I. Vision and Mission of the Institute

Vision

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of industry, society, the nation and the world at large

Mission

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning processes through scholarly activities
- Enriching research and innovation activities in collaboration with industry and institutes of repute
- Ensuring the academic processes to uphold culture, ethics and social responsibilities

II. Vision and Mission of the Department

Vision

To be a centre of academic and research excellence in Chemical Engineering to cater to the diverse needs of industry, society and the global community

Mission

The mission of the department is to

- Provide quality education that integrates values and practical skills to ensure effective learning outcomes
- Promote research, innovation, and collaboration with industries and institutions of repute
- Inculcate professionalism, ethics, lifelong learning and social responsibilities

III. Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) of the CHEMICAL ENGINEERING (CH) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO1: Apply knowledge of science, and engineering to solve complex Chemical Engineering problems in diverse chemical and allied industries

PEO2: Design, develop, and optimize chemical processes and products to uphold the needs of society and environment ensuring sustainability

PEO3: Exhibit a commitment to lifelong learning, research and professional ethics

IV. Program Outcomes (POs)

Graduates of the CHEMICAL ENGINEERING will be able to

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/ multi-disciplinary teams

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

V. Program Specific Outcomes (PSOs)

Graduates of the CHEMICAL ENGINEERING will be able to

PSO1: Acquire the necessary knowledge, skill and competence on the principles of Chemical Engineering

PSO2: Adopt Chemical Engineering principles with advanced and innovative practices for process and product development

VI. PEO / PO Mapping

Following three levels of correlation should be used:

1: Low

2: Medium

3: High

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
PEO 1	3	3	1	2	2	-	-	-	-	-	-	3	3
PEO 2	-	-	2	1	2	3	2	-	2	2	-	3	3
PEO 3	-	-	-	-	-	2	2	3	3	2	2	3	3

VII. Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
I	English Proficiency I	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Matrices and Calculus	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	✓
	Engineering Physics	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓
	Engineering Chemistry	✓	✓	✓	-	✓	-	-	-	-	-	✓	✓	✓
	Problem Solving using C	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓
	Digital Technologies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Elements of Mechanical Engineering	✓	✓	-	-	-	✓	-	-	-	-	-	✓	✓
	Introduction to Chemical Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Français pour les Ingénieurs – French I	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Nihongo no Enginia – Japanese I	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Hindi for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Deutsch für Ingenieure – German I	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Chinese for Engineers - Chinese I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Induction Program - Universal Human Values I	-	-	-	-	-	✓	✓	✓	-	-	✓	✓	✓
	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	✓	✓	-	✓	-	✓	✓
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Computer Fundamentals and Coding Essentials	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
II	English Proficiency II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Mathematical Transforms	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	✓
	Materials Science	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	✓
	Environmental Science and Sustainability	✓	✓	✓	✓	✓	✓	✓	-	✓	-	✓	✓	✓
	Python Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Basics of Electrical and Electronics Engineering	✓	✓	✓	-	-	-	✓	✓	✓	-	✓	✓	✓
	Engineering Graphics	✓	✓	-	-	✓	-	✓	✓	✓	-	✓	✓	✓
	Hindi for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	Français pour les Ingénieurs – French II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Nihongo no Enginia – Japanese II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Deutsch für Ingenieure – German II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Chinese for Engineers - Chinese II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Universal Human Values II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	✓	✓	-	✓	-	✓	✓
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓

CHEMICAL ENGINEERING

Regulations 2025

For the students admitted from 2025 onwards

CHOICE BASED CREDIT SYSTEM

CURRICULUM FOR I - VIII SEMESTERS

SEMESTER I

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25ENG01	English Proficiency I	HSMC	L	-	-	2	-	1
2	U25MA102	Matrices and Calculus	BSC	TwL	2	-	2	-	3
3	U25PH101	Engineering Physics	BSC	TwL	2	-	2	-	3
4	U25CY103	Engineering Chemistry	BSC	TwL	2	-	2	-	3
5	U25CSG02	Problem Solving using C	ESC	TwL	2	-	2	-	3
6	U25CSG03	Digital Technologies	ESC	T	1	-	-	-	1
7	U25MEG01	Elements of Mechanical Engineering	ESC	TwL	1	-	2	-	2
8	U25CH101	Introduction to Chemical Engineering	PCC	TwL	2	-	2	-	3
9	U25LEG01 U25LEG02 U25LEG03 U25LEG04	Deutsch für Ingenieure – German I Nihongo no Enginia – Japanese I Français pour les Ingénieurs – French I Hindi for Engineers - I	HSMC	TwL	1	-	2	-	2
10	U25LEG09	Chinese for Engineers - Chinese I	HSMC	TwL	1	-	2	-	2
Total									**23**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
11	U25MCC01	Induction Program - Universal Human Values I	MCC	MCC	2	1	-	-	3
12	U25MCC02	தமிழர் மரபு / Heritage of Tamils	MCC	Tamil Courses	1	-	-	-	1
13	U25MCC03 U25MCC04 U25MCC05	Design Thinking Computer Fundamentals and Coding Essentials @ Biology for Engineers $	MCC	MCC	1	-	2	-	2
Total									**6**

$ - For Non-Biology Students, @ - For Biology Students

SEMESTER II

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25ENG02	English Proficiency II	HSMC	L	-	-	2	-	1
2	U25MA204	Mathematical Transforms	BSC	TwL	2	-	2	-	3
3	U25PH204	Materials Science	BSC	TwP	2	-	-	2	3
4	U25CY201	Environmental Science and Sustainability	BSC	TwL	1	-	2	-	2
5	U25CH201	Python Programming	PCC	TwL	2	-	4	-	4
6	U25EEG02	Basics of Electrical and Electronics Engineering	ESC	TwL	1	-	2	-	2
7	U25MEG03	Engineering Graphics	ESC	L	-	-	4	-	2

No	Course Code	Title	Category	Type	L	T	P	J	C
8	U25LEG05 U25LEG06 U25LEG07 U25LEG08	Deutsch für Ingenieure – German II Nihongo no Enginia – Japanese II Français pour les Ingénieurs – French II Hindi for Engineers - II	HSMC	TwL	1	-	2	-	2
9	U25LEG10	Chinese for Engineers - Chinese II	HSMC	TwL	1	-	2	-	2
Total									**21**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
10	U25MCC06	Universal Human Values II	MCC	MCC	2	1	-	-	3
11	U25MCC07	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MCC	Tamil Courses	1	-	-	-	1
12	U25MCC03 U25MCC05	Design Thinking Biology for Engineers $	MCC	MCC	1	-	2	-	2
Total									**6**

$ - For Non-Biology Students

T - Theory, **L** - Laboratory, **TwL** - Theory with Laboratory, **TwP** - Theory with Project

SEMESTER I

U25LEG09	Chinese for Engineers - Chinese I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Gain basic proficiency in listening, speaking, reading, and writing - understanding everyday conversations, speaking in survival situations, reading short texts, and writing simple sentences
- Acquire essential knowledge of Chinese grammatical structures to support communication and comprehension
- Gain introductory insights into Chinese cultural norms, practices, and everyday life

COURSE OUTCOMES:

CO 1:	Acquire familiarity in the Chinese alphabet & basic vocabulary	**Understand**
CO 2:	Listen and identify individual sounds of Chinese	**Understand**
CO 3:	Use basic sounds and words while speaking	**Apply**
CO 4:	Read and understand simple advertisements, brochures and invitations	**Understand**
CO 5:	Use basic grammar and appropriate vocabulary in completing language tasks	**Remember**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: FUNDAMENTAL CHINESE FOR BEGINNERS **6 + 3**

Introduction to Mandarin Chinese, daily greetings – Learning Mandarin alphabet initials, finals, 4 tones and tone change rules (Pinyin 拼音) – Learning numbers 0–20 – Learning basic in-class vocabulary and phrases

UNIT II: NUMBERS AND VOCABULARY EXPANSION **6 + 3**

Learning numbers up to 999 – Learning country names and nationalities – Learning personal pronouns and Subject-Verb-Object (SVO) sentence structure – Practice with short dialogues and self-introductions

UNIT III: THE NEW CLASSMATE **6 + 3**

Learning vocabulary related to names and introductions – Learning the differences among 是 (to be), 叫 (to be called), 姓 (to have a surname) – Learning how to form questions with 嗎 – Learning abbreviated questions with 呢 – Practice dialogues: exchanging names and personal details

UNIT IV: TIME AND POSSESSION **6 + 3**

What time do you go to the university? – Learning vocabulary for time, dates, and days of the week – Learning grammar: placement of time words (S + Time word + V) – Learning to express possession with 有 / 沒有 – Learning the usage of 的 as a possessive particle – Practice with daily schedules and activities

UNIT V: COMMUNICATION AND REVIEW **6 + 3**

Grammar consolidation: auxiliary verbs and sentence order – Forming positive-negative questions (e.g., 是不是, 有沒有) – Conversational practice: greetings, introductions, time, possession – Role-play in real-life scenarios – Cultural notes: politeness and forms of address – Final review and integrated practice of Units I–IV

LIST OF EXPERIMENTS

1. Prepare a family tree chart
2. Record a self-intro video
3. Describe your college
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Mandarin Training Centre, National Taiwan Normal University, Modern Chinese I時代華語 I, Edited by Chih-Ping Chou, Taipei: Cheng Chung Book Company Ltd., 2019
2. Huayu101 / 華語101, Taiwan Ministry of Education, Taiwan Mandarin Educational Resources Centre, 2018

REFERENCES:

1. Cheng Chung Book Company Ltd, 時代華語 I 教師手冊 [Modern Chinese I Teacher's Manual, 2019
2. www.lmit.edu.tw/bag

SEMESTER I

U25ENG01	English Proficiency I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		0	0	2	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Comprehend technical vocabulary
- Apply reading strategies to understand academic and professional texts

COURSE OUTCOMES:

CO 1: Comprehend technical and professional documents using vocabulary and strategies **Remember**

CO 2: Evaluate the understanding from technical reports and case studies **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	2	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	2	1	1

SYLLABUS:

LIST OF EXPERIMENTS

1. Contextual lexicon – Discourse markers – Strategies for reading – Read aloud: stress and intonation – Interpretive Reading and narrative analysis – Critical reading of abstracts and conclusions from research articles / magazines / blogs
2. Newspaper: Opinions, Editorials and Columns – Short Story: The Bet – Anton Chekhov – Science Fiction: Never Let Me Go – Kazuo Ishiguro
3. Reading Standard Operating Procedures (SOPs) – Manuals – Case Studies (Field Work) Evaluation – Sustainability Practices in Industry: A Case Study – Biographies of Popular Engineers and Inventors – Success Stories of Start-ups and Entrepreneurs

LEARN BEYOND CONTENT:

- Readathon – Reading online articles – Book Review

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. Meenakshi Raman and Sangeeta Sharma, “Technical Communication: Principles and Practice”, 3rd Edition, Oxford University Press, 2015
2. Debra Daise and CharlNorloff, “Q Skills for Success: Q: Skills for Success: Reading and Writing, Level 4”, 3rd Edition, Oxford University Press, 2019

REFERENCES:

1. Sudharshana N P and Savitha C, “English for Technical Communication”, 1st edition, Cambridge University Press, 2016

2. Thomas L. Means, “English and Communication for Colleges”, 4th Edition, Cengage India Private Limited, 2017

SEMESTER I

U25MA102	Matrices and Calculus (Common to CE, CH, ME, MI)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To build competence in using matrices for solving systems and modeling physical systems
- To apply techniques of calculus for engineering analysis involving rates of change, motion, and area/volume estimation
- To interpret real-world problems in terms of calculus and matrix methods for design and analysis

COURSE OUTCOMES:

CO 1:	Solve engineering problems involving systems of equations and matrix-based methods	**Apply**
CO 2:	Use differential calculus to solve and optimize engineering processes	**Apply**
CO 3:	Apply integration techniques to find areas and volumes in engineering models	**Apply**
CO 4:	Interpret physical scenarios like motion and system changes using calculus concepts	**Apply**
CO 5:	Understand and apply concepts of matrix transformations and characteristic values to engineering models such as vibrations and stability	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 4	2	2	-	-	-	-	-	-	-	-	-	1	1
CO 5	2	2	-	2	1	-	-	-	-	-	-	1	1

SYLLABUS:

UNIT I: MATRIX METHODS FOR ENGINEERING PROBLEMS **6 + 6**

Review of matrix operations – Determinant – based methods for inverse computation – Solving systems of equations using inverse method and Cramer’s rule – Applications to circuit analysis and structural systems

UNIT II: CALCULUS FOR MAXIMA MINIMA **6 + 6**

Applications of Derivative in optimization: maxima and minima – Rate of change in physical systems (e.g., flow rate, motion) – Higher – order derivatives in design and behavior analysis

UNIT III: TECHNIQUES AND APPLICATIONS OF INTEGRATION **6 + 6**

Definite integrals for area under curves and between curves – Volume calculation by integration (e.g., rotating objects, storage tanks) – Techniques: Substitution and integration by parts – Engineering application-based examples

UNIT IV: CALCULUS OF DYNAMICS AND OPTIMIZATION **6 + 6**

Motion along a line: position, velocity, acceleration – Time – rate problems in machines, piping systems – Models for Improving Engineering Efficiency – Cost and Design Criteria

UNIT V: MATRIX APPLICATIONS IN SYSTEM BEHAVIOUR **6 + 6**

Matrix–based transformations in 2D/3D systems – Characteristic values (eigenvalues) and characteristic directions (eigenvectors) – Applications: Vibrations in mechanical systems, system stability in control processes

LIST OF EXPERIMENTS

1. System Solving using Matrices – Implement and solve matrix systems arising from real applications – Visualize and interpret results
2. Rate-Based and Design Improvement Modeling – Model and solve rate-based engineering problems using derivatives (e.g., fluid flow, heat transfer) – Apply calculus to optimize designs (e.g., beam dimensions, tank volume
3. Integration for Design Computations – Estimate areas/volumes for components – Plot 2D and 3D integrated shapes
4. Motion and System Dynamics Visualization. – Plotting and Analyzing Motion – Dynamic System Simulation
5. Characteristic Value Applications – Compute eigenvalues/eigenvectors for simple systems – Apply to stability and vibration models

LEARN BEYOND CONTENT:

- Structural systems – Dynamic systems – Flow systems

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 10th Ed., 2018
2. Gilbert Strang, Introduction to Applied Mathematics, Wellesley-Cambridge Press, 2016

REFERENCES:

1. George B. Thomas, Thomas' Calculus, Pearson, 13th Ed., 2018
2. Grewal,B.S. Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017
3. Dennis G. Zill, Advanced Engineering Mathematics, Cengage, 2012

SEMESTER I

U25PH101	Engineering Physics (Common to all programmes)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the fundamental mechanical and thermal properties of solids and fluids for real-world engineering applications
- To explore advanced concepts in ultrasonic waves and their applications in imaging, testing, and sensing technologies
- To gain insights into semiconductor physics and photonics for their role in modern electronic and optical systems

COURSE OUTCOMES:

CO 1:	Evaluate stress-strain relationships, modulus of elasticity, and bending moment to analyze mechanical behavior of solids and structures	**Evaluate**
CO 2:	Examine the heat transfer in thermal systems and properties of fluids	**Analyze**
CO 3:	Apply the principles of ultrasonics in testing, imaging, and communication technologies	**Apply**
CO 4:	Estimate charge carrier transport concepts in semiconductors and devices such as Hall effect sensors and Schottky diodes	**Apply**
CO 5:	Practice the principles of laser and fiber optics in industrial and medical applications	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 4	2	2	-	-	-	-	-	-	-	-	-	1	1
CO 5	2	2	-	-	-	-	-	-	-	-	-	1	1

SYLLABUS:

UNIT I: MECHANICAL PROPERTIES OF SOLIDS **6 + 6**

Modulus of Elasticity – Stress-strain diagram – Poisson's ratio – Elastic and plastic deformation – Stress-strain behaviour in metals, polymers and ceramics – Bending Moment – Cantilever – Applications (GIRDERS, MEMS)

UNIT II: FUNDAMENTALS OF HEAT TRANSFER AND FLUIDS **6 + 6**

Heat transfer – Thermal expansion – Heat conductivity – Lee's Disc method – Surface tension –Viscosity – Coefficient of viscosity using Poiseuille's flow experiment – Solar water heater – Microwave oven – Heat exchangers – Radiators – Cooling towers

UNIT III: ULTRASONICS AND ITS APPLICATIONS **6 + 6**

Properties of Ultrasonic waves – Production of ultrasonic waves – Piezoelectric Oscillator – Magnetostriction Oscillator – Velocity measurement of Ultrasonic waves – SONAR – Non-Destructive Testing – Ultrasound imaging in medicine – Ultrasonic scanning methods

UNIT IV: SEMICONDUCTOR PHYSICS **6 + 6**

Properties – Direct and Indirect bandgap-semiconductor – Intrinsic and extrinsic Semiconductors – Carrier concentration in n-type semiconductor – P-type semiconductor – Carrier Transport in Semiconductor – Hall effect – Ohmic contacts – Schottky diode

UNIT V: PHOTONICS **6 + 6**

Interaction of Radiation with Matter – Laser Characteristics – Population Inversion – CO2 laser – Semiconductor Diode Laser – Laser applications – Total Internal Reflection – Structure and working principle of Optical fibre – Fiber optic Endoscopy – Fiber optic sensors

LIST OF EXPERIMENTS

1. Determine the moduli of elasticity of the given beams and evaluate them for different structural applications. (High/ Medium/Low modulus)
2. Evaluate the shear moduli of the different materials and rank them for suitable applications with reference to their strength
3. Select the most effective thermal insulation material from mica, cardboard, and glass for optimal heat protection
4. Determine the Viscosity of Liquids Using Poiseuille's Method and Identify the Fastest-Flowing Liquid
5. Measure the speed of ultrasound in liquids and calculate their compressibility for different hydraulic purposes
6. Categorize the specified semiconducting materials according to their energy bandgap values
7. Determine a semiconducting material's Hall coefficient and identify its type
8. Determination of wavelength of given laser and the particle size of the given samples using diffraction method
9. Use an optical fiber to measure its light-gathering capacity and calculate the propagation angle
10. Calculate the surface tension of different liquids and examine how surfactants affect it
11. Determination of wavelength of various spectral lines by using spectrometer and grating
12. Determination of velocity of light passing through glass medium using spectrometer

LEARN BEYOND CONTENT:

- Torsional Pendulum – Hologram – Fiber optics communication system

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S. Arun Murthy, "A Textbook of Engineering Physics", 11th edition, S. Chand Publishing, New Delhi, 2022
2. R.K. Gaur and S.L. Gupta, "Engineering Physics", 8th edition, Dhanpat Rai Publications, New Delhi, 2017

REFERENCES:

1. Harald Ibach and Hans Luth, "Solid State Physics: An Introduction", 4th edition, Springer Publications, 2020
2. Charles Kittel, revised by David Pines (Editor) "Introduction to Solid State Physics", 9th edition, Wiley & Sons, US, 2020

3. H.K. Malik and A.K. Singh “Engineering Physics” Publisher: McGraw Hill Education India 2022

4. https://onlinecourses.nptel.ac.in/noc20cy17/preview

SEMESTER I

U25CY103	Engineering Chemistry	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To describe atomic and molecular behaviour using quantum concepts and analyze organic mechanisms, functional group transformations
- To explain polymer properties, processing techniques and fundamentals of coordination chemistry
- To describe the core principles of thermodynamics, electrochemistry, kinetics and analytical techniques like spectroscopy and chromatography

COURSE OUTCOMES:

CO 1: Describe atomic and molecular structures using quantum mechanical models and bonding theories **Understand**

CO 2: Analyze reaction mechanisms and functional group transformations involved in organic synthesis **Analyze**

CO 3: Apply polymer processing methods and concepts of coordination chemistry for the chemical process design and applications **Apply**

CO 4: Interpret the fundamental principles of thermodynamics, electrochemistry and chemical kinetics involved in chemical processes **Understand**

CO 5: Use the surface analysis, spectroscopic and chromatographic methods for the physico-chemical analysis of materials **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	1	-	1	-	-	-	-	-	1	1	1
CO 2	3	2	1	-	1	-	-	-	-	-	1	1	1
CO 3	3	2	2	-	1	-	-	-	-	-	2	1	1
CO 4	2	1	1	-	1	-	-	-	-	-	2	1	1
CO 5	3	2	2	-	2	-	-	-	-	-	2	1	1

SYLLABUS:

UNIT I: MOLECULAR STRUCTURE, BONDING AND REACTIVITY **6 + 6**

Atomic models – Wave-particle duality, deBroglie equation, Schrödinger equation (qualitative), Atomic molecular orbitals, hybridization sp, sp^2, sp^3, Benzene, aromaticity (Hückel's rule), Acid-base theory – Bronsted–Lowry, Lewis's acids, bases, pKa and pKb trends in alcohols, amines, acids, Conformational analysis – Newman, Sawhorse, Fischer projections, Stereochemistry – Chirality, optical activity, E/Z and cis/trans isomerism

UNIT II: ORGANIC CHEMISTRY AND MECHANISMS **6 + 6**

Bond cleavage – Homolytic vs. heterolytic, nucleophiles and electrophiles, electrophilic (SE1, SE2, SEAr), nucleophilic (SN1, SN2, SNAr – Nitration, Friedel Crafts, halogenation), additions, eliminations reactions, Functional group transformations (alcohol to aldehyde, aldehyde to acid, amine to diazonium, azo dye synthesis)

UNIT III: POLYMERS AND COORDINATION CHEMISTRY **6 + 6**

Types of polymers (thermoplastics, thermosets, elastomers, tacticity, functionality, addition and condensation), properties – Tg, Mn, Mw, PDI, Tm and secondary transitions, Processing – Injection, extrusion, compression Coordination chemistry – Introduction, Crystal field theory, colour, magnetism, Organometallic complexes in catalysis (Ziegler–Natta, Wilkinson's catalyst)

UNIT IV: THERMODYNAMICS, ELECTROCHEMISTRY AND KINETICS **6 + 6**

Thermodynamics – Enthalpy, Entropy, Gibbs free energy, Clausius–Clapeyron and Maxwell relations, Electrochemistry – EMF, electrodes – Calomel and Glass electrode, fuel cells – Hydrogen-Oxygen. Phase diagrams- water system, eutectics Chemical kinetics – Rate laws, order, molecularity, steady-state approximation, Enzyme Kinetics – Michaelis-Menten Equation

UNIT V: SURFACE CHEMISTRY, SPECTROSCOPY AND CHROMATOGRAPHY **6 + 6**

Adsorption – Langmuir, Freundlich and Nernst isotherms, Colloids and micelles, zeta potential, emulsions, vesicles. contact angle, wetting / spreading. Beer- Lamberts Law, Theory and Instrumentation of UV-Vis, IR, NMR Chromatography – types, principles and applications – HPLC & GC

LIST OF EXPERIMENTS

1. Determination of pKa of acetic acid and phenol by pH titration
2. Preparation of azo dye via diazotization coupling reaction
3. Qualitative test for acids, aldehydes, amines
4. Determination of molecular weight and degree of polymerisation of a given polymer using an Ostwald viscometer
5. Determination of rate constant of acid catalysed hydrolysis of an ester
6. EMF measurement using calomel electrode and glass electrode
7. Distribution coefficient of iodine between water and CCl_4
8. Verification of Beer-Lambert's law using UV-Vis Spectrometer/Colorimetry

LEARN BEYOND CONTENT:

- Stereochemistry and conformational analysis using Newmann and Fisher Projections
- Study of nucleophilic sustitutions-SN1 vs SN2 mechanism
- Gravimetric analysis of Ni as Ni-DMG complex
- Synthesis of Polyaniline (PANI) /Bakelite
- Determination of enthalpy change using Calorimetry
- IR spectroscopy of synthesized or provided organic compounds
- Separation and identification of compounds by thin layer chromatography
- Determination of adsorption isotherms- Langmuir and Freundlich model

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. P. Atkins, J. de Paula and J. Keeler, “Atkins’ Physical Chemistry: Thermodynamics and Kinetics”, 11th edition, Oxford University Press, 2018
2. P. Y. Bruice, “Organic Chemistry”, 9th edition, Pearson, 2024
3. G. Odian, “Principles of Polymerization”, 4th edition, Wiley-Interscience, 2004
4. C.N. Banwell and E.M. McCash, “Fundamentals of Molecular Spectroscopy”, 4th edition, McGraw-Hill, 1994

REFERENCES:

1. R.T. Morrison and R. N. Boyd, “Organic Chemistry”, 7th edition, Pearson Education, 2011
2. H.H. Willard, L.L. Merritt Jr., J.A. Dean, Frank A. Settle Jr.,“Instrumental Methods of Analysis”, 7th edition, CBS Publishers & Distributors, 2004
3. Sunita Rattan, “Engineering Chemistry with Experiments”, 8th edition, S.K. Kataria & Sons, 2023
4. J.D. Lee, “Concise Inorganic Chemistry”, 5th edition, Oxford University Press, 2008

SEMESTER I

U25CSG02	Problem Solving using C (Common to CE, CH, ME)	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide exposure to problem-solving through programming
- To develop computational thinking perspective of one's discipline
- To write, compile and debug programs using the C language

COURSE OUTCOMES:

CO 1: Describe the basic organization of computers and number systems, and construct flowcharts, algorithms, and pseudocode to represent solutions for real-world problems **Understand**

CO 2: Develop C programs using variables, data types, operators, control structures, and input/output functions to solve basic scientific and statistical problems **Apply**

CO 3: Implement one-dimensional and two-dimensional arrays and perform string operations such as searching, sorting, and matrix manipulations **Apply**

CO 4: Design modular programs using functions, recursion, and pointers for efficient memory usage and structured data handling **Apply**

CO 5: Construct and manipulate programs using structures and unions to model and solve real-world problems **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	2	-	-	-	-	-	-	-	-	-	2	1
CO 2	3	2	1	1	-	-	-	-	-	-	2	2	1
CO 3	3	2	1	1	-	-	-	-	-	-	2	2	1
CO 4	3	2	1	1	-	-	-	-	-	-	2	2	1
CO 5	3	2	1	1	1	-	-	-	-	-	2	2	1

SYLLABUS:

UNIT I: INTRODUCTION **6 + 6**

Generation and Classification of Computers – Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart

UNIT II: C PROGRAMMING BASICS **6 + 6**

Problem formulation – Problem Solving - Introduction to 'C' programming – Structure of a 'C' program – Compilation and linking processes – Constants, Variables – Data Types – Expressions using operators – Managing Input and Output operations – Decision Making and Branching – Looping statements – Solving simple scientific and statistical problems

UNIT III: ARRAYS AND STRINGS **6 + 6**

Arrays – Initialization – Declaration – One-dimensional and Two-dimensional arrays. String- String operations – String Arrays. Simple programs – sorting – searching – matrix operations

UNIT IV: FUNCTIONS AND POINTERS **6 + 6**

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic – Pointers and arrays – Example Problems

UNIT V: STRUCTURES AND UNIONS **6 + 6**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives

LIST OF EXPERIMENTS

1. Program Using Basic Input/Output and Arithmetic Expressions
2. Program to Solve a Scientific Problem using Decision Making and Looping
3. Program for Sorting Elements in a One-Dimensional Array
4. Program for Matrix Addition using Two-Dimensional Arrays
5. Program for String Manipulation using Standard String Functions
6. Program using User Defined Functions with Pass by Value and Reference
7. Program using Structures and Nested Structures
8. Program using String and Arrays for Solving Engineering Problems
9. Program using User Defined Functions for Solving Engineering Problems
10. Program using Structures for Solving Engineering Problems

LEARN BEYOND CONTENT:

- File Handling
- Dynamic Memory Allocation

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. David D. Railey and Kenny A.Hunt , “Computational Thinking for Modern problem Solver”, 1st Edition, CRC Press, 2014
2. Brian W. Kernighan and Dennis Ritchie, “ The C Programming Language” , 2nd Edition, Pearson, 2015

REFERENCES:

1. Paolo Ferragina and Fabrizio Luccio, “Computational Thinking First Algorithms”, Then Code” ,1st Edition,Springer International Publishing, 2018
2. Reema Thareja, “Programming in C”, 2nd Edition, Oxford University Press, 2016
3. Paul Deitel and Harvey Deitel, “C How to Program”, 7th Edition, Pearson Publication, 2015
4. Juneja, B. L and Anita Seth, “Programming in C”,1st Edition, Cengage Learning India Pvt. Ltd., 2011
5. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, 1st Edition, Oxford University Press, 2009

SEMESTER I

U25CSG03	Digital Technologies (Common to all programmes)	Category: ESC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To explain the foundational concepts of AI, IoT, cloud, cybersecurity, and blockchain technologies
- To apply practical knowledge of OpenAI, RPA, and digital marketing strategies effectively
- To analyse interconnected sart systems, big data, and evolving digital landscapes
- To evaluate ethical implications of AI, data privacy, and societal impact of technologies

COURSE OUTCOMES:

CO 1:	Understand the foundational concepts of AI, ML, DL, and key OpenAI generative tools	**Understand**
CO 2:	Explain the interplay of AI, wearables, and big data in emerging technologies like the Metaverse and Edge AI	**Understand**
CO 3:	Describe the key components and uses of IoT, cloud computing, and cybersecurity, including common threats	**Understand**
CO 4:	Interpret the core principles and practical uses of blockchain, RPA, and digital marketing strategies	**Understand**
CO 5:	Recognize the key concepts and applications of 3D printing, digital manufacturing, AR/VR, Metaverse, and ethical considerations in AI	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	1	1	-	-	-	-	1	2	2
CO 2	3	3	2	2	1	1	-	1	1	1	1	2	2
CO 3	3	2	3	1	2	1	-	1	2	2	1	2	2
CO 4	3	2	1	3	3	1	-	1	-	1	-	2	2
CO 5	3	2	1	1	2	1	1	1	-	1	1	2	2

SYLLABUS:

UNIT I: MODERN ARTIFICIAL INTELLIGENCE AND OPENAI TOOLS **6**

An Overview of Artificial Intelligence – Introduction to Machine Learning and Deep Learning – ChatGPT – GPT 4 – OpenAI Tools: AI Text Classifier – OpenAI Tools: Point-E – Text to Image Generator – DALL-E

UNIT II: MART SYSTEMS AND ANALYTICS **6**

Intelligent Wearables – AI and Metaverse – Edge AI / TinyML – Evolution of Big Data Analytics –Applications of Big Data Analytics

UNIT III: IOT, CLOUD, CYBERSECURITY ESSENTIALS **6**

Internet of Things – Applications of IoT – Industrial Internet of Things or IIoT – Digital Payments –Overview of Cloud Computing – Applications of Cloud Computing – Service Models in Cloud Computing – Overview of Cybersecurity – Applications of Cybersecurity – Types of Cyber Attacks – Data Privacy and User Data Control – Deepfake

UNIT IV: DIGITAL INNOVATION AND AUTOMATION **6**

Evolution of Blockchain – Applications of Blockchain in Finance Industry – Impact of Blockchain on Workforce & Workplace – Getting Started with Robotic Process Automation – Applications of Robotic Process Automation in Banking & Insurance Industry – Web, Mobile Development and Marketing – 5Ds of Digital Marketing – Digital Storytelling

UNIT V: DIGITAL DESIGN AND RESPONSIBILITY **6**

3D Printing Modelling – Digital Manufacturing – Augmented Reality and Virtual Reality – Pre-requisites for Augmented Reality & Virtual Reality – Metaverse – Applications of Augmented Reality – Virtual Reality in – AI Ethics – Ethical Considerations of Generative AI

LEARN BEYOND CONTENT:

- Case Study of Digital Technologies of Real time application

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. Faheem Syeed Masoodi, Zubair Sayeed Masoodi, Khalid Bashir Dar, "Digital and Technological Solutions: Exploring the Foundations of Digitization", 1st Edition, BPB Publications, 2024

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach" Universities Press, 2014
3. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles and Practice", Addison-Wesley, 2016
4. Daniel Drescher, "Blockchain Basics: A Non-Technical Introduction in 25 Steps" Apress, 2017
5. Xiaofei Wang, Yunchuan Sun, "Edge AI: Convergence of Edge Computing and Artificial Intelligence", Wiley, 2022
6. Mark Coeckelbergh, "AI Ethics", MIT Press, 2020
7. https://www.futureskillsprime.in/journey/digital-101-30-hours/ - Digital 101 Futureskills Prime Course by NASSCOM

SEMESTER I

U25MEG01	Elements of Mechanical Engineering	Category: ESC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide the fundamental knowledge of mechanical elements, actuation systems, and manufacturing processes essential for engineering applications
- To develop an understanding of energy conversion, power generation systems and thermal systems for solving practical problems

COURSE OUTCOMES:

CO 1: Identify the mechanical elements and actuation systems used in basic engineering applications **Understand**

CO 2: Classify various manufacturing processes and distinguish between shaping, joining, and additive manufacturing methods **Understand**

CO 3: Identify the various conventional and non-conventional methods of power generation **Understand**

CO 4: Interpret the concepts of refrigeration and air conditioning, identify industrial safety measures, and predict CAD and simulation tools for basic engineering applications **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	1	-	-	-	-	-	2	2
CO 2	3	2	-	-	-	1	-	-	-	-	-	2	2
CO 3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO 4	3	2	-	-	-	1	-	-	-	-	-	2	2

SYLLABUS:

UNIT I: MECHANICAL ELEMENTS AND ACTUATION SYSTEMS **3 + 6**

Mechanical elements – Gears, chains, shaft, keys, coupling, bolts, nuts, screws, spring, bearings – Actuators – Hydraulics actuators, pneumatics actuators

UNIT II: FUNDAMENTALS OF MANUFACTURING PROCESSES **4 + 9**

Introduction to manufacturing – Classification of manufacturing processes – Shaping processes – Casting, molding, powder metallurgy, additive manufacturing (FDM, SLA) – Joining processes – Arc welding, brazing and soldering

UNIT III: ENERGY CONVERSION SYSTEMS **4 + 6**

Engines – IC engines – Petrol and diesel engines, two stroke and four stroke engines – General layout of electric vehicle – Power plant – Working – Thermal power plant, nuclear power plant, gas power plant – Renewable energy – Solar, wind, tidal, OTEC

UNIT IV: THERMAL SYSTEMS AND INDUSTRIAL SAFETY **4 + 9**

Refrigeration and air conditioning – Types of refrigeration and air conditioning – Industrial safety – Personal protective equipment, safety signs, fire safety, LOTO – Introduction to CAD and simulation softwares

LIST OF EXPERIMENTS

1. Determine the velocity ratio using simple and compound gear trains
2. Construct and demonstrate a basic pneumatic circuit using single-acting and double-acting cylinders
3. Perform step turning operation on a lathe machine
4. Perform drilling operation on drilling machine
5. Demonstrate the working of 3D printer by printing a simple object
6. Determination of port timing of two-stroke engine
7. Determination of valve timing of four-stroke engine
8. Determination of COP of a refrigeration system
9. 2D Sketching of Mechanical Components using CAD Software
10. 3D Modeling of Mechanical Components using CAD Software

LEARN BEYOND CONTENT:

- Basics of Thermodynamics and Fluid Properties

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Pravin Kumar, “Basic Mechanical Engineering”, 3rd Edition, Pearson Education India, 2018
2. H. S. Bawa, “Manufacturing Processes”, Latest Edition, Tata McGraw-Hill Education, 2004

REFERENCES:

1. Godfrey C. Onwubolu, “Mechatronics: Principles and Applications”, 1st Edition, Elsevier, 2006
2. 3. P. K. Nag, “Power Plant Engineering”, 4th Edition, McGraw Hill Education, 2017

SEMESTER I

U25CH101	Introduction to Chemical Engineering	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide a comprehensive overview of the history, evolution, and fundamentals of Chemical Engineering
- To develop understanding of key unit operations, unit processes, design, and process control principles
- To introduce computational tools and their applications in Chemical Engineering along with industry exposure

COURSE OUTCOMES:

CO 1:	Explain the history, evolution, and scope of Chemical Engineering	**Understand**
CO 2:	Describe the fundamental principles of unit operations in fluid mechanics and mechanical operations	**Remember**
CO 3:	Describe the principles of unit operations in heat transfer and mass transfer processes	**Remember**
CO 4:	Describe the unit process in reaction kinetics and thermodynamics relevant to chemical engineering	**Remember**
CO 5:	Understand the basics of process control concepts, flow sheets development and use of computational tools/software for process industries	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	1	-	-	-	-	-	-	1	1
CO 2	3	3	3	2	2	1	1	1	-	-	-	2	2
CO 3	3	2	2	2	1	1	-	1	-	-	-	2	2
CO 4	3	3	3	3	2	2	1	1	1	1	1	2	2
CO 5	3	3	3	3	2	2	2	2	1	1	1	3	3

SYLLABUS:

UNIT I: INTRODUCTION **6 + 6**

History of Chemical Engineering – Great Personalities of Chemical Engineering – Chemist and Chemical Engineer – Role of Chemical Engineering in this world – Major Achievements – Chemical Engineering applications in Food, Water, Agriculture, Health Care, Energy, and Environment

UNIT II: FLUID DYNAMICS AND MECHANICAL OPERATIONS **6 + 6**

Units and Dimensions, Unit Conversions, Process Variables – Fluid Flow – Newton's law of Viscosity – Classification of Fluids – Transportation of Fluids – Working of Centrifugal and Piston Pumps – Mechanical Operations – Size Separation (Sieves, cyclone separator and centrifuge) and Size Reduction (laws and types)

UNIT III: HEAT TRANSFER AND MASS TRANSFER OPERATIONS **6 + 6**

Heat Transfer – Modes – Conduction, Convection and Radiation – Heat Exchangers – Classifications – Basic Concepts of Mass Transfer Operations and Equipment's – Distillation, Evaporation, Absorption and Extraction

UNIT IV: FUNDAMENTALS OF UNIT PROCESSES **6 + 6**

Classification of Chemical Reactions – Basics of Order of a Reaction, Rate Equation, and Various types of Industrial Reactors – Thermodynamics – Basics laws – Importance of Scales in Chemical Process Development: Lab, Pilot and Industrial Scales – Anatomy of Chemical Process Industries

UNIT V: BASICS OF PROCESS CONTROL, PROCESS FLOW SHEETS AND COMPUTATIONAL TOOLS **6 + 6**

Process, Instrumentation, Dynamics and Control – Basic terms, Importance, General Process Control System: Control of Temperature in Hot Water Tank System –Types of Controllers – Flow sheet development for a simple chemical process industry – Case studies on Sulfuric Acid and Soda Ash production – Use of Computational tools – MATLAB, ASPEN Plus, ANSYS CFD, SCILAB, and DWSIM

LIST OF EXPERIMENTS

1. Visit to a typical Chemical Industry
2. Visit to a typical Process Industry
3. Visit to a typical Process Industry
4. Visit to a typical Process Industry
5. Visit to a Typical Process Industry

LEARN BEYOND CONTENT:

- Industrial Visit Reports
- Case Study and Reports

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Badger W.L. and Banchero J.T., “Introduction to Chemical Engineering”, 6th Edition, Tata McGraw Hill, 1997
2. Pushpavanam S., “Introduction to Chemical Engineering”, 2nd Edition, PHI Learning, 2012
3. Ghosal S.K., Sanyal S.K., and Dutta S., “Introduction to Chemical Engineering”, 4th Edition, TMH, 1998

REFERENCES:

1. McCabe W.L., Smith J.C., and Harriot P., “Unit Operations in Chemical Engineering”, 7th Edition, McGraw Hill, 2001
2. Solen K.A. and Harb J.N., “Introduction to Chemical Engineering: Tools for Today and Tomorrow”, 5th Edition, Wiley, 2011
3. Finlayson B.A., “Introduction to Chemical Engineering Computing”, John Wiley & Sons, 5th Edition, 2006
4. Randolph Norris Shreve, George T. Austin, “Shreve’s Chemical Process Industries”, 5th Edition, McGraw Hill, 1984
5. Bhatt B.I. and Vora S.M., ”Stoichiometry”, 4th Edition, McGraw Hill, 2004

SEMESTER I

U25LEG01	Deutsch für Ingenieure – German I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Gain basic proficiency in listening, speaking, reading, and writing - understanding everyday conversations, speaking in survival situations, reading short texts, and writing simple sentences
- Acquire essential knowledge of German grammatical structures to support communication and comprehension
- Gain introductory insights into German cultural norms, practices, and everyday life

COURSE OUTCOMES:

CO 1:	Acquire familiarity in the German alphabet & basic vocabulary	**Understand**
CO 2:	Listen and identify individual sounds of German	**Understand**
CO 3:	Use basic sounds and words while speaking	**Apply**
CO 4:	Read and understand simple advertisements, brochures and invitations	**Understand**
CO 5:	Use basic grammar and appropriate vocabulary in completing language tasks	**Remember**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: INTRODUCTION TO GERMAN LANGUAGE AND SOUNDS **6 + 3**

Alphabet and pronunciation (phonetics and name spelling) – Basic greetings and farewells – Asking for and giving personal information – Countries – Languages – Professions – Numbers (0–100) – Cultural focus: German-speaking countries

UNIT II: GRAMMAR FOUNDATIONS AND SENTENCE BUILDING **6 + 3**

Formal vs. informal register: Sie vs. du – Personal pronouns: ich - du -Sie - er - sie - es – Verb conjugation in Präsens (regular and irregular) – Verbs: sein - haben (to be - to have) – Questions: wo -wer - wie - was - etc – Yes/No questions (Ja-/Nein-Fragen) – Cultural focus: Formal vs. informal speech

UNIT III: DAILY LIFE AND ROUTINES **6 + 3**

Describing daily activities and routines – Talking about time – Days – Routine verbs and nouns – Grammar: Separable verbs (aufstehen - mitkommen) – Modal verbs (intro): können - müssen – Negation: nicht - kein – Cultural focus: Typical German daily schedules

UNIT IV: GRAMMAR – CASES AND STRUCTURE **6 + 3**

Accusative case: articles and pronouns – Dative case: definite and indefinite articles – Grammar focus: Prepositions with dative (in, auf, bei, mit, zu) – Cultural focus: Office hours and punctuality in German culture

UNIT V: NAVIGATION AND PUBLIC INTERACTION **6 + 3**

Asking for/giving directions – Describing locations and surroundings – Places in the city: Supermarkt, Bahnhof – Post – Kino – Reading and understanding public signs – Maps – Timetables – Grammar: Imperative (basic usage for giving directions) – Cultural focus: Public transportation – City services in German-speaking countries

LIST OF EXPERIMENTS

1. Prepare a family tree chart
2. Record a self-intro video
3. Describe your college
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Buscha- A & Szita, S-Begegnungen Deutsch als Fremdsprache A1+: Integriertes Kurs- und Arbeitsbuch- 1st Edition, 2021
2. Brüseke, R., “Grammatik leicht A1,” 1st Edition-2019

REFERENCES:

1. Netzwerk Deutsch als Fremdsprache A1, 1st Edition: BlueNBells, 2012
2. Huber, K., & Keller, F., “DaF kompakt A1: Deutsch als Fremdsprache,” 3rd Edition, Langenscheidt, 2018

SEMESTER I

U25LEG02	Nihongo no Enginia – Japanese I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Gain basic proficiency in listening, speaking, reading, and writing - understanding everyday conversations, speaking in survival situations, reading short texts, and writing simple sentences
- Acquire essential knowledge of Japanese grammatical structures to support communication and comprehension
- Gain introductory insights into Japanese cultural norms, practices, and everyday life

COURSE OUTCOMES:

CO 1:	Acquire familiarity in the Japanese alphabet and basic vocabulary	**Understand**
CO 2:	Listen and identify individual sounds of Japanese	**Understand**
CO 3:	Use basic sounds and words while speaking	**Apply**
CO 4:	Read and understand simple advertisements, brochures and invitations	**Understand**
CO 5:	Use basic grammar and appropriate vocabulary in completing language tasks	**Remember**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: INTRODUCTION TO JAPANESE WRITING AND GREETINGS **6 + 3**

Hiragana Mastery – Basic greetings & expressions – Desu (~です) – Particles: は (wa), の (no), か (ka) – Basic vocabulary: Professions, countries, school related terms – Cultural note: Bowing – Formal vs. informal speech

UNIT II: KATAKANA AND BASIC COMMUNICATION **6 + 3**

Katakana Mastery – Numbers -time - and age expressions – Vocabulary: Objects, locations and daily expressions – Particles: を (wo), - に (ni) - で (de) – Grammar: Arimasu / Imasu (existence) – Negation: じゃありません / ではありません – Cultural note: Japanese use of numbers and time in daily life

UNIT III: VERB BASICS AND SENTENCE STRUCTURE **6 + 3**

Verb sentence structure – Verb conjugation basics: Non-past affirmative/negative – Asking about objects – Time and location expressions – Vocabulary: Places - classroom items - basic actions – Cultural note: School and work environments in Japan

UNIT IV: DAILY ACTIVITIES AND VOCABULARY EXPANSION **6 + 3**

Daily routine verbs: おきます, たべます, ねます, etc., – Days of the week – Frequency expressions – Vocabulary: Food - drink - daily routine – Common locations: Library - school - station – Particles: は, を, に, で, も, へ – Cultural note: Japanese daily life and food habits

UNIT V: INTRODUCTION TO KANJI AND PRACTICAL USE **6 + 3**

Kanji: Recognition (~50), Writing (~30) – Practical reading and writing exercises using learned Kanji – Review of particles in context – Integration of all skills through short dialogues and written practice – Cultural note: Importance of Kanji in Japanese society and signage

LIST OF EXPERIMENTS

1. Prepare a family tree chart
2. Record a self-intro video
3. Describe your college
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. 3A Corporation, “Minna no Nihongo Shokyū I: Main Textbook,” 2nd Indian Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2018
2. Banno, Eri, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, and Kyoko Tokashiki, “Genki I: An Integrated Course in Elementary Japanese,” 3rd Edition, The Japan Times Publishing, Tokyo, 2020

REFERENCES:

1. Yamada, M., & Fujita, T., “Japanese for Beginners: A Practical Approach,” 1st Edition, Tuttle Publishing, 2019
2. Takahashi, A., & Sato, M., “Nihongo Pro: Japanese for N5 Level,” 1st Edition, KADOKAWA, 2018

SEMESTER I

U25LEG03	Français pour les Ingénieurs – French I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Gain basic proficiency in listening, speaking, reading, and writing - understanding everyday conversations, speaking in survival situations, reading short texts, and writing simple sentences
- Acquire essential knowledge of French grammatical structures to support communication and comprehension
- Gain introductory insights into French cultural norms, practices, and everyday life

COURSE OUTCOMES:

CO 1:	Acquire familiarity in the French alphabet and basic vocabulary	**Understand**
CO 2:	Listen and identify individual sounds of French	**Understand**
CO 3:	Use basic sounds and words while speaking	**Apply**
CO 4:	Read and understand simple advertisements, brochures and invitations	**Understand**
CO 5:	Use basic grammar and appropriate vocabulary in completing language tasks	**Remember**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: INTRODUCTION TO FRENCH LANGUAGE AND BASICS **6 + 3**

Alphabet and pronunciation: French sounds – Accents – Spelling names – Greeting people and introducing yourself and others – Asking about someone: names – Nationalities, and countries – Grammar: Subject pronouns (je, tu, il, elle…) - être (to be) - s'appeler (to be called) – Articles: definite/indefinite (le, la, un, une) -Gender and number of nouns – Cultural focus: French-speaking countries – forms of address (tu vs. vous)

UNIT II: DESCRIBING PEOPLE AND BACKGROUND **6 + 3**

Describing yourself and others: nationality – profession – Age – Asking and answering personal questions – Numbers: 0–69 – Talking about languages spoken – Grammar: Verbs avoir (to have parler (to speak) – Negation: ne…pas – Cultural focus: Francophone diversity – naming conventions (nom, prénom)

UNIT III: GRAMMAR AND AGREEMENT IN DESCRIPTIONS **6 + 3**

Gender agreement of adjectives and professions – Asking questions: Interrogative expressions (Où, Quoi, Qui, Quel(le)) – Practice with personal descriptions – More on sentence structure and simple dialogues – Cultural focus: Intercultural identity – Polite introductions and small talk

UNIT IV: TALKING ABOUT DAILY LIFE **6 + 3**

Describing a typical day – Talking about daily activities and frequency – Saying what you like/don't like doing – Talking about schedules and routines – Cultural focus: A typical day in France – school/work life in Francophone countries

UNIT V: TIME, VERBS, AND DAILY EXPRESSIONS **6 + 3**

Telling time – grammar: Regular -er verbs in present tense – The verb aller (to go) and expressions with faire – Prepositions: à -chez - en - au -Cultural focus: French meal times – Weekend habits – Transportation

LIST OF EXPERIMENTS

1. Prepare a family tree chart
2. Record a self-intro video
3. Describe your college
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Marie-José Lopes & Jean-Thierry Bougnec, "Inspire 2 A1-A2 Méthode de français," 1st Edition, Hachette Français Langue Etrangère, 2020
2. Gibbe, C., Berthet, A., & Hugot, C., "Édito A2: Méthode de français," 1st Edition, Didier, 2024

REFERENCES:

1. Chantal Fougères & Marc de la Harpe, "Le Nouveau Sans Frontières 2: Méthode de français A2," 1st Edition, Hachette FLE, 2020
2. Xavier Maingueneau, "Le Français pour les Nuls: A2-B1," 3rd Edition, Wiley, 2021

SEMESTER I

U25LEG04	Hindi for Engineers - I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Gain basic proficiency in listening, speaking, reading, and writing - understanding everyday conversations, speaking in survival situations, reading short texts, and writing simple sentences
- Acquire essential knowledge of Hindi grammatical structures to support communication and comprehension
- Gain introductory insights into Hindi cultural norms, practices, and everyday life

COURSE OUTCOMES:

CO 1:	Acquire familiarity in the Hindi alphabet and basic vocabulary	**Understand**
CO 2:	Listen and identify individual sounds of Hindi	**Understand**
CO 3:	Use basic sounds and words while speaking	**Apply**
CO 4:	Read and understand simple advertisements, brochures and invitations	**Understand**
CO 5:	Use basic grammar and appropriate vocabulary in completing language tasks	**Remember**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: UNIT I INTRODUCTION TO HINDI SCRIPT AND CULTURE **6 + 3**

Devanagari script basics (vowels and consonants) – Hindi sound system (aspirated/unaspirated, retroflex sounds) – Basic greetings and self-introduction – Sentence ending with है (hai) – Vocabulary: Professions – Nationalities – Countries – Family members – Grammar: Personal pronouns (मैं, तुम, आप, वह, यह) – Use of है and क्या (kya) for yes/no questions – Simple nominal sentences – Cultural note: Indian naming conventions – Forms of address (तुम vs. आप) – Gestures like namaste and head nods – Sociolinguistic formality

UNIT II: SENTENCE STRUCTURE AND EVERYDAY CONTEXTS **6 + 3**

Introducing others – Talking about objects and places – Yes/no and WH- questions – Negation using नहीं – Use of यह (yeh) – वह (voh) – Vocabulary: Everyday objects – Common locations – Classroom and household terms – Grammar: Postpositions में (mein), से (se), का/की/के (possessives) – Verb basics with है and नहीं है, Subject-object-verb (SOV) structure – Cultural note: Spatial metaphors in Hindi, gestures with demonstratives, plural forms, and respect levels

UNIT III: DESCRIBING DAILY LIFE AND HABITS **6 + 3**

Describing daily routines like waking – Eating – Going – Returning – Sleeping – Vocabulary: Daily activities – Time expressions – Common verbs – Talking about routines in present tense – Adverbs of frequency: हमेशा - कभी-कभी - कभी नहीं – Grammar: Present tense of जाना - खाना - करना - उठना - सोना – Verb agreement by gender and number – Use of को (ko) as object marker – Cultural note: Time perception – Daily routines in Indian homes – Lifestyle differences – Typical student/professional day

UNIT IV: EXPANSION OF VERB USE AND QUESTIONS **6 + 3**

Extended verb usage in different contexts – Asking and answering questions with Wh-words – Expressing possession – Giving simple commands and requests – Vocabulary: Verbs of movement – Expression – Need – Grammar: Imperatives – Compound verbs – Continued use of postpositions – Sentence expansion using connectors – Cultural note: Politeness in commands – Body language in communication – Informal/formal tone shift

UNIT V: PRACTICAL COMMUNICATION AND REVIEW **6 + 3**

Role-plays: shopping – Traveling, introducing family – Speaking about preferences and opinions – Listening to simple dialogues and identifying key points – Vocabulary: Common nouns – Adjectives – Survival phrases – Grammar: Review of present tense – Pronouns – Postpositions – Negation – Cultural note: Real-life communication scenarios – Marketplace culture – Indian transportation and hospitality norms

LIST OF EXPERIMENTS

1. Prepare a family tree chart
2. Record a self-intro video
3. Describe your college
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Pavithra Publications, “Spoken Hindi: Through Tamil,” 2nd Edition, Pavithra Publications, Chennai, 2015
2. Dakshina Bharat Hindi Prachar Sabha, “Prathamic Text Book: New Syllabus,” 1st Edition, Dakshina Bharat Hindi Prachar Sabha, Madras, 2023

REFERENCES:

1. Ganga, K., & Ramesh, V., “Learn Hindi in 30 Days: A Beginner's Guide,” 3rd Edition, Hindi Academy, 2020
2. Vyas, S., “Spoken Hindi for Beginners,” 1st Edition, Orient BlackSwan, 2018

SEMESTER I

U25MCC01	Induction Program - Universal Human Values I (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		2	1	0	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human beings), family, society, and nature/existence
- Understanding (or developing clarity) of the harmony in the human being, family, society, and nature/existence
- Strengthening of self-reflection
- Development of commitment and courage to act

COURSE OUTCOMES:

CO 1:	Recognize the essentials of human values and skills	**Understand**
CO 2:	Analyse connection between profession and happiness	**Understand**
CO 3:	Develop appropriate technologies and management patterns to create harmony in family and society	**Understand**
CO 4:	Evaluate the significance of trust, mutually satisfying human behaviour, and enriching interaction with nature	**Understand**
CO 5:	Demonstrate professional and ethical responsibility	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	3	3	-	-	-	3	1	1
CO 2	-	-	-	-	-	3	3	3	-	-	3	1	1
CO 3	-	-	-	-	-	3	3	-	-	-	3	1	1
CO 4	-	-	-	-	-	3	3	-	-	-	3	1	1
CO 5	-	-	-	-	-	3	3	3	-	-	3	1	1

SYLLABUS:

UNIT I: INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT, AND PROCESS FOR VALUE EDUCATION **6 + 3**

Purpose and motivation for the course – Self-Exploration: what is it – Its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration – Continuous Happiness and Prosperity – A look at basic Human Aspirations – Right understanding, Relationship, and Physical Facilities – the basic requirements for the fulfillment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario – Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT II: HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF **6 + 3**

Understanding human beings as a co-existence of the sentient 'I' and the material 'Body' – Understanding the needs of Self ('I') and 'Body' – Happiness and Convenience – Understanding the Body as an instrument of 'I' (I being the doer, seer, and enjoyer) – Understanding the harmony of I with the Body: Self-control and Welfare; correct appraisal of Physical needs – Meaning of Prosperity in detail – Programs to ensure Self-control and Welfare

UNIT III: HARMONY IN THE FAMILY AND SOCIETY **6 + 3**

Understanding values in human – Human relationships; the meaning of Justice (nine universal values in relationships) and the program for its fulfillment to ensure satisfaction – Trust and Respect as the foundational values of relationship – Understanding the meaning of Trust – Difference between intention and competence – Understanding the meaning of Respect – The Difference between respect and differentiation; and the other salient values in relationship – Understanding the harmony in the society (society being an extension of the family): Peace, Prosperity, Courage, and Coexistence as comprehensive Human Goals – Visualizing a universal harmonious order in society – Undivided Society – Universal Order from family to world family

UNIT IV: HARMONY IN THE NATURE AND EXISTENCE **6 + 3**

Understanding the harmony in Nature, Interconnectedness, and mutual fulfillment among the four orders of nature – Recyclability and self-regulation in nature – Understanding Existence as a Co-existence of mutually interacting units in an all-pervasive space – Holistic perception of harmony at all levels of existence – Practice sessions to discuss human beings as the cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology, etc

UNIT V: HARMONY ON PROFESSIONAL ETHICS **6 + 3**

Natural acceptance of human values – Definitiveness of Ethical Human Conduct – Basic for Humanistic Education – Humanistic Constitution, and Humanistic Universal Order – Competence in professional ethics – Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people, friendly and eco-friendly production systems, and Ability to identify and develop appropriate technologies and management patterns for the above production systems – Case studies of typical holistic technologies, management models, and production systems – Strategy for a transition from the present state to Universal Human Order – At the level of the individual: as socially and ecologically responsible engineers, technologists, and managers – At the level of society: as mutually enriching institutions and organizations

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. R R Gaur, R. Asthana , G P Bagaria, A Foundation course in Human Values and Professional Ethics, 3rd Edition, Excel Books, New Delhi, 2024
2. Prof. K. V. Subba Raju, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition, 2013

REFERENCES:

1. Ivan IIlich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA, 1974
2. E. F. Schumancher, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain, 1973

SEMESTER I

U25MCC02	தமிழர் மரபு / Heritage of Tamils (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Learn the extensive literature of classical Tamil
- Review the fine arts heritage of Tamil culture
- Realize the contribution of Tamils in Indian freedom struggle

COURSE OUTCOMES:

CO 1:	Understand the extensive literature of Tamil and its classical nature	**Understand**
CO 2:	Understand the heritage of sculpture, painting and musical instruments of ancient people	**Understand**
CO 3:	Review on folk and martial arts of Tamil people	**Understand**
CO 4:	Realization of Thinai concepts, trade and victory of Chozha dynasty	**Understand**
CO 5:	Understand the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 2	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 3	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 4	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 5	-	-	-	-	-	-	3	3	-	2	-	1	1

SYLLABUS:

UNIT I: LANGUAGE AND LITERATURE **3**

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

UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

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

UNIT III: FOLK AND MARTIAL ARTS **3**

Tattooing, basket weaving,Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils

UNIT IV: THINAI CONCEPT OF TAMILS **3**

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

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

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

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Jayanthi Ravikrishna K, Heritage of Tamils, Sri Krishna publications, First Edition, 2023
2. S. Priyadharshini, Heritage of Tamils, V. K. Publications

REFERENCES:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை, International Institute of Tamil Studies, C.P.T Campus, Chennai
2. கணினித் தமிழ் - முனைவர். இல. சுந்தரம், விகடன் பிரசுரம், அண்ணா சாலை, சென்னை, திசம்பர் 2016
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தொல்லியல் துறை வெளியீடு, தமிழ்நாடு அரசு, சென்னை, ஆறாம் பதிப்பு 2020
4. Social Life of Tamils, Dr. K. K. Pillay, A joint publication of TNTB & ESC and RMRL (in print) University of Madras, Chennai, Second Edition 1975
5. The Contributions of the Tamils to Indian Culture, Dr.M.Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995

SEMESTER I

U25MCC04	Computer Fundamentals and Coding Essentials (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop an understanding of fundamental computing concepts such as data types, variables, operators and algorithmic problem-solving.
- To enable students to write, debug, and execute simple programs in C using control structures, arrays and strings for solving basic scientific and engineering problems.
- To introduce the basic structure and functioning of computer systems, including hardware, software, operating systems and file management.

COURSE OUTCOMES:

CO 1: Build basic computational concepts such as data types, variables, operators, algorithms to solve simple problems **Apply**

CO 2: Develop simple programs using input/output operations, control structures, arrays, and strings in C language **Apply**

CO 3: Describe the fundamental components of a computer system and explain the role of operating systems and file management in computing **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	3	2	2	-	-	-	-	-	-	2	1	1
CO 2	3	3	3	-	2	2	-	-	-	-	2	1	1
CO 3	3	2	-	-	2	-	-	-	-	-	-	1	1

SYLLABUS:

UNIT I: FUNDAMENTALS OF COMPUTING **3 + 5**

Introduction to algorithms and flowcharts –Data types, variables, and operators

UNIT II: INTRODUCTION TO PROGRAMMING **6 + 5**

Programming languages overview - Input/output, conditional statements, loops - Basic data structures: arrays and strings - Overview of Logic gates and basic digital circuits - System software

UNIT III: INTRODUCTION TO COMPUTERS **6 + 5**

Evolution of Computers - Overview of computer hardware and software - Number Systems - Understanding input/output devices, memory, storage – Basics of operating systems and file management

LIST OF EXPERIMENTS

1. Identifying computer components

2. Installation and debugging of Operating System
3. Programs using variables and data types
4. Programs using Conditional Statements
5. Programs using Loops and Iterations
6. Program using Nested Loops & Pattern Printing

LEARN BEYOND CONTENT:

- Introduction to Debugging and IDEs

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. Glenn Brookshear J and Dennis Brylow, “Computer Science: An Overview” , 13th Edition, Perarson, 2020
2. Rajaraman V and Neeharika Adabala “Fundamentals of Computers”, 6th Edition PHI Learning Private Limited, 2015
3. Yashavant Kanetkar, “Let Us C”, 17th Edition, BPB Publications, 2020

REFERENCES:

1. Reema Thareja, “Programming in C”, 2nd Edition, Oxford University Press, 2016
2. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, 1st Edition, Oxford University Press, 2009

SEMESTER II

U25LEG10	Chinese for Engineers - Chinese II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To improve comprehension of real-life conversations in familiar everyday situations (shopping, dining, describing spaces, etc.)
- To develop fluency in expressing preferences, describing people, homes, and daily routines using basic sentence structures
- To build competence in writing short, structured texts such as messages, descriptions, and informal communications

COURSE OUTCOMES:

CO 1:	Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases	**Remember**
CO 2:	Describe people, homes, weather, and daily routines using structured sentences with correct grammar	**Understand**
CO 3:	Read and interpret simple texts such as product labels, menus, signs, and weather updates	**Understand**
CO 4:	Write short messages or descriptions related to everyday topics like hobbies, weather, or family	**Understand**
CO 5:	Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: WOULD YOU LIKE TO HAVE COFFEE OR TEA? **6 + 3**

Learning transposed objects – Learning how to express “too”, “also” with 也 – Learning how to express “excessively” with 太…..了 – Learning numerical system in Chinese – Learning how to express “more than” with 多

UNIT II: WHERE IS MY WALLET? **6 + 3**

Learning 在 as a verb with a place word – Learning location of an action (S + 在 + 處所詞 (PW) + 動作 (V)) – Learning how to express suggestion with 吧 – Learning noun + directional word as a place word – Learning existential sentences with 有

UNIT III: LET’S PLAY TENNIS THIS WEEKEND! **6 + 3**

Learning how to express acquired skills with 會 (know how to) – Learning complement marker 得– Learning 有(一)點(兒) as an adverb – Learning auxiliary verb 可以

UNIT IV: HOW MUCH IS THIS? **6 + 3**

Learning new vocabulary for shopping – Learning measure words (個, 本, 張, 件) – Learning how to ask and answer about prices (多少錢).Using 塊, 毛, 分 for money – Practicing shopping dialogues

UNIT V: WHAT'S YOUR FAVORITE FOOD? **6 + 3**

Learning new vocabulary for food and drinks – Learning common verbs for eating and drinking (吃, 喝) – Expressing preferences with 喜歡 / 不喜歡 – Using 還是 to make choices – Role-play: ordering food in a restaurant

LIST OF EXPERIMENTS

1. Prepare a city map
2. Video: Talk about your daily routine
3. Describe your school (using past tense)
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Mandarin Training Centre, National Taiwan Normal University, Modern Chinese I時代華語 I, Edited by Chih-Ping Chou, Taipei: Cheng Chung Book Company Ltd., 2019
2. Huayu101 / 華語101, Taiwan Ministry of Education, Taiwan Mandarin Educational Resources Centre, 2018

REFERENCES:

1. Cheng Chung Book Company Ltd, 時代華語 I 教師手冊 [Modern Chinese I Teacher's Manual, 2019
2. www.lmit.edu.tw/bag

SEMESTER II

U25ENG02	English Proficiency II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		0	0	2	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Be an active listener for better comprehension and retention
- Identify main points in spoken materials such as lectures, podcasts, and conversations

COURSE OUTCOMES:

CO 1: Deploy effective listening strategies in academic, technical and everyday situations **Remember**

CO 2: Engage in discussions expressing opinions and responding to ideas and arguments **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	2	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	2	1	1

SYLLABUS:

LIST OF EXPERIMENTS

1. Listening to Lectures: Structure and Emphasis – Note-making Techniques: capturing main ideas and details – Conversations, Dialogues and Identifying Opinions – Podcasts and Interviews – Active Listening Skills: Overcoming Barriers and Improving Focus
2. Listening for Specific Information: Facts, Figures, and Sequences – Global Accents: British, American, Australian – Following Instructions and Procedures: Task-based listening – Listening to Technical Explanations: Engineering Concepts – Short Writing Task: Summary or outline from technical input
3. Listening to Workplace Conversations: Meetings, Calls and Voice Notes – Listening to News & Current Events: Identifying Main Ideas and Recognizing – Colloquial Expressions and Idioms in Context: Enhancing comprehension of informal speech

LEARN BEYOND CONTENT:

- TED Talks – Podcast creation – Peer Interview

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. Rob Freire and Tamara Jones, “Q: Skills for Success: Listening & Speaking”, Level 4, 3rd edition, Oxford University Press, 2019
2. Ashraf M. Rizvi and Priyadarshi Patnaik, “Effective Technical Communication”, 3rd Edition, McGraw Hill, 2024

REFERENCES:

1. Nixaly Leonardo, “Active Listening Techniques:30 Practical Tools to Hone Your Communication Skills”, Embassy Books, 2022
2. Heather R. Younger, “The Art of Active Listening: How People at Work Feel Heard, Valued, and Understood”, Berrett-Koehler Publishers, 2023

SEMESTER II

U25MA204	Mathematical Transforms (Common to CE, CH, EE, ME, MI)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand Fourier analysis for periodic and aperiodic signals
- To apply Laplace transforms for solving linear ODEs with initial conditions
- To use Z-transforms for analyzing discrete – time systems

COURSE OUTCOMES:

CO 1: Understand and construct Fourier series representations of periodic functions, and apply them to solve basic signal analysis and engineering problems **Understand**

CO 2: Apply Fourier transform techniques to analyze and interpret continuous-time signals in the frequency domain **Apply**

CO 3: Compute Laplace transforms of standard functions and use them to model and analyze engineering systems involving differential equations **Apply**

CO 4: Use inverse Laplace transforms and convolution theorem to solve ordinary differential equations with initial conditions in engineering applications **Apply**

CO 5: Apply discrete-time systems using Z-transforms, and solve difference equations relevant to digital signal processing and control systems **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	1
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 4	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 5	2	2	-	2	1	-	-	-	-	-	-	1	1

SYLLABUS:

UNIT I: FOURIER SERIES **6 + 6**

Dirichlet's conditions – General Fourier series – Even and odd functions – Half-range sine and cosine series – Parseval's identity

UNIT II: FOURIER TRANSFORM **6 + 6**

Fourier transform pair – Sine and cosine transforms – Basic properties – Transforms of standard functions – Convolution theorem

UNIT III: LAPLACE TRANSFORM **6 + 6**

Standard functions – Unit step and delta functions – Derivatives and integrals – Transform of periodic functions

UNIT IV: INVERSE LAPLACE TRANSFORM **6 + 6**

Inverse Laplace methods – Convolution theorem – Solution of linear ODEs with constant coefficients

UNIT V: Z–TRANSFORM **6 + 6**

Z–transforms – Properties – Inverse Z-transform – Initial/final value theorems – Solution of difference equations

LIST OF EXPERIMENTS

1. Fourier Series – Fourier Series Approximation – Even/Odd Functions and Half-Range Expansions
2. Fourier Transforms – FFT and Spectral Analysis. – Convolution Theorem
3. Laplace Transforms – Laplace of Basic Functions – System Response Using Laplace
4. Inverse Laplace and ODE Solving – Inverse Laplace Transform – ODE Solving Using Laplace
5. Z-Transform Applications – Z-Transform and Sequence Analysis – Digital Filter Design and Stability

LEARN BEYOND CONTENT:

- Spectral leakage and windowing in Fourier analysis – Z-transform in digital control of DC motors

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th ed., Wiley India, 2018
2. Wylie C. R. & Barrett L. C., Advanced Engineering Mathematics, Tata McGraw-Hill, 2016
3. Grewal B. S., Higher Engineering Mathematics, 44th ed., Khanna Publishers, 2017

REFERENCES:

1. Andrews, L.C & Shivamoggi, B., Integral Transforms for Engineers, SPIE Press, 2016
2. Bali N. P. & Manish Goyal, Engineering Mathematics, 12th ed., Laxmi Publications, 2016
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 2016
4. James G., Advanced Modern Engineering Mathematics, 3rd ed., Pearson, 2013

SEMESTER II

U25PH204	Materials Science (Common to CH, ME)	Category: BSC				
		L	T	P	J	C
		2	0	0	2	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the fundamental principles of magnetic ,dielectric , superconducting and phase change materials and their technological applications
- To explore the characteristics and uses of emerging engineering materials such as metallic glasses, shape memory alloys, and nanomaterials
- To develop skills in microstructural analysis using various characterization techniques

COURSE OUTCOMES:

CO 1:	Categorize magnetic and di-electric materials for various applications	**Analyze**
CO 2:	Illustrate the physical phenomena of superconductors and their technological applications	**Apply**
CO 3:	Analyze the properties and applications of new engineering materials like SMAs and nanomaterials	**Analyze**
CO 4:	Apply characterization techniques for microstructural analysis of materials	**Apply**
CO 5:	Classify and evaluate the performance of phase change materials for energy-related applications	**Evaluate**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 4	3	2	-	1	1	-	-	-	-	-	-	1	1
CO 5	3	2	-	1	1	-	-	-	-	-	-	1	1

SYLLABUS:

UNIT I: MAGNETIC AND DIELECTRIC MATERIALS **6 + 6**

Classification of magnetic materials – Domain theory – Hysteresis – Hard and soft magnetic materials – Dielectric materials – Types of polarization – Langevin-Debye equation – Dielectric breakdown – Ferroelectricity

UNIT II: SUPERCONDUCTING MATERIALS **6 + 6**

Superconductors – Meissner effect – Persistent current – Critical temperature – Critical magnetic field – Isotope effect – Type I, Type II superconductors – BCS theory of Superconductivity – High temperature superconductors – Josephson Effect – SQUID – Magnetic levitation

UNIT III: NEW ENGINEERING MATERIALS **6 + 6**

Metallic glasses – Types, melt spinning process, applications – Shape memory alloys – Phases, shape memory effect, pseudo elastic effect – NiTi alloy – Applications – Nanomaterials: ball milling, chemical vapour deposition, properties and applications – Carbon nanotubes: types and applications

UNIT IV: PHASE CHANGE MATERIALS **6 + 6**

Classification of phase change materials – Fabrication methods: Encapsulation and Electro spinning Techniques – Thermophysical properties – Phase change material composites – Applications – Building and Construction – Thermal storage in Solar water heater

UNIT V: MATERIALS CHARACTERIZATION TECHNIQUES **6 + 6**

UV Visible spectroscopy – FTIR – X Ray Diffraction – Optical microscopes for surface studies – Rayleigh criterion – resolving power – Atomic force microscope – Scanning electron microscope – Transmission electron microscope

LIST OF PROJECTS

1. Comparative Study of Hard vs. Soft Magnetic Materials
2. Design of a Magnetic Storage Demonstration
3. Demonstrating Polarization in Dielectric Materials
4. Research Poster: Ferroelectric Materials and Their Uses
5. Magnetic Levitation Demo Using a Superconducting Kit
6. Simulation/Poster: Type I vs. Type II Superconductors
7. SQUID Applications in Medicine and Geophysics
8. Study of Critical Temperature of YBCO Superconductor
9. Fabrication of a Metallic Glass Ribbon via Melt Spinning (Simulation/Model)
10. NiTi Shape Memory Alloy Demonstration
11. Synthesis of Nanoparticles Using Ball Milling (Review or Lab Study)
12. Carbon Nanotubes: Properties and Application Review
13. Thermal Storage Using Phase Change Material (PCM)
14. Fabrication of PCM Capsules (Model/Simulation)
15. Comparison of Thermal Response in PCM vs Non-PCM Insulated Boxes

LEARN BEYOND CONTENT:

- Three phase four wire – Balanced star and delta load – Unbalance star and delta load

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** 30 Periods **Total:** 60 Periods

TEXTBOOKS:

1. Serway, R.A. & Jewett, J.W., “Physics for Scientists and Engineers”, 10th Edition, Cengage Learning, 2018
2. Budinski, K.G. & Budinski, M.K., “Engineering Materials: Properties and Selection”, 10th Edition, Pearson Education, 2020

REFERENCES:

1. Kasap, S.O., “Principles of Electronic Materials and Devices”, 4th Edition, McGraw Hill Education, 2018
2. Kittel, C., “Introduction to Solid State Physics”, 8th Edition, Wiley, 2004

3. Cabeza, L.F. (Ed.), “Phase Change Materials and Their Applications”, Springer, 2020

4. https://archive.nptel.ac.in/courses/115/103/115103030/

SEMESTER II

U25CY201	Environmental Science and Sustainability (Common to all programmes)	Category: BSC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide the basic concepts of ecosystems, biodiversity, air and water systems and how to protect them
- To analyze the effects of human activities on the lithosphere, waste generation, and environmental health, and evaluate disaster management and technological solutions
- To apply the principles of sustainable living and green technologies in alignment with the UN Sustainable Development Goals

COURSE OUTCOMES:

CO 1:	Describe ecosystems functions and the importance of protecting biodiversity	**Understand**
CO 2:	Analyze the atmospheric and hydrospheric issues such as pollution, climate change, and water crises using global and local case studies	**Analyze**
CO 3:	Estimate land-related challenges, agriculture-related issues and waste management methods	**Apply**
CO 4:	Assess the role of population, disaster management, and IT tools in addressing environmental and public health challenges	**Apply**
CO 5:	Apply the concepts of sustainability, circular economy, green chemistry and energy efficiency in real-world scenarios and Sustainable Development Goals	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	-	-	-	1	1	1	-	2	-	2	1	1
CO 2	3	2	-	1	1	1	3	-	2	-	2	1	1
CO 3	3	3	2	1	1	1	3	-	2	-	2	1	1
CO 4	3	3	2	1	1	1	3	-	2	-	2	1	1
CO 5	3	3	3	1	1	1	3	-	2	-	2	1	1

SYLLABUS:

UNIT I: ENVIRONMENTAL SCIENCE AND BIODIVERSITY **3 + 6**

Ecosystems – Classification, Structure, Energy Flow, Ecological Succession – Biodiversity – Importance, Values and Levels – India as a Mega-diversity Nation – Red Data Book, Hotspots and Conservation of Biodiversity Self-Learning and Case Studies – Wildlife Crime in India (Poaching) – Man and Wildlife Conflict (e.g., Elephant-Human conflict in Odisha or Assam)

UNIT II: ATMOSPHERE AND HYDROSPHERE **3 + 6**

Atmosphere – Structure, Climatic Zones, Air Quality Standards (National & WHO), Air Pollution – Causes, effects, control measures, Carbon Emissions – Greenhouse Effect, Global Warming, Carbon Footprint and reduction strategies Hydrosphere – Hydrological Cycle – Water Quality Parameters, water pollution – Causes, effects, control measures, Overutilization of Ground Water – Water Conservation Strategies Self-Learning and Case Studies – Atmosphere – Urban air quality (Delhi, Beijing case), Hydrosphere – (National Water Mission (NAPCC), NRCP, Jal Shakti Abhiyan – Cape Town Water Crisis (2017–2018)

UNIT III: LITHOSPHERE AND SOLID WASTE MANAGEMENT **3 + 6**

Lithosphere – Composition, Plate tectonics, continental drift, Soil Nutrients, Nitrogen cycles, Soil Pollution – Causes, effects (Land degradation, desertification) and control measures, Agriculture – Problems of Modern agriculture Solid Waste Management – Types & Sources of Waste, waste management processes Self-Learning and Case Studies - (Land degradation – Rajasthan - Soil erosion – Narmada River Basin, MP – Desertification – Thar Desert – Eco buddy program)

UNIT IV: GLOBAL ISSUES, HUMAN WELFARE AND ROLE OF TECHNOLOGY **3 + 6**

Disasters – Floods, Landslides, Disaster management cycle, Land Clearing Projects – Dam sites, Highways projects, Resettlement and Rehabilitation (R&R) Population – Global and national growth patterns, Population explosion and its ecological footprint Role of Information Technology (IT) – Fundamentals of GIS, Open Sources GIS- QGIS, OSM (Open Series Map) – Use of IT in human health monitoring – Disease tracking and prediction using big data and AI (e.g., COVID-19 apps), Health information systems – Telemedicine, electronic health records (EHRs) Self-Learning and Case Studies – Use of IT in environmental monitoring (GIS, Remote Sensing, sensors, data loggers) Pollution Monitoring – Water, Air

UNIT V: SUSTAINABLE DEVELOPMENT AND GREEN PRACTICES **3 + 6**

Sustainable Development – Introduction, Concepts and Strategies, Sustainable Practices and Circular Economy – 5Rs, Zero Waste Lifestyle Sustainable Agriculture, Sustainable Energy – Biofuels, low-impact renewable energy, Concepts of carbon credits and emissions trading Green Technologies – Green Chemistry and reagent in industries, Environmental Management – ISO 14001:2004, energy efficiency, sustainable transport, carbon sequestration Self-Learning and Case Studies - Overview of United Nations SDGs (focus on SDGs 6, 7, 11, 12, 13), Role of India in implementing SDGs, Ambikapur, Chhattisgarh – Zero waste city model, Pune, Maharashtra – Integrating informal waste sector, Delhi Metro – Energy efficiency, carbon credits from regenerative braking, solar power use, Kochi, Kerala – Sustainable urban transport with water metro and public transit integration

LIST OF EXPERIMENTS

1. Determination of molecular weight and degree of polymerisation of a given polymer using an Ostwald Viscometer
2. Estimation of hardness (total, temporary, permanent) in water samples
3. Iodometric determination of available chlorine in a sample of bleaching powder
4. Monitoring of air quality using sensors
5. Estimation of dissolved oxygen in water
6. Determination of soil moisture content and water holding capacity of soil
7. Recovery of aluminium from waste materials
8. Photocatalytic degradation of dye using TiO_2
9. Synthesis of biodesel from vegetable oil

LEARN BEYOND CONTENT:

- Mapping Indian biodiversity hotspots using GIS tools or visual mapping software
- Determination of Particulate Matter emissions from stationary sources

- Measurement of noise levels in different environments using a dosimeter
- Life Cycle Assessment (LCA) experiment: Compare traditional vs green products (energy, materials, emissions)
- Coir pith composting and application study
- Field survey and GPS-based mapping of waste dump sites or urban agriculture sites
- Simulation of disaster management cycle (Preparedness → Response → Recovery → Mitigation)
- Carbon footprint calculator activity for individual or institutional ecological footprint

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. E. Bharucha, “Environmental Studies for Undergraduate Courses”, 2nd edition, Hyderabad, University Press (India) Pvt. Ltd., 2005
2. R. Rajagopalan, “Environmental Studies: From Crisis to Cure”, 3rd edition, New Delhi: Oxford University Press, 2016
3. A. Kaushik and C. P. Kaushik, “Environmental Science and Engineering” 5th edition, New Delhi: New Age International Publishers, 2019
4. R. R. Hiremath, “Sustainable Development”, 1st edition, New Delhi: Himalaya Publishing House, 2008
5. P. D.Sharma, “Ecology and Environment” 13th edition, Meerut: Rastogi Publications, 2020

REFERENCES:

1. P. Meenakshi, “Elements of Environmental Science and Engineering” 1st edition, New Delhi: Prentice Hall of India, 2005
2. G. R. Chatwal and Harish Sharma, “A Textbook of Environmental Studies” 3rd edition, Mumbai: Himalaya Publishing House, 2018
3. A. Kumar, “Environmental Studies”, Revised edition, Patna: Bharati Bhawan Publishers & Distributors, 2019
4. V. Desai, “Environment and Sustainable Development” 1st edition, Mumbai: Himalaya Publishing House, 2009
5. G. K. Taneja, Gopal and S. C. Sharma, “Environmental Sustainability and Development”, 2nd edition, New Delhi: Deep and Deep Publications, 2010

SEMESTER II

U25CH201	Python Programming	Category: PCC				
		L	T	P	J	C
		2	0	4	0	4

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To introduce Python programming fundamentals
- To develop problem-solving skills using Python
- To equip students with the ability to analyze and visualize data using Python

COURSE OUTCOMES:

CO 1:	Understand and apply fundamental Python programming concepts	**Understand**
CO 2:	Develop modular Python programs using functions and exception handling	**Apply**
CO 3:	Utilize Python data structures for effective data representation	**Apply**
CO 4:	Implement file operations and data processing techniques	**Apply**
CO 5:	Apply Python to solve engineering problems that involves linear algebra and ordinary differential equations	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	1	-	-	-	-	-	-	2	2
CO 2	3	3	3	2	2	1	1	1	-	-	-	2	2
CO 3	3	2	2	2	1	1	-	1	-	-	-	2	2
CO 4	3	3	3	3	2	2	1	1	1	1	1	2	-
CO 5	3	3	3	3	2	2	2	2	1	1	1	2	2

SYLLABUS:

UNIT I: INTRODUCTION TO PYTHON PROGRAMMING **6 + 12**

Python installation and setup. Variables, data types, and operators. Control structures: if – else, for, while loops. Functions and modular programming. Introduction to Jupyter Notebooks and Google Collaboratory for Python scripting

UNIT II: DATA STRUCTURES AND FUNCTIONS **6 + 12**

String operations and formatting. Lists: creation, indexing, slicing, and methods. Tuples and dictionaries: usage and operations. Defining and calling functions. Recursion and its applications

UNIT III: FILE HANDLING AND EXCEPTION MANAGEMENT **6 + 12**

File I/O operations. Exception handling mechanisms. Working with file paths and directories. Using Python's shutil module for file operations. Debugging techniques and best practices

UNIT IV: DATA ANALYSIS WITH PYTHON **6 + 12**

Introduction to NumPy arrays and operations. Pandas: DataFrame creation, indexing, and manipulation. Data visualization using Matplotlib and Seaborn. Statistical functions and methods in Python. Handling missing data and data normalization

UNIT V: PYTHON APPLICATIONS **6 + 12**

Introduction to Python libraries for engineering applications, Solving Linear Equations, Simultaneous equations, and ordinary differential equations – Case studies

LIST OF EXPERIMENTS

1. Getting Started with Jupyter Notebooks and Google Collaboratory for interactive execution of code cells, and markdown for documentation
2. Perform Basic Arithmetic Operations
3. Apply Conditional Logic and Iterative Structures to Control Program Flow
4. Create and use Functions and Modular Programming
5. Python Strings – Operations and Formatting
6. Python Lists – Creation, Indexing, Slicing, and Methods
7. Python Collections – Tuples and Dictionaries
8. Working with Functions and Recursion
9. Working with File I/O
10. Advanced File Operations with Shutil Module
11. Debugging Techniques and Best Practices
12. NumPy Array Fundamentals and Operations
13. Pandas DataFrame Creation and Manipulation
14. Basic Statistical Analysis and Data Visualization using Matplotlib and Seaborn
15. Data Preprocessing: Missing Data and Normalization
16. Solving Simple Linear Equations
17. Solving Simultaneous Equations
18. Solving Ordinary Differential Equations

LEARN BEYOND CONTENT:

- Explore real – world applications of Python in scientific and engineering contexts
- Case Studies

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 60 Periods **Project:** - Periods **Total:** 90 Periods

TEXTBOOKS:

1. Reema Thareja, “Python programming: Using problem solving approach”, 1st Edition, Oxford Press, 2017
2. William McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, Shroff/O'Reilly Publication, 2017

REFERENCES:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, “Programming and Problem Solving with Python”, 2nd Edition, McGrawHill Education, 2018
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, 1st Edition, Pearson India Education Services Pvt. Ltd., 2016

SEMESTER II

U25EEG02	Basics of Electrical and Electronics Engineering	Category: ESC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To solve electric circuits using basic laws
- To understand DC/AC machines, renewable energy, and power utilization
- To analyze semiconductor devices and their applications

COURSE OUTCOMES:

CO 1:	Apply circuit laws to solve electrical networks	**Apply**
CO 2:	Explain working principles of motors/transformers in industrial settings	**Understand**
CO 3:	Describe renewable energy integration in chemical processes	**Understand**
CO 4:	Identify semiconductor devices used in instrumentation	**Understand**
CO 5:	Design and test power supply circuits for process instrumentation	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	-	-	-	-	-	-	1	1	1
CO 2	2	1	1	-	-	-	1	1	1	-	1	1	1
CO 3	2	1	1	-	-	-	-	-	-	-	1	1	1
CO 4	2	1	1	-	-	-	1	1	1	-	1	1	1
CO 5	3	2	1	-	-	-	1	1	1	-	1	1	1

SYLLABUS:

UNIT I: ELECTRICAL CIRCUITS **5 + 10**

Active elements – Passive elements – DC Circuits: Ohm’s law – Kirchhoff’s laws – Series/Parallel circuits. AC fundamentals: Power factor – Single-phase vs three-phase systems

UNIT II: INDUSTRIAL ELECTRICAL SYSTEMS **5 + 10**

DC Motor: Industrial applications – Transformers in power distribution – Induction motors for pumps/compressors – Electrical safety in hazardous areas .- Renewable energy for chemical plants (Solar/Wind) – Energy efficiency – Electrical Tariff calculation

UNIT III: ELECTRONICS FOR PROCESS CONTROL AND APPLICATIONS **5 + 10**

PN diode – Zener diode – BJT as switch – SCR in power control – Sensors for pressure / temperature – Rectifiers for instrumentation power – Voltage regulators – Motor speed control circuits

LIST OF EXPERIMENTS

1. Load Test on DC shunt motor
2. Load Test on single phase transformer
3. Load Test on three phase Induction Motor
4. VI Characteristics of PN Junction diode
5. VI characteristics of SCR
6. Halfwave and Fullwave Rectifiers
7. Voltage regulator using Zener diode

LEARN BEYOND CONTENT:

- Three phase four wire – Balanced star and delta load – Unbalance star and delta load

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. R.K. Rajput, Electrical Machines, 6th edition, Laxmi Publications, New Delhi, 2016
2. V.K. Mehta and Rohit Mehta, Principles of Electronics, 12th edition, S.Chand Publications, New Delhi, 2020

REFERENCES:

1. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, 4th edition, Pearson Education, New Delhi, 2013
2. John Bird, Electrical Circuit Theory and Technology, 7th edition, Routledge, London, 2021
3. Tony R. Kuphaldt, Lessons in Industrial Instrumentation, 2nd edition, Open Educational Resource, 2022
4. NPTEL Online Certification Course, "Renewable Energy Systems", IIT Madras, 2023
5. IEEE Transactions on Industrial Electronics, ISSN: 0278-0046. [Journal]

SEMESTER II

U25MEG03	Engineering Graphics (Common to CE, CH, EC, EE, ME)	Category: ESC				
		L	T	P	J	C
		0	0	4	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To impart knowledge of BIS standards and conventions in engineering graphics for the accurate construction of curves, projections and developments
- To develop the ability to visualize and represent 3D objects in 2D space through orthographic projections, sectional views and development of surfaces
- To enhance the drafting skills to interconvert between isometric and orthographic views for practical engineering application using CAD Software

COURSE OUTCOMES:

CO 1:	Illustrate engineering curves with BIS standards for effective engineering communication	**Understand**
CO 2:	Apply the principles of orthographic projection to represent points, straight lines, plane surfaces, and solids on engineering drawing sheets	**Understand**
CO 3:	Construct projections of truncated and frustums solids and develop the lateral surfaces of solids	**Understand**
CO 4:	Convert the isometric views of simple objects to orthographic views and vice versa	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	-	2	1	2	-	2	1	1
CO 2	3	1	-	-	-	-	1	1	2	-	-	1	1
CO 3	3	1	-	-	2	-	-	1	2	-	-	1	1
CO 4	3	2	-	-	2	-	2	1	2	-	2	1	1

SYLLABUS:

LIST OF EXPERIMENTS

1. Introduction, drawing instruments and its uses, sheet layout, BIS conventions, lines, lettering and dimensioning practices lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. agency, parallelism, inclination and perpendicularity (Not for Exam)
2. Manual construction of ellipse, parabola, and hyperbola by eccentricity method
3. Construction of involute of square and circle by manual drafting
4. Projection of points in all four quadrants by manual drafting
5. Projection of lines inclined to both horizontal and vertical planes by manual drafting
6. Projection of planes inclined to both horizontal and vertical planes by manual drafting
7. Projection of solids inclined to one plane and parallel to other planes using AUTOCAD

8. Section of solids with base resting on HP using AUTOCAD
9. Development of lateral surfaces of solids with base on HP using AutoCAD
10. Construction of isometric views of simple and truncated solids using AutoCAD
11. Sketching orthographic views from pictorial representation of 3D objects using AutoCAD

LEARN BEYOND CONTENT:

- Perspective Projection

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 60 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. N.D. Bhatt and V.M. Panchal, "Engineering Drawing", Charotar Publishing House, Gujarat, 55th edition, 2025
2. K. Venugopal and V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited, 2022
3. D.M.Kulkarni, A.P.Rastogi and A.K.Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi, Revised Edition, 2021

REFERENCES:

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2017
2. Sam Tickoo, "AutoCAD 2024 for Engineers and Designers", Dreamtech Press, 2024

SEMESTER II

U25LEG05	Deutsch für Ingenieure – German II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To improve comprehension of real-life conversations in familiar everyday situations (shopping, dining, describing spaces, etc.)
- To develop fluency in expressing preferences, describing people, homes, and daily routines using basic sentence structures
- To build competence in writing short, structured texts such as messages, descriptions, and informal communications

COURSE OUTCOMES:

CO 1:	Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases	**Remember**
CO 2:	Describe people, homes, weather, and daily routines using structured sentences with correct grammar	**Understand**
CO 3:	Read and interpret simple texts such as product labels, menus, signs, and weather updates	**Understand**
CO 4:	Write short messages or descriptions related to everyday topics like hobbies, weather, or family	**Understand**
CO 5:	Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: EVERYDAY SHOPPING AND DINING **6 + 3**

Shopping for groceries and clothes – Ordering food and drinks at a restaurant – Talking about prices and quantities – Expressing preferences – Reading menus, labels, and receipts – Grammar: Accusative case review with articles and adjectives, Plural forms of nouns, Adjective endings in nominative and accusative – Cultural Focus: Eating habits in Germany, Austria, and Switzerland – Supermarket etiquette – Restaurant culture – Tipping practices

UNIT II: PEOPLE AND PERSONAL INTERESTS **6 + 3**

Talking about family and relationships – Describing people's appearance and personality – Hobbies and free time activities – Likes and dislikes – Grammar: Possessive pronouns - Adjective endings with possessive pronouns – Word order in main clauses – Cultural Focus: Family structures – Popular hobbies and sports – Work-life balance in German-speaking countries

UNIT III: HOME AND LIVING **6 + 3**

Describing your home and rooms – Furniture and household items – Talking about home layout and comfort – Grammar: Two-way prepositions with accusative/dative – Use of es gibt – Describing location vs. movement – Cultural Focus: Typical German homes – Living arrangements – Interior design norms

UNIT IV: SEASONS AND WEATHER **6 + 3**

Talking about weather and seasons – Seasonal activities – Preferences for seasons – Grammar: Temporal phrases – Review of present tense verb usage with seasonal context – Use of weil (because) – Cultural Focus: Seasonal festivals like Weihnachten and Oktoberfest – Weather patterns in German speaking countries

UNIT V: PUTTING IT TOGETHER – DAILY LIFE **6 + 3**

Combining shopping – Personal life – Home, and seasonal activities into daily routines – Conversational practice across units – Grammar: Practice of main and subordinate clauses – Sentence structure review – Verb position with weil and prepositions – Cultural Focus: Daily routines in Germany – Overview of regional variations in culture and habits

LIST OF EXPERIMENTS

1. Prepare a city map
2. Video: Talk about your daily routine
3. Describe your school (using past tense)
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Buscha, A., & Szita, S., “Begegnungen Deutsch als Fremdsprache A1+: Integriertes Kurs- und Arbeitsbuch,” 1st Edition, 2021
2. Brüseke, R., “Grammatik leicht A1,” 1st Edition, 2019

REFERENCES:

1. Netzwerk Deutsch als Fremdsprache A1, 1st Edition: BlueNBells, 2012
2. Huber, K., & Keller, F., “DaF kompakt A1: Deutsch als Fremdsprache,” 3rd Edition, Langenscheidt, 2018

SEMESTER II

U25LEG06	Nihongo no Enginia – Japanese II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To improve comprehension of real-life conversations in familiar everyday situations (shopping, dining, describing spaces, etc.)
- To develop fluency in expressing preferences, describing people, homes, and daily routines using basic sentence structures
- To build competence in writing short, structured texts such as messages, descriptions, and informal communications

COURSE OUTCOMES:

CO 1:	Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases	**Remember**
CO 2:	Describe people, homes, weather, and daily routines using structured sentences with correct grammar	**Understand**
CO 3:	Read and interpret simple texts such as product labels, menus, signs, and weather updates	**Understand**
CO 4:	Write short messages or descriptions related to everyday topics like hobbies, weather, or family	**Understand**
CO 5:	Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: SHOPPING AND QUANTITIES **6 + 3**

Shopping-related expressions – Asking prices and quantities – Counting objects with counters: ～つ, ～人, ～枚, ～本 – Describing wants using ～がほしいです – Offering and requesting using ～をください – Grammar: Verbs in -masu form (かいます, かります, あげます, もらいます) – Particles: と, や, から, まで – Sentence structures: ～があります / ～がいます, ～は～にあります – Vocabulary: Money, items, colors, shops – Kanji: Numbers (一～十), Days (日, 月, 火) – Basic shopping terms – Cultural note: Japanese currency – Store etiquette – Giving/receiving customs

UNIT II: DAILY LIFE AND TIME EXPRESSIONS **6 + 3**

Talking about schedules and habits – Expressing future plans using time expressions and verb tense – Grammar: Verb conjugation (non-past affirmative/negative) – Introduction to te-form: 〜てください, 〜てもいいです – Sequence with 〜てから – Frequency expressions: 〜まいにち, 〜ときどき, 〜よく – Vocabulary: School/work schedule, leisure activities, public places, transportation – Kanji: Days of the week (月, 火, 水, 木, 金, 土, 日) – Time-related (時, 分, 半) – Motion verbs (行く, 来る, 帰る) – Cultural note: Japanese daily routines – Work-life balance, punctuality

UNIT III: MAKING REQUESTS AND SEQUENCING ACTIONS **6 + 3**

Talking about likes and dislikes: 〜がすきです / 〜がきらいです – Describing abilities: 〜がじょうずです / 〜がへたです – Vocabulary: Hobbies, sports, entertainment terms – Inviting someone using 〜ませんか – Accepting or declining invitations: いいですね / ちょっと – Grammar: Verb forms for expressing preference and intention – Particle: が for subject in expressions of ability and preference – Kanji: Verbs related to hobbies (見, 聞, 読, 書, 食) – Nouns related to interests – Cultural note: Popular hobbies in Japan – Seasonal pastimes – Communication norms in social invitations

UNIT IV: HOBBIES AND PREFERENCES **6 + 3**

Asking and giving directions – Describing locations of people and things – Using maps and signs – Grammar: Particles に and で for location and direction – Expressions: 〜のまえに, 〜のとなりに, 〜のなかに – Vocabulary: Places in town – Transportation terms – Directional phrases – Kanji: Location and place words (駅, 右, 左, 上, 下, 中) – Common public signs – Cultural note: Navigating Japanese cities – Polite phrases for asking directions – Public transport norms

UNIT V: ABILITIES AND SOCIAL INTERACTIONS **6 + 3**

Review of shopping – Preferences, routines, and directions – Roleplays: at the store, planning a weekend – Inviting a friend – Asking for help and giving opinions – Grammar: Integrated use of learned verb forms and particles – Vocabulary: Reinforcement through conversation – Kanji: Mixed use in real-life contexts – Cultural note: Everyday conversation etiquette – Blending formal and informal speech – Real-life scenarios in Japan

LIST OF EXPERIMENTS

1. Prepare a city map
2. Video: Talk about your daily routine
3. Describe your school (using past tense)
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. 3A Corporation, “Minna no Nihongo Shokyū I: Main Textbook,” 2nd Indian Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2018
2. Banno, Eri, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, and Kyoko Tokashiki, “Genki I: An Integrated Course in Elementary Japanese,” 3rd Edition, The Japan Times Publishing, Tokyo, 2020

REFERENCES:

1. Yamada, M., & Fujita, T., “Japanese for Beginners: A Practical Approach,” 1st Edition, Tuttle Publishing, 2019

2. Takahashi, A., & Sato, M., “Nihongo Pro: Japanese for N5 Level,” 1st Edition, KADOKAWA, 2018

SEMESTER II

U25LEG07	Français pour les Ingénieurs – French II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To improve comprehension of real-life conversations in familiar everyday situations (shopping, dining, describing spaces, etc.)
- To develop fluency in expressing preferences, describing people, homes, and daily routines using basic sentence structures
- To build competence in writing short, structured texts such as messages, descriptions, and informal communications

COURSE OUTCOMES:

CO 1:	Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases	**Remember**
CO 2:	Describe people, homes, weather, and daily routines using structured sentences with correct grammar	**Understand**
CO 3:	Read and interpret simple texts such as product labels, menus, signs, and weather updates	**Understand**
CO 4:	Write short messages or descriptions related to everyday topics like hobbies, weather, or family	**Understand**
CO 5:	Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: FOOD AND SHOPPING ESSENTIALS **6 + 3**

Food items – Quantities – Packaging – Prices – Navigating markets and stores – Asking for prices and quantities – Expressing preferences and choices – Grammar: Partitive articles (du - de la - des) – Expressions of quantity (un kilo de - beaucoup de - etc.) – Use of il y a – Verb prendre (to take) – Vouloir (to want) – Acheter (to buy) in the present tense – Cultural Focus: French culinary culture – Market etiquette – Typical meals and menus

UNIT II: DINING OUT AND CAFÉ CULTURE **6 + 3**

Ordering in a café or restaurant – Understanding menus – Making polite requests – Expressing likes and dislikes – Talking about meals – Grammar: Adjective placement and agreement with nouns – Review of present tense verbs – Questions and polite forms – Cultural Focus: Café culture in France and Francophone regions – Dining customs – Tipping practices

UNIT III: DESCRIBING HOME AND SURROUNDINGS **6 + 3**

Talking about where you live – Describing your home and rooms – Locating objects in a room – Discussing furniture and appliances – Grammar: Prepositions of place (sur - sous - devant - derrière - entre) – Demonstrative adjectives (ce - cette - ces) – Verb habiter and other -er verbs – Cultural Focus: Types of housing in France – Apartment etiquette – Real estate ads in Francophone cities

UNIT IV: DAILY ROUTINES AND PERSONAL DESCRIPTIONS **6 + 3**

Describing people – Talking about daily routines – Introduction to reflexive verbs – Using adverbs of place (ici - là-bas) – Giving simple directions – Grammar: Reflexive verbs (s'habiller, se lever) – Adverbs of place – Review of verb placement – Cultural Focus: Urban vs. rural living – Typical neighborhood life in French cities

UNIT V: LEISURE, WEATHER, AND SOCIAL LIFE **6 + 3**

Talking about hobbies and sports – Weekend activities – Making and responding to invitations – Expressing preferences and future intentions – Grammar: Verbs faire, aimer, préférer, sortir, aller – Contractions with à and de (au, du) – Near future tense (futur proche: aller + infinitive) – Use of on – Cultural Focus: Leisure activities in Francophone countries – Popular sports and pastimes – Social norms around outings and gatherings

LIST OF EXPERIMENTS

1. Prepare a city map
2. Video: Talk about your daily routine
3. Describe your school (using past tense)
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Marie-José Lopes & Jean-Thierry Bougnec, "Inspire 2 A1-A2 Méthode de français," 1st Edition, Hachette Français Langue Etrangère, 2020
2. Gibbe, C., Berthet, A., & Hugot, C., "Édito A2: Méthode de français," 1st Edition, Didier, 2024

REFERENCES:

1. Chantal Fougères & Marc de la Harpe, "Le Nouveau Sans Frontières 2: Méthode de français A2," 1st Edition, Hachette FLE, 2020
2. Xavier Maingueneau, "Le Français pour les Nuls: A2-B1," 3rd Edition, Wiley, 2021

SEMESTER II

U25LEG08	Hindi for Engineers - II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To improve comprehension of real-life conversations in familiar everyday situations (shopping, dining, describing spaces, etc.)
- To develop fluency in expressing preferences, describing people, homes, and daily routines using basic sentence structures
- To build competence in writing short, structured texts such as messages, descriptions, and informal communications

COURSE OUTCOMES:

CO 1:	Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases	**Remember**
CO 2:	Describe people, homes, weather, and daily routines using structured sentences with correct grammar	**Understand**
CO 3:	Read and interpret simple texts such as product labels, menus, signs, and weather updates	**Understand**
CO 4:	Write short messages or descriptions related to everyday topics like hobbies, weather, or family	**Understand**
CO 5:	Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: SHOPPING LANGUAGE AND NUMBER USAGE **6 + 3**

Interacting in markets and shops – Asking prices and quantities – Expressing need and preference – Vocabulary: Fruits – Vegetables – clothes – Money terms – Numbers (1–100) – Classifiers: किलो - दर्जन – Use of polite requests – Grammar: Verbs चाहना - लेना -देना in present tense – Use of कुछ and कितना – Postpositions: के लिए - के पास – Emphatic words: ही - भी – Cultural note: Indian market etiquette – Bargaining norms – Respectful phrases for shopkeepers – Currency handling

UNIT II: DESCRIBING PEOPLE AND RELATIONSHIPS **6 + 3**

Talking about family and people – Describing physical appearance and personality – Expressing family relations – Vocabulary: Family members – Descriptive adjectives – Colors – Body parts – Grammar: Adjective agreement by gender and number – Possessives with का/की/के – Verb होना in past tense (था/थी/थे) – Using का रिश्ता for relationships – Honorific subject-verb agreement – Cultural note: Kinship terms – Family address norms – Formal/informal differences – Indian respect systems

UNIT III: HOBBIES, LIKES, AND SOCIAL LANGUAGE **6 + 3**

Talking about hobbies and free time – Expressing likes and dislikes – Making suggestions and invitations – Vocabulary: Leisure activities – hobbies - entertainment words – Days of the week – Grammar: पसंद होना constructions – Compound verb use with करना (e.g., किताब पढ़ना) – Use of मुझे X पसंद है – Use of को for preferences – Future tense basics with गा/गी/गे – Cultural note: Indian leisure culture – Film and music – Inviting friends – Group social etiquette

UNIT IV: EVERYDAY CONVERSATIONS AND NEEDS **6 + 3**

Describing needs and routines in daily life – Making polite offers and requests – Talking about simple problems and solutions – Vocabulary: Basic needs – Services – Tools – simple household and health terms – Grammar: Requests with क्या आप...? – Use of चाहिए – Conditional phrases with अगर (if) – More on present vs. future tense use – Cultural note: Navigating services in India – Polite refusals – Help seeking expressions

UNIT V: RECAP AND REAL-LIFE PRACTICE **6 + 3**

Conversational roleplays: shopping – Family introductions – Hobby discussion – Describing routines and asking for help – Combining sentence structures from previous units – Vocabulary: Review and integrate all learned sets – Grammar: Review of verb tenses – Guestion structures – Postpositions – Honorifics – Cultural note: Integrating cultural etiquette with language use – Real-world scenarios for communication in Hindi

LIST OF EXPERIMENTS

1. Prepare a city map
2. Video: Talk about your daily routine
3. Describe your school (using past tense)
4. Presentation related to culture
5. Dialogue roleplay
6. Mock interview

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 15 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Pavithra Publications, “Spoken Hindi: Through Tamil,” 2nd Edition, Pavithra Publications, Chennai, 2015
2. Dakshina Bharat Hindi Prachar Sabha, “Prathamic Text Book: New Syllabus,” 1st Edition, Dakshina Bharat Hindi Prachar Sabha, Madras, 2023

REFERENCES:

1. Ganga, K., & Ramesh, V., “Learn Hindi in 30 Days: A Beginner's Guide,” 3rd Edition, Hindi Academy, 2020
2. Vyas, S., “Spoken Hindi for Beginners,” 1st Edition, Orient BlackSwan, 2018

SEMESTER II

U25MCC06	Universal Human Values II (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		2	1	0	0	3

PRE-REQUISITES:

- U25MCC01 - UNIVERSAL HUMAN VALUES - I

COURSE OBJECTIVES:

- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature

COURSE OUTCOMES:

CO 1: Evaluate the significance of value inputs in formal education and start applying them in their life and profession **Understand**

CO 2: Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc **Understand**

CO 3: Analyze the value of harmonious relationship based on trust and respect in their life and profession **Understand**

CO 4: Examine the role of a human being in ensuring harmony in society and nature **Understand**

CO 5: Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 2	-	-	-	-	-	-	-	2	3	-	-	1	1
CO 3	-	-	-	-	-	-	-	-	3	-	1	1	1
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	1
CO 5	-	-	-	-	-	-	-	2	3	-	1	1	1

SYLLABUS:

UNIT I: INTRODUCTION-BASIC HUMAN ASPIRATION, ITS FULFILLMENT THROUGH ALL ENCOMPASSING RESOLUTION **6 + 3**

The basic human aspirations and their fulfillment through Right understanding and Resolution – Right understanding and Resolution as the activities of the Self-self being central to Human Existence – All encompassing Resolution for a Human Being – Its details and solution of problems in the light of Resolution

UNIT II: RIGHT UNDERSTANDING - KNOWER, KNOWN & THE PROCESS **6 + 3**

The domain of right understanding starting from understanding the human being and extending up to understanding nature/ existence – its interconnectedness and co-existence – and finally understanding the role of human being in existence (human conduct)

UNIT III: UNDERSTANDING HUMAN BEING **6 + 3**

Understanding the human being comprehensively as the first step and the core theme of this course – Human being as co-existence of the self and the body – The activities and potentialities of the self-basis for harmony/contradiction in the self

UNIT IV: UNDERSTANDING NATURE AND EXISTENCE **6 + 3**

A comprehensive understanding about the existence – Nature being included – The need and process of inner evolution – Particularly awakening to activities of the Self: Realization – Understanding and Contemplation in the Self

UNIT V: UNDERSTANDING HUMAN CONDUCT, ALL-ENCOMPASSING RESOLUTION & HOLISTIC WAY OF LIVING **6 + 3**

Understanding Human Conduct – Different aspects of all encompassing Resolution – Holistic way of living for Human Being with all encompassing resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work leading to harmony at all levels from Self to Nature and entire Existence

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019

REFERENCES:

1. E G Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press, 2000
2. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd
3. B P Banerjee, Foundations of Ethics and Management, Excel Books, 2005
4. B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

SEMESTER II

U25MCC07	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To learn weaving, ceramic and construction technology of Tamils
- To understand the agriculture, irrigation and manufacturing technology of Tamils
- To realize the development of scientific Tamil and Tamil computing

COURSE OUTCOMES:

CO 1:	Understand the weaving and ceramic technology of ancient Tamil people nature	**Understand**
CO 2:	Understand the construction technology, building materials in Sangam period and case studies	**Understand**
CO 3:	Infer the metal process, coin and beads manufacturing with relevant archeological evidence	**Understand**
CO 4:	Realize the agriculture methods, irrigation technology and pearl diving	**Understand**
CO 5:	Apply the knowledge of scientific Tamil and Tamil computing	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 2	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 3	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 4	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 5	-	-	-	-	-	-	3	3	-	2	-	1	1

SYLLABUS:

UNIT I: WEAVING AND CERAMIC TECHNOLOGY **3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

UNIT II: DESIGN AND CONSTRUCTION TECHNOLOGY **3**

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

UNIT III: MANUFACTURING TECHNOLOGY **3**

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

UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY **3**

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

UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

Development of Scientific Tamil – The role of journals in the development of scientific Tamil – Scientific Tamil vocabulary – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Tamils and Technology, K. Jayanthi Ravikrishna, Sri Krishna publications, Mahalakshmi Nagar, Velappanchavadi, Chennai – 600 007, First Edition 2023
2. Tamils and Technology, S. Priyadharshini, V. K. Publications, 55, Gopuram Colony, Sivakasi – 626 124

REFERENCES:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை, International Institute of Tamil Studies, C.P.T Campus, Chennai
2. கணினித் தமிழ் - முனைவர். இல. சுந்தரம், விகடன் பிரசுரம், அண்ணா சாலை, சென்னை, திசம்பர் 2016
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தொல்லியல் துறை வெளியீடு, தமிழ்நாடு அரசு, சென்னை, ஆறாம் பதிப்பு 2020
4. The Contributions of the Tamils to Indian Culture, Dr. M. Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995
5. Studies in the History of India with Special Reference to Tamil Nadu, Dr. K. K. Pillay, 1979

SEMESTER I & II

U25MCC03	Design Thinking (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the basics of Design Thinking, its principles, processes, and tools used
- To empathize with stakeholders and frame problems using structured tools and techniques
- To generate ideas, create prototypes, and present solutions effectively using design tools

COURSE OUTCOMES:

CO 1:	Explain purpose and features of design thinking process	**Understand**
CO 2:	Use required tools to empathize with the stockholders to identify the problem	**Apply**
CO 3:	Define the identified problem elaborately and clearly	**Apply**
CO 4:	Develop prototypes for conceptual solutions	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	1	2	3	2	-	-	-	-	1	1	1	1	1
CO 2	1	2	3	2	-	-	-	-	1	1	1	1	1
CO 3	1	2	3	2	-	-	-	-	1	1	1	1	1
CO 4	1	2	3	2	-	-	-	-	1	1	1	1	1

SYLLABUS:

UNIT I: FUNDAMENTALS OF DESIGN THINKING **3 + 6**

Introduction to Design Thinking: Definition, relevance, and applications – Contexts and situations where Design Thinking is most effective – Core process of implementing Design Thinking – Stakeholders involved in a Design Thinking approach – Design The Thinking – Personal Visualization, The Wheel of Life, and Balancing Priorities – Understanding and appreciating the concept of 'Design' – The 3 Laws of Design Thinking

UNIT II: THE EMPHATHIZE STAGE **3 + 6**

Understanding Stakeholders – Role of Empathy in Design Thinking – Tools: Persona, Journey Mapping, Stakeholder Mapping, CATWOE, Cartographic Perspective (L0), Empathy Map – Case Study

UNIT III: THE DEFINE STAGE **3 + 6**

Problem Framing and Reframing – Role of a Design Thinker – Tools: Five Whys, Anti-Pattern, Problem Paraphrasing, Challenge Mapping – Introduction to LORD Skillset – Case Study

UNIT IV: THE DIVERGENCE AND CONVERGENCE STAGE **3 + 6**

Ideation through Divergent and Convergent Thinking – Tools: Brainstorming, Metaphor, Random Association, End-State Visualization, 10gm–100gm–1000gm – Prototyping Basics – Wire framing – Case Study – Communicating for Effective Outcome

UNIT V: THE COMMUNICATION STAGE **3 + 6**

Presenting and Packaging Design Outcomes – Tools: 4Cs Framework, Naming, Packaging, Storyboarding, Presentation Techniques, Distribution Methods

LIST OF EXPERIMENTS

1. Personal Visualization
2. 3 Laws of Design Thinking®
3. Persona
4. Journey Mapping
5. Cartographic Perspective
6. Anti-Pattern, Problem Paraphrasing
7. Brainstorming
8. 10gm–100gm–1000gm
9. Prototyping Basics
10. Storyboarding
11. Presentation Techniques

LEARN BEYOND CONTENT:

- Design Thinking for Digital Transformation

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd., 2018
2. Idris Mootee, Design Thinking for Strategic Innovation, John Wiley & Sons Inc, 2013
3. Arun Jain, UnMukt: Science & Art of Design Thinking, School of Design Thinking, 2020

REFERENCES:

1. Roger Martin, The Design of Business: Why Design Thinking is the Next Competitive Advantage,Harvard Business Press, 2009
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), Design Thinking: Understand – Improve– Apply, Springer, 2011
3. Liedtka , Andrew King, Kevin Bennett , Book - Solving Problems with Design Thinking - Ten Stories of What Works, Columbia Business School Publishing, 2013
4. Maurício Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, Design thinking: Business Innovation, MJV Press, 2011
5. Burgelman, Christensen, and Wheelwright, Strategic Management of Technology and Innovation, 5th Edition, McGraw Hill Publications, 2017

SEMESTER I & II

U25MCC05	Biology for Engineers (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the biological concepts from an engineering perspective
- To understand the importance of human physiology and sensing techniques
- To perform the various laboratory tests with the relevant instruments / equipment

COURSE OUTCOMES:

CO 1:	Interpret the biological concepts of cell and its structure	**Understand**
CO 2:	Describe the importance of human physiology	**Understand**
CO 3:	Summarize the various sensing techniques and assistive devices	**Understand**
CO 4:	Utilize the instruments / equipment to perform the microbial growth and laboratory tests	**Precision**
CO 5:	Apply the principles to demonstrate the microbial growth and laboratory test	**Precision**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	1	1	-	-	-	-	-	-	-	-	1	1	1
CO 2	1	1	-	-	-	-	-	-	-	-	1	1	1
CO 3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO 4	1	2	2	1	-	-	-	1	2	1	1	1	1
CO 5	1	2	2	1	-	-	-	1	2	1	1	1	1

SYLLABUS:

UNIT I: BASICS OF CELL **5**

Cell structure and function – Cell division – Mitosis – Meiosis – Cell Membrane potential

UNIT II: HUMAN PHYSIOLOGY **5**

Circulatory system – Respiratory system – Digestive system – Neurology system Carbohydrates – Proteins and amino acid – Nucleic acid (DNA and RNA)

UNIT III: SENSING TECHNIQUES AND ASSISTIVE DEVICES **5**

Sensory organs: Eyes and ears – Visual aids – Hearing aids – Electronic nose – Electronic tongue – Electronic skin

UNIT IV: BIOINSPIRATION **15**

Demonstration on bionic principles in nature-inspired design – Exploration of biomimetic materials and their engineering applications – Identification of natural structures mimicked in robotics and sensors – Observation and analysis of bioinspired prototypes (e.g., soft actuators, lotus-effect surfaces)

UNIT V: BASIC LABORATORY TESTS **15**

Separation of serum – Identification of blood groups – Estimation of blood pressure – Measurement of pH – Acquisition of ECG signals – Introduction to bioinformatics for biomedical data interpretation: visualization of gene/protein sequences, exploration of databases such as NCBI and UniProt, and understanding their applications in clinical diagnostics and personalized medicine

LEARN BEYOND CONTENT:

- Lab-on-a-Chip

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Campbell N.A., Reece J.B., Urry L., Cain M.L. and Wasserman S.A., “Biology: A global approach”, 12th edition, Pearson Education Ltd, 2020
2. Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., “Biology for Engineers”, 1st edition, Tata McGraw-Hill, 2018
3. Elaine N. Marieb and Suzanne. M. Keller, “Essential of Human Anatomy and Physiology”, 12th edition, Pearson Education, 2017

REFERENCES:

1. Leslie Cromwell, Erich A. Pfeiffer, Fred J. Weibell, “Biomedical Instrumentation”, 2nd Edition, Prentice Hall, 2011
2. Arthur T Johnson, “Biology for Engineers”, 1st edition, CRC press, 2011
3. David. L. Nelson, Michael. M. Cox, “Lehninger Principles of Biochemistry”, 7th edition, WH Freeman, 2017
4. John Enderle and Joseph Bronzino, “Introduction to Biomedical Engineering”, 3rd edition, Academic Press, 2012