits, and demonstrate appropriate electrical safety practices.	K4
CO3	Illustrate the construction and examine the operating principles of DC machines, transformers, induction motors, synchronous generators, and special-purpose motors.	K2
CO4	Analyse the characteristics of semiconductor devices and evaluate the performance of analog electronic circuits including diodes, transistors, voltage regulators, timers, and operational amplifiers.	K4
CO5	Analyse the fundamental principles of digital electronics and describe the architecture and potential applications of microcontrollers.	K4

CO-PO/PSO MAPPING

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

26TAT201	தமிழர்களும் தொழில்நுட்பமும் TAMILS AND TECHNOLOGY		L	T	P	C
			1	0	0	1

பாடநெறி நோக்கங்கள்:

- பழந்தமிழர்களின் அறிவியல் மற்றும் தொழில்நுட்ப அறிவைப் பற்றி அறிந்துகொள்ளுதல்.
- தமிழர்களின் வடிவமைப்பு மற்றும் கட்டுமானத் தொழில்நுட்பத்தைப் பற்றிக் கற்றல்.
- தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் குறித்து விழிப்புணர்வு பெறுதல்.
- தமிழர்கள் பயன்படுத்திய பாரம்பரிய வேளாண்மை மற்றும் நீர்ப்பாசன முறைகளைப் பற்றி விரிவாக அறிந்து கொள்ளுதல்.
- அறிவியல் தமிழ் மற்றும் கணினித் தமிழின் முக்கியத்துவத்தைப் புரிந்து கொள்ளுதல்..

COURSE OBJECTIVES:

- To study about the scientific and technological knowledge of ancient Tamils.
- To learn about the design and construction technology of Tamils.
- To aware about the manufacturing technology of Tamils.
- To study about traditional agriculture and irrigation systems used by Tamils.
- To know the importance of scientific Tamil and modern Tamil computing

UNIT - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம் / WEAVING AND CERAMIC TECHNOLOGY	3(H)
	சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்புப் பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age, Ceramic technology, Black and Red Ware Potteries (BRW), Graffiti on Potteries.	
UNIT - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: DESIGN AND CONSTRUCTION TECHNOLOGY	3(H)
	சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் 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, திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள் மற்றும் பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரசெனிக் கட்டிடக் கலை. 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 Mahal, Chetti Nadu Houses, Indo, Saracenic architecture at Madras during British Period.	
UNIT - III	உற்பத்தித் தொழில்நுட்பம்/MANUFACTURING TECHNOLOGY	3(H)
	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. 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	
UNIT-IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்/ AGRICULTURE AND IRRIGATION TECHNOLOGY	3(H)
	அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுமித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு -மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம் . 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.	
UNIT - V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்/ SCIENTIFIC TAMIL & TAMIL COMPUTING	3(H)
	அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம். Development of Scientific Tamil, Tamil computing, Digitalization of Tamil Books, Development of Tamil Software, Tamil Virtual Academy, Tamil Digital Library, Online Tamil Dictionaries, Sorkuvai Project	
TOTAL: 15 HOURS		
Weightage: Continuous Assessment :40%, End Semester Examinations :60%		
Assessment Methodology: Internal Examinations, Activities (Quiz, Assignments).		
Text-Cum-Reference Books 1. தமிழக வரலாறு, மக்களும் பண்பாடும், மக. மக. 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. பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு). 5. Social Life of Tamils – Dr. K. K. Pillay. A Joint Publication of Tamil Nadu Textbook and Educational Services Corporation (TNTB & ESC) and Roja Muthiah Research Library (RMRL). 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 the River Vaigai. Jointly Published by Department of Archaeology & Tamil Nadu Textbook 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 Textbook and Educational Services Corporation, Tamil Nadu.		

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	தமிழர்களின் நெசவு மற்றும் மண்பாண்டத் தொழில்நுட்பத்தைப் புரிந்துகொள்ளுதல். Understand the contribution of Tamils in various fields. Explain about the weaving and pottery technology of Tamils.	K2
CO2	தமிழர்களின் கட்டுமானத் தொழில்நுட்பத்தை விளக்குதல். Explain about the design and construction technology of Tamils.	K2
CO3	தமிழர்களின் உற்பத்தித் தொழில்நுட்பத்தை விளக்குதல். Explain about the manufacturing technology of Tamils.	K2
CO4	தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பத்தைப் புரிந்துகொள்ளுதல். Understand the agriculture and irrigation technology of Tamils.	K2
CO5	அறிவியல் தமிழ் மற்றும் தமிழ் கணினியியலின் வளர்ச்சியை அறிதல். Define the growth of scientific Tamil and Tamil computing.	K2

CO-PO/PSO MAPPING

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

26PHT202	APPLIED PHYSICS (ME&TECH) – II	L	T	P	C
		2	1	0	3

COURSE OBJECTIVES:

- To understand the concepts of centre of mass, moment of inertia, and the dynamics of rotating rigid bodies used in engineering applications.
- To study heat conduction, methods of measuring thermal conductivity, and the fundamental laws of thermodynamics.
- To understand phase transformations, phase diagrams, and heat treatment processes for engineering materials.
- To learn the properties and engineering applications of advanced functional materials, including ceramics, composites, shape memory alloys, biosensors, and carbon nanotubes.
- To understand the principles, properties, and engineering applications of superconducting materials and devices

UNIT I	RIGID BODY DYNAMICS	9 (H)
	Centre of mass – Moment of inertia (circular disc, solid cylinder, hollow cylinder, solid sphere, hollow sphere), Gear, shaft, gyroscope Activities: Demonstration of moment of inertia of Gear, shafts and Gyroscopes.	
UNIT II	THERMAL PHYSICS	9 (H)
	Thermal conductivity – Transient plane source method, Transient Line Source method – Lees disc Method - Forbe's method - conduction through compound media, Laws of Thermodynamics . Activities: Demonstration of thermal conductivity of insulators	
UNIT III	PHASE TRANSITIONS	9 (H)
	Solid solutions - single component system, binary phase diagrams - iron-carbon equilibrium diagram, T-T-T-diagram - heat treatment of steels – hardening techniques Activities: Demonstration of Hardening of steels	
UNIT IV	FUNCTIONAL MATERIALS	9 (H)
	Ceramics – Composites, Fiber Reinforced Plastics - Metallic Glasses - Shape Memory alloys – Bio-Sensors – CNT (Carbon Nano tubes) Activities: Demonstration of 3D Structures of CNTs.	
UNIT V	SUPERCONDUCTING MATERIALS	9 (H)
	Superconducting Materials – Zero resistance and Meissner effect – Type I and II Superconductors – BCS Theory (Qualitative) – High T _c Superconductors – Applications – SQUID, Cryotron, Magnetic levitation. Activities: Demonstration of Superconductors.	

TOTAL : 45 HOURS

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

Assessment Methodology: Quiz , Assignments, Flipped Class Internal Examinations.

References :

1. Mathur, D. S. (2008). Elements of properties of matter. S. Chand.
2. Brij Lal, & Subramaniam, N. (2018). Heat, thermodynamics and statistical physics. S. Chand.
3. Raghavan, V. (2009). Physical metallurgy: Principles and practice. PHI Learning.
4. Askeland, D. (2022). 8TH Edition Materials science and engineering. Brooks/Cole.

E-Resources:

1. Thermal conductivity -Understanding Thermal Conductivity in Solids <https://youtu.be/VcFqqdGcwrw>
2. White LED_ <https://archive.nptel.ac.in/courses/108/108/108108122/>
3. Shape memory alloys: <https://nescacademy.nasa.gov/video/00a31561480547248033a1c2df6f87831d>
4. Moment of Inertia: https://youtu.be/fDJeVR0o__w

5. Conduction: <http://kcl.digimat.in/nptel/courses/video/112106155/L32.html>
6. Iron –Carbon phase diagram - <https://archive.nptel.ac.in/courses/113/104/113104068>
 Gyroscope_ <https://www.youtube.com/watch?v=FydJu1A1oeM> gyroscope-131127011945-
 phpapp02.pdf Hardening Techniques_ <https://www.youtube.com/watch?v=ckCN9jGsdUY>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Explain the concepts of centre of mass, moment of inertia, gears, shafts, and gyroscopes and apply them to analyze rigid body dynamics problems.	K2
CO2	Apply the principles of thermal conductivity and laws of thermodynamics to solve engineering problems involving heat transfer through different media.	K3
CO3	Interpret phase transformations using phase diagrams, T-T-T diagrams, and heat treatment processes in steels.	K2
CO4	Examine the properties, characteristics, and engineering applications of ceramics, composites, metallic glasses, shape memory alloys, biosensors, and carbon nanotubes.	K4
CO5	Explain the fundamentals of superconductivity, distinguish between different types of superconductors, and evaluate their engineering applications.	K3

CO-PO/PSO MAPPING

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

26BTI201	CELL BIOLOGY				L 3	T 0	P 2	C 4
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COURSE OBJECTIVES:

- To elucidate the structure, functions and cellular organelles of prokaryotic and eukaryotic cells, and demonstrate microscopic techniques for cell identification.
- To outline the organization and functions of cytoskeletal proteins and cell divisions.
- To illustrate the principles of membrane transport and interpret their physiological significance through experimental demonstrations.
- To demonstrate the mechanisms of cell signaling and signal transduction using computational and graphical approaches.
- To execute the modern cell biology techniques for the study of cellular structure, organization, and protein localization.

UNIT I	CELL STRUCTURE AND FUNCTION OF THE ORGANELLES	12 (H)
	Discovery of cells – Basic properties of cell - Prokaryotic and Eukaryotic cells - Sub-cellular organelles and functions – Structural Organization and function of the plasma membrane - Extra cellular matrix: Interaction of cells with extracellular materials, Cell–cell communication through tight junctions, adherens junctions, desmosomes, hemidesmosomes and gap junctions. Practicals: 1. Identification of bacterial, plant and animal cell 2. Preparation of transverse sections of monocot and dicot roots and stems by staining and slide preparation for microscopic observation. Activities: Create a model of a cellular structure.	
UNIT II	CELL DIVISION AND CYTOSKELETON PROTEINS	12 (H)
	Cytoskeleton and cell motility: functions of cytoskeleton, study of the cytoskeleton, microtubules, intermediate filaments, microfilaments, muscle contractility – Mitosis: and Meiosis- Cell cycle: different phases of cell cycle - Regulation of cell cycle: cyclin and cyclin dependent kinases-Cancer: Basic properties of cancer cell, causes of cancer, genetics of cancer- Role of Ras and Raf in oncogenesis and apoptosis. Practicals: 1. Cell viability using Trypan blue assay. 2. Staining for different stages of mitosis in <i>Allium cepa</i> (onion) 3. Meiotic cell division in <i>Hibiscus</i> flower buds Activities: Construction of a three-dimensional model representing cytoskeletal components, including microtubules and actin filaments, to illustrate their structural organization.	
UNIT III	PRINCIPLES OF MEMBRANE TRANSPORT	12(H)
	Overview on membrane transport - Passive and Active Transport - Bacterial Permeases - Ion channels - ATP pumps and ionic transport environment -Na^+ / K^+ / Ca^{2+} pumps – uniport - symport - antiporter system - Ligand gated / voltage gated channels and the propagation of action potentials in nerve cells; Acetylcholine-gated cation channels leads to muscle contraction - Agonists and Antagonists. Practicals: 1. Demonstration of osmosis using dialysis membrane Activities: Prepare a Comparison Chart showing transport mechanisms with examples.	
UNIT IV	CELL SIGNALING AND SIGNAL TRANSDUCTION	12(H)
	Fundamentals of Cellular Communication network, Receptor- mediated signaling mechanisms, Cell surface receptors and intracellular receptors, Different classes of receptors autocrine, paracrine, endocrine models – Secondary messengers molecules: calcium signaling. Practicals 1. Virtual demonstration of receptor-mediated signaling pathways using Reactome Software Activities: Preparation of flowcharts illustrating one signaling pathways. e.g. Receptor tyrosine kinase, Calcium signalling.	

UNIT V	TECHNIQUES USED TO STUDY CELLS	12(H)
	Cell fractionation principles and subcellular isolation methods, Differential and density gradient centrifugation and Flow cytometry. Morphology and identification of cells using microscopic studies like SEM, TEM and Confocal Microscopy. Localization of proteins in cells – Immunostaining.	
	Practicals: 1.Cell fractionation using centrifugation techniques.	
	Activities: Compare and interpret the cellular images obtained from SEM, TEM and Confocal microscopy and prepare a table on resolution, magnification and ultrastructural details.	
	TOTAL : 60 HOURS	
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%		
Assessment Methodology: Assignments/module activities, Laboratory performance and record, Practical skill assessment, Internal Examinations.		
Textbook: 1. Bruce Alberts, Rebecca Heald, Alexander Johnson, David Morgan, Martin Raff, Keith Roberts,Peter Walter, John Wilson & Tim Hunt (2022). Molecular Biology of the Cell, 7th Edition. <i>W. W. Norton & Company</i>. 2. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Kelsey C. Martin, Michael P. Yaffe & Angelika Amon (2021) S. Molecular Cell Biology, 9th Edition. <i>W. H. Freeman/Macmillan Learning</i>. 3. Gerald Karp (2024). Cell and Molecular Biology: Concepts and Experiments, 10th Edition. <i>John Wiley & Sons</i>. 4. Geoffrey M. Cooper & Robert E. Hausman (2019). The Cell: A Molecular Approach, 9th Edition. <i>Oxford University Press</i>. 5. Bruce Alberts, Karen Hopkin, Alexander Johnson, David Morgan, Martin Raff, Keith Roberts & Peter Walter (2025). Essential Cell Biology, 6th Edition. <i>W. W. Norton & Company</i>.		
References 1. David S. Goodsell (2021). The Machinery of Life, 3rd Edition. <i>Springer Nature</i>. 2. Daniel L. Hartl, Andrew H. Knoll & Robert A. Lue (2023). Essential Cell Biology Laboratory Manual, Latest Edition. 3. Janeway, Murphy, Travers & Walport (2022). Janeway's Immunobiology, 10th Edition. Garland Science. 4. Michael R. King (2022). Cell Biology: Principles and Applications. <i>CRC Press</i>. 5. Thomas D. Pollard, William C. Earnshaw, Jennifer Lippincott-Schwartz & Graham Johnson (2023). Cell Biology, 4th Edition. <i>Elsevier</i>.		
NPTEL: Introduction to Cell Biology by Prof.Nagraj Balasubramanin and Prof. Girish Ratnaparkhi; https://onlinecourses.nptel.ac.in/noc25_bt69/preview MOOc-list.com/tags/ Cell Biology		

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand the structure, organization, and functions of prokaryotic and eukaryotic cells.	K2
CO2	Understand the principles of cell division, cell cycle regulation, and apoptosis to biological systems.	K2
CO3	Understand the membrane structure, function, and transport mechanisms in cellular processes.	K2
CO4	Understand the role of cell receptors and signaling pathways in cellular communication and regulation.	K2
CO5	Understand and perform cell biology experiments using microscopy, cell fractionation, and flow cytometry techniques.	K2

CO-PO / PSO MAPPING

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

26ENI201	ENGLISH ESSENTIALS - II	L	T	P	C
		1	0	2	2

COURSE OBJECTIVES:

- Develop effective oral communication skills for interpersonal, group, and professional interactions.
- Enhance listening skills and the ability to provide and receive constructive feedback effectively.
- Build competency in business correspondence through professional emails, formal letters, and meeting documentation.
- Develop academic writing skills by practicing paraphrasing, summarizing, essays, and technical writing.
- Foster teamwork, leadership, negotiation, and problem-solving skills for academic and professional success.

UNIT I	ORAL COMMUNICATION	6 (H)
	Types (Verbal and Nonverbal), Interpersonal and group communication, Telephonic conversation. Activities: Short presentations, Debates, Formal Speeches (Welcome, Vote of Thanks and introducing guests), Listen and respond to short podcasts.	
UNIT II	LISTENING AND FEEDBACK SKILLS	6 (H)
	Types of listening (Active, Passive, Critical, Empathetic) Barriers to effective listening. Giving Constructive Feedback – Specific vs vague feedback, Feedback on behaviour, not person. Receiving Feedback Positively – Handling criticism without defensiveness. Activities: Note-taking, Story sharing, Two stars and a wish (After a presentation, each student gives 2things the presenter did well + 1 suggestion to improve) Speed Feedback (2 mins per pair, student A shares work, Student B gives feedback, then swap. Rotate 3-4 times)	
UNIT III	BUSINESS CORRESPONDENCE	6 (H)
	Email Communication, Formal Letters (Types), Business Meeting. Activities: Email and letter writing (Complaint, request, permission), Agenda, minutes of the meeting.	
UNIT IV	ACADEMIC WRITING	6 (H)
	Paraphrasing, Summarizing, Essay Writing, Instructions and Recommendations. Activities: Essay writing (Cause and effect, argumentative, persuasive), User guides/ manuals, policy document.	
UNIT V	TEAM WORK	6 (H)
	Leadership Skills (Team building, Team Leader, Team player), Negotiation and Problem solving skills Activities: SWOT Analysis, Brainstorming and Group discussions.	
TOTAL : 30 HOURS		
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%		
Assessment Methodology: Internal Examinations, Activity (Group Activity, Report Writing)		
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/>

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Demonstrate effective oral communication in interpersonal, group, and professional settings.	K2
CO2	Apply active listening techniques and provide constructive feedback in various communication contexts.	K2
CO3	Prepare professional emails, formal letters, agendas, and minutes of meetings using appropriate formats.	K2
CO4	Produce clear and well-organized academic and technical documents using effective writing strategies.	K2
CO5	Demonstrate leadership, teamwork, negotiation, and problem-solving skills in collaborative activities.	K2

CO-PO / PSO MAPPING

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

26MEL001	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	10 (H)
	• Overview of the product lifecycle. • Hands-on disassembly of simple products. • Practice basic measurements and sketching. • Introduction to CAD modeling of disassembled parts. • Virtual assembly of parts.	
BOOTCAMP 2	EMBEDDED SYSTEM PROGRAMMING	10 (H)
	• Open-source platforms (e.g., Arduino). • Practice of interfacing sensors, reading data. • Automation in home, healthcare and agriculture.	
ACTIVITY	REVERSE ENGINEERING & PROTOTYPING	10 (H)
	• Sketch and prototype alternative designs. • Group brainstorming sessions. • Manufacture prototype parts using 3D printing and / or workshop tools. • Assemble prototype product.	
TOTAL: 30 HOURS		
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%		
Assessment Methodology: Internal Examinations, Activities (Project, Assignment).		
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/		

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand the product development lifecycle, including stages such as concept generation, design, prototyping, and testing.	K2
CO2	Apply reverse engineering techniques to analyze and document existing products.	K3
CO3	Collaborate in teams to fabricate prototypes using appropriate tools.	K5
CO4	Engage in independent learning and continuously adapt to emerging technologies in product design.	K4

CO-PO/PSO MAPPING

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

26UCT201	LIFE SKILLS FOR ENGINEERS-II	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To develop creative thinking skills by applying imagination, lateral thinking, and collaborative approaches to generate innovative solutions.
- To develop effective decision-making and problem-solving skills through convergent and divergent thinking and critical analysis.
- To apply analytical, logical, and structured problem-solving techniques to address real-world engineering challenges.
- To develop leadership, communication, and decision-making skills for effective collaboration and responsible professional practice.
- To enhance teamwork, conflict resolution, empathy, and shared vision for achieving common goals in multidisciplinary environments.

goals in multiple primary environments.

UNIT I	FOUNDATIONS OF CREATIVE THINKING	3 (H)
	Creativity, critical thinking, and collaboration - the building blocks of good thinking Imagination, intuition, and experience as sources of creativity - Lateral thinking and busting common myths about creativity Activities: Two-Brainstorm method on a real problem -Take on the “30 Circles” creativity challenge - Solve lateral-thinking riddles and puzzles- Take part in “Creativity Myth Busters” - spotting false beliefs about creativity	
UNIT II	THINKING STYLE AND DECISION MAKING	3 (H)
	Problem solving and decision making - Convergent thinking (narrowing down to one answer) vs divergent thinking (opening up many ideas) - Critical reading and the idea of “multiple intelligences” people are smart in different ways Activities: Work through a “Desert Survival” team simulation -Write short “What If?” scenario stories -Play a “Fast vs Slow Thinking” game	
UNIT III	PROBLEM-SOLVING TOOLBOX	3 (H)
	Problem-solving techniques: Six Thinking Hats, Mind Mapping, Forced Connections - Analytical thinking - Logical thinking Activities: Analyse a real-world case study - Take part in an “Escape Room” challenge that needs logical problem solving	
UNIT IV	TEAMWORK,CONFLICT,AND VISION	3 (H)
	Leadership styles, and assessing your own natural style - Communication and active listening 1. Decision-making and taking responsibility Activities: Take part in a “Crisis Leadership” simulation - Role-play real “Leadership Dilemmas	
UNIT V	PROBLEM-SOLVING TOOLBOX TEAMWORK, CONFLICT, AND VISION	3 (H)
	Teamwork and delegation -sharing work fairly -Empathy, integrity, and handling conflict Vision, motivation, and goal-setting for a team Activities: Classic “Tower Challenge” (building something as a team under a time limit) - Build a Team Vision Board together	

TOTAL: 15 HOURS

Weightage: Continuous Assessment: 100%

Assessment Methodology: Internal Examinations, Activities (Quiz, Flipped Class).

Textbooks:

1. Edward de Bono, Lateral Thinking: Creativity Step by Step, Revised Edition, Harper Perennial, 2015.
2. Daniel Kahneman, Thinking, Fast and Slow, Farrar, Straus and Giroux, 2011.
3. David A. Whetten and Kim S. Cameron, Developing Management Skills, 9th Edition, Pearson Education, 2016.
4. Richard Paul and Linda Elder, The Miniature Guide to Critical Thinking: Concepts and Tools, 9th Edition, Foundation for Critical Thinking Press, 2020.

References:

1. Edward de Bono, Six Thinking Hats, Revised Edition, Little, Brown Book Group, 2017.
2. Peter A. Facione, Critical Thinking: What It Is and Why It Counts, Insight Assessment, 2015.
3. Tony Buzan and Barry Buzan, The Mind Map Book, BBC Active/Pearson Education, Updated Edition, 2018.
4. Peter G. Northouse, Leadership: Theory and Practice, 10th Edition, Sage Publications, 2024.
5. Stephen R. Covey, The 7 Habits of Highly Effective People, 30th Anniversary Edition, Simon & Schuster, 2020.
6. Carol S. Dweck, Mindset: The New Psychology of Success, Updated Edition, Ballantine Books, 2016.

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Apply creative thinking, imagination, and lateral thinking techniques to generate innovative ideas for solving engineering and real-world problems.	K3
CO2	Analyze problems using appropriate thinking styles and decision-making strategies to select effective solutions	K4
CO3	Apply structured problem-solving tools and logical reasoning techniques to solve practical engineering challenges.	K3
CO4	Demonstrate leadership, communication, and decision-making skills for effective collaboration in professional environments.	K3
CO5	Evaluate teamwork, conflict resolution, and goal-setting strategies to enhance collaboration and achieve shared objectives in multidisciplinary teams.	K5

CO-PO/PSO MAPPING

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

26UCT202	FOREIGN LANGUAGE - JAPANESE	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To introduce the fundamentals of the Japanese language, including Hiragana, Katakana, pronunciation, and basic vocabulary.
- To develop the ability to communicate using simple Japanese expressions in everyday situations such as greetings, self-introduction, and classroom interactions.
- To enable learners to apply basic Japanese grammar, sentence patterns, and commonly used vocabulary in oral and written communication.
- To provide an understanding of elementary Japanese conversational skills for daily life, including asking questions, giving directions, and making polite requests.
- To familiarize learners with Japanese culture, customs, and etiquette to promote effective and culturally appropriate communication.

UNIT I	WRITING SYSTEMS & PRONUNCIATION	3 (H)
	Introduction to the Japanese language – Hiragana: vowels and basic characters – Reading and writing Hiragana – Introduction to Katakana: basic characters and usage – Pronunciation and sound patterns. Activities: Flashcard games, Hiragana writing drills, Katakana reading practice, Audio-based pronunciation exercises.	
UNIT II	BASIC COMMUNICATION	3 (H)
	Greetings and farewells (こんにちは, おはようございます, さようなら) – Self-introduction (Name, nationality, age) – Basic sentence structure (Subject–Object–Verb) – Numbers (1–100) – Days of the week – Classroom expressions. Activities: Self-introduction, Greeting practice, Number and date matching, Listening exercises.	
UNIT III	GRAMMAR & VOCABULARY	3 (H)
	Particles: は (wa), を (wo), の (no), へ (e), に (ni) – Present tense verbs: です and ます forms – Negative forms (ではありません, ません) – Question words: なに, どこ, だれ, いつ – Vocabulary related to family, food, colours, and common actions. Activities: Verb conjugation drills, Particle exercises, Picture description, Shopping vocabulary practice.	
UNIT IV	EVERYDAY CONVERSATION	3 (H)
	Describing people and objects using い and な adjectives – Talking about daily routines and schedules – Time expressions – Asking and giving simple directions – Ordering food and making polite requests – Expressing likes and dislikes. Activities: Role-plays, Daily schedule presentation, Restaurant conversation, Dialogue practice.	
UNIT V	JAPANESE CULTURE & PRACTICAL COMMUNICATION	3 (H)
	Listening to short conversations – Identifying key expressions – Introduction to formal and informal speech – Basic Japanese etiquette and cultural practices – Revision of Hiragana and Katakana – Beginner-level conversation practice. Activities: Group discussion on Japanese etiquette, Listening comprehension, Vocabulary quiz, Oral presentation, Conversation practice.	

TOTAL: 15 HOURS

Weightage: Continuous Assessment: 100%

Assessment Methodology: Internal Examinations, Activities (Quiz).

Textbooks:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2020). *Genki I: An Integrated Course in Elementary Japanese* (3rd Edition). Tokyo: The Japan Times Publishing.
2. The Japan Foundation. (2020). *Marugoto: Japanese Language and Culture – Starter A1 (Katsudoo & Rikai)*. Tokyo: The Japan Foundation.

References:

1. Makino, S., & Tsutsui, M. (2022). *A Dictionary of Basic Japanese Grammar* (Revised Edition).

Tokyo: The Japan Times Publishing.

2. The Japan Foundation. (2022). *IRODORI: Japanese for Life in Japan – Starter (A1)*. Tokyo: The Japan Foundation.
3. Hadamitzky, W., & Spahn, M. (2023). *Japanese Hiragana & Katakana for Beginners* (Latest Edition). Tuttle Publishing.
4. Alma Publishing. (2021). *Minna no Nihongo Elementary I – Main Textbook* (2nd Edition, English Translation). 3A Corporation.

COURSE OUTCOME

COURSE OUTCOME	DESCRIPTION OF COURSE OUTCOME	MAXIMUM BLOOM'S LEVEL
CO1	Understand the basic Hiragana and Katakana writing systems, pronunciation, and essential Japanese vocabulary.	K2
CO2	Understand simple Japanese greetings, self-introduction, numbers, dates, and classroom expressions for everyday communication	K2
CO3	Apply basic Japanese grammar, particles, verb forms, and sentence structures to construct simple sentences.	K3
CO4	Apply basic Japanese conversational skills in everyday situations such as shopping, asking directions, ordering food, and expressing preferences.	K3
CO5	Understand Japanese cultural practices and etiquette for appropriate communication in simple real-life contexts	K2

CO-PO/PSO MAPPING

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