



Learn Beyond

**KPR Institute of
Engineering and
Technology**

(Autonomous, Affiliated to Anna University)

CURRICULUM AND SYLLABI REGULATIONS – 2025

Department of
Mechatronics Engineering

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 transdisciplinary department for the development of academic excellence and research in the field of Mechatronics, catering to the needs of the Industry and the Society

Mission

The mission of the department is to

- Preparing graduates to suit the requirements of the Industry by offering quality education
- Providing an education ecosystem to foster R&D, innovation, creativity, and entrepreneurship
- Inculcating professionalism, ethics, human values and lifelong learning practices

III. Program Educational Objectives (PEOs)

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

PEO1: The graduates of Mechatronics Engineering will possess adequate knowledge and skills to succeed in their professional career

PEO2: The graduates of Mechatronics Engineering will analyze, design, and develop a transdisciplinary engineering-based products and processes for real world applications

PEO3: The graduates of Mechatronics Engineering will practice their profession with good ethics and human values

IV. Program Outcomes (POs)

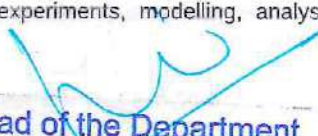
Graduates of the MECHATRONICS ENGINEERING will be able to

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)


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- 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 MECHATRONICS ENGINEERING will be able to

- PSO1:** Graduates will be able to apply their gained knowledge and skills to design, develop and implement mechatronics systems in the field of engineering and sciences
- PSO2:** Graduates will be able to apply innovative ideas and multidisciplinary approaches to solve real world problems

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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	2	2	3	2	2	2	2	2	3	3	3
PEO 2	3	3	3	3	3	2	2	2	2	3	3	3	3
PEO 3	1	2	2	2	2	3	3	3	3	2	2	2	2

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	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓
	Applied Chemistry for Electronics Engineers	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
	Python Programming and Applications	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
	Digital Technologies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Electrical and Electronics for Mechatronics	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
	Chinese for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	French for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Japanese for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Hindi for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	German for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Induction Program - Universal Human Values I	-	-	-	-	-	✓	✓	✓	-	-	✓	✓	-
	Heritage of Tamils	-	-	-	-	-	-	✓	✓	-	✓	-	-	-
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	-
II	Computer Fundamentals and Coding Essentials	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
	English Proficiency II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Mathematical Transforms	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	✓
	Physics for Electrical and Electronics Engineering	✓	✓	✓	✓	-	-	-	-	-	-	-	✓	✓
	Environmental Science and Sustainability	✓	✓	✓	✓	-	-	✓	✓	✓	-	✓	✓	✓
	C Programming and Applications	✓	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	✓
	3D Modelling and Assembly	✓	✓	✓	✓	✓	✓	-	✓	✓	-	-	✓	✓
	Manufacturing and Mechatronics Practice Laboratory	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓

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Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	Mechanics for Mechatronics	✓	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓
	Chinese for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Hindi for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	French for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Japanese for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	German for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Universal Human Values II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	-
	Tamils and Technology	-	-	-	-	-	-	✓	✓	-	✓	-	✓	✓
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	-
	Computer Fundamentals and Coding Essentials	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
III	Probability and Statistics	✓	✓	-	-	✓	-	-	-	-	-	-	✓	✓
	Engineering Thermodynamics	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
	Fluid Mechanics and Machinery	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓
	Sensors and Signal Processing	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓
	Electronic Devices and Digital Circuits	✓	✓	✓	-	✓	-	-	-	✓	-	✓	✓	✓
	Electrical Drives and Control	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	✓	✓
	Data Structures and Algorithms	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓
	Manufacturing Processes Laboratory	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
	Essence of Indian Traditional Knowledge	-	✓	-	✓	-	-	✓	-	-	-	-	✓	-
	Professional Skill Development - I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV	Numerical Methods and Partial Differential Equations	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓
	Microcontroller and Embedded Systems	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓
	Object Oriented Programming Using Java	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Theory of Machines	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓
	Metrology and CNC	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Microcontroller and Embedded Systems Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	-	✓	✓	✓
	Object Oriented Programming Using Java Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Indian Constitution	-	-	-	-	-	✓	✓	✓	-	-	-	✓	-
	Professional Skill Development - II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓


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MECHATRONICS 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	U25CY102	Applied Chemistry for Electronics Engineers	BSC	TwL	2	-	2	-	3
5	U25MI101	Python Programming and Applications	ESC	TwL	2	-	2	-	3
6	U25CSG03	Digital Technologies	ESC	T	1	-	-	-	1
7	U25MI102	Electrical and Electronics for Mechatronics	PCC	TwL	1	-	4	-	3
8	U25LEG01	German for Engineers - I	HSMC	TwL	1	-	2	-	2
	U25LEG02	Japanese for Engineers - I							
	U25LEG03	French for Engineers - I							
	U25LEG04	Hindi for Engineers - I							
	U25LEG09	Chinese for Engineers - I							
Total									19
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MCC01	Induction Program - Universal Human Values I	MCC	MCC	2	1	-	-	3
10	U25MCC02	Heritage of Tamils	MCC	Tamil Courses	1	-	-	-	1
11	U25MCC03	Design Thinking	MCC	MCC	1	-	2	-	2
	U25MCC04	Computer Fundamentals and Coding Essentials @							
	U25MCC05	Biology for Engineers \$							
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	U25PH205	Physics for Electrical and Electronics Engineering	BSC	TwP	2	-	-	2	3
4	U25CY201	Environmental Science and Sustainability	BSC	TwL	1	-	2	-	2
5	U25MI201	C Programming and Applications	ESC	TwL	2	-	2	-	3
6	U25MI202	3D Modelling and Assembly	ESC	L	-	-	4	-	2
7	U25MI203	Manufacturing and Mechatronics Practice Laboratory	PCC	L	-	-	4	-	2
8	U25MI204	Mechanics for Mechatronics	PCC	T	3	-	-	-	3

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No	Course Code	Title	Category	Type	L	T	P	J	C
9	U25LEG05	German for Engineers - II	HSMC	TwL	1	-	2	-	2
	U25LEG06	Japanese for Engineers - II							
	U25LEG07	French for Engineers - II							
	U25LEG08	Hindi for Engineers - II							
	U25LEG10	Chinese for Engineers - II							
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	Tamils and Technology	MCC	Tamil Courses	1	-	-	-	1
12	U25MCC03	Design Thinking	MCC	MCC	1	-	2	-	2
	U25MCC04	Computer Fundamentals and Coding Essentials @							
	U25MCC05	Biology for Engineers \$							
Total									6

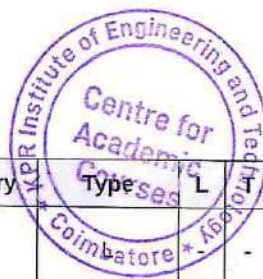
\$ - For Non-Biology Students, @ - For Biology Students

SEMESTER III

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25MA302	Probability and Statistics	BSC	TwL	2	-	2	-	3
2	U25MEG04	Engineering Thermodynamics	PCC	T	3	-	-	-	3
3	U25MEG05	Fluid Mechanics and Machinery	PCC	T	3	-	-	-	3
4	U25MI301	Sensors and Signal Processing	PCC	TwL	2	-	2	-	3
5	U25MI302	Electronic Devices and Digital Circuits	PCC	TwL	2	-	2	-	3
6	U25EEG04	Electrical Drives and Control	ESC	TwL	2	-	2	-	3
7	U25ADG02	Data Structures and Algorithms	PCC	TwL	3	-	2	-	4
8	U25MI303	Manufacturing Processes Laboratory	PCC	L	-	-	4	-	2
Total									24
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MNC02	Essence of Indian Traditional Knowledge	MNC	MNC	1	-	-	-	-
10	U25MCC08	Professional Skill Development - I	MCC	MCC	-	-	-	-	1
Total									1

SEMESTER IV

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25MA403	Numerical Methods and Partial Differential Equations	BSC	T	3	-	-	-	3
2	U25MI401	Microcontroller and Embedded Systems	PCC	T	3	-	-	-	3
3	U25CSG11	Object Oriented Programming Using Java	PCC	T	3	-	-	-	3
4	U25MEG06	Theory of Machines	PCC	TwL	3	-	2	-	4
5	U25MI402	Metrology and CNC	PCC	TwL	1	-	2	-	2
6	U25MI403	Microcontroller and Embedded Systems Laboratory	PCC	LWP	-	-	2	2	2



No	Course Code	Title	Category	Type	L	T	P	J	C
7	U25CSG13	Object Oriented Programming Using Java Laboratory	PCC			-	2	-	1
8	-	Open Elective I	OEC	T	1	-	4	-	3
					3	-	-	-	
					2	-	2	-	
Total									21
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MNC03	Indian Constitution	MNC	MNC	1	-	-	-	-
10	U25MCC09	Professional Skill Development - II	MCC	MCC	-	-	-	-	1
Total									1

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

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SEMESTER I

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

QP PATTERN: A

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

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

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

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SEMESTER I

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

QP PATTERN: A

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 Understand
such as vibrations and stability

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	-	-	-	-	-	-	-	-	-	2	2
CO 3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO 4	2	2	-	-	-	-	-	-	-	-	-	2	2
CO 5	2	2	-	2	1	-	-	-	-	-	-	2	2

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

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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

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

QP PATTERN: A

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: Explain the modulus of elasticity and stress-strain behavior of materials to infer the elastic properties of materials Understand
- 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 in semiconductors and the performance of devices such as Hall effect sensors and Schottky diodes Apply
- CO 5: Organise the principles of laser and fiber optics for industrial and medical applications Apply

CO - PO MAPPING:

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

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


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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

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

U25CY102	Applied Chemistry for Electronics Engineers (Common to BM, EC, EE, MI)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To explain the properties, classifications and engineering applications of polymeric materials
- To describe corrosion mechanisms and evaluate electrochemical principles relevant to energy conversion and storage technologies
- To investigate the materials and working principles underlying display technologies, photonic devices, sensors, and wafer fabrication processes

COURSE OUTCOMES:

- CO 1:** Execute polymer synthesis, molecular weight determination using viscometry, and the structure–functional behavior of polymers in electronic applications.(Apply) **Apply**
- CO 2:** Utilize appropriate corrosion prevention and coating strategies for engineering materials based on corrosion analysis. **Apply**
- CO 3:** Implement appropriate energy storage devices and colorimetric analysis based on photochemical principles **Apply**
- CO 4:** Execute sensor principles in pH-metric and conductometric titrations for solution analysis and in materials used for display and smart sensing devices. **Apply**
- CO 5:** Employ wafer fabrication techniques for manufacturing micro- and nanoelectronic devices and for extracting copper from PCB boards. **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	-	1	1	1
CO 2	3	2	1	1	-	-	-	1	1	-	1	1	1
CO 3	3	2	1	1	-	-	-	1	1	-	1	1	1
CO 4	3	2	1	1	-	-	-	1	1	-	1	2	2
CO 5	3	2	1	1	-	-	-	1	1	-	1	2	2

SYLLABUS:

UNIT I: POLYMERIC MATERIALS

6 + 6

Polymers – classification and properties, Polymer compounding: (Compression, Injection, Extrusion) – Conductive Polymers – (PANI, PEDOT) Synthesis, Properties, Mechanism and applications, Photochromic polymers: Azobenzenes, Diarylethenes – Mechanism of photo-switching, Electroluminescent polymers – Fabrication of light-emitting electrochemical cells and application, Biopolymers – PLA – Synthesis and applications – Packaging materials for integrated circuits – Purpose, key components and types


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UNIT II: CORROSION SCIENCE**6 + 6**

Types of corrosion – dry, wet – Electrochemical theory – Electrochemical series – Factors influencing corrosion and control methods – Cathodic protection – Corrosion inhibitors – anodic, cathodic, mixed – Metallic coatings – Electroplating – Tinning, Phosphating, Carburizing, Nitriding, Protective Coatings – Advanced surface treatments and protective coatings – powder and antifouling coatings – Self-healing and corrosion-sensing paints

UNIT III: ENERGY CONVERSION AND STORAGE**6 + 6**

Batteries – Classification, Fabrication & working – Li-polymer, LiFePO_4 – Fuel Cells (Proton Exchange Membrane, Solid Oxide Fuel Cell, Microbial Fuel Cells) and Green Hydrogen Technologies – Laws of Photochemistry – Jablonski Diagram, Solar Cells – Dye-Sensitized Solar Cells, Supercapacitors – Electrostatic double layer, Pseudocapacitors, Hybrid Supercapacitors

UNIT IV: MATERIALS FOR DISPLAY AND SENSING DEVICES**6 + 6**

Liquid Crystal Displays, OLED, QLED – structure, properties and mechanism – Emerging Display Materials – Perovskite emitters – Phase-Change Memory (PCM) materials – Sensors – Electrochemical sensor, Conductometric, Potentiometric, pH metric titrations – principle, working and applications

UNIT V: WAFER TECHNOLOGY**6 + 6**

Semiconductors (GaAs, SiGe), Insulators and High Resistive Materials (Porcelain, Bakelite, Transformer oil, Epoxy, SF_6) – Wafer Manufacturing and Purification – Czochralski and Float Zone methods and applications – Photolithography and Microfabrication – Epitaxial Growth and its Significance – Smart Materials and Nano-enabled Devices – MEMS & NEMS

LIST OF EXPERIMENTS

1. Synthesis of Polyaniline (PANI) and Bakelite
2. Determination of molecular weight and degree of polymerisation of a given polymer using an Ostwald viscometer
3. Determination of rate of corrosion of mild steel by weight loss method
4. Potentiometric estimation of Fe present in corrosion medium
5. Estimate the concentration of copper (Cu^{2+}) or nickel (Ni^{2+}) in a given solution using colorimetric analysis based on Beer-Lambert's law
6. Evaluate the strength of the given HCl by pH metry
7. Determination of the amount of HCl present in the given solution by conductometric titration
8. Recover copper from waste printed circuit boards (PCBs) using chemical methods and estimate the amount of copper recovered using appropriate analytical techniques

CONTACT PERIODS:

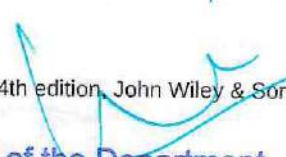
Lecture: 30 Periods Tutorial: - Periods Practical: 30 Periods Project: - Periods Total: 60 Periods

TEXTBOOKS:

1. Wiley India Pvt. Ltd., "Engineering Chemistry", 2nd edition, Wiley India Pvt. Ltd., New Delhi, 2013
2. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", 12th edition, Chand Publishing, New Delhi, 2024
3. R.V. Gadag and A. Nityananda Shetty, "Engineering Chemistry", 3rd edition, I.K. International Publishing House, New Delhi, 2014
4. Sunita Rattan, "Experiments in Applied Chemistry", 3rd edition, S.K. Kataria & Sons, New Delhi 2021

REFERENCES:

1. Fred W Billmeyer, "Textbook of Polymer Science", 4th edition, John Wiley & Sons, New York, 1999


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2. Lieng-Huang Lee, "Conductive Polymers and Plastics: In Industrial Applications", 1st edition, Springer, New York, 1990
3. M.F. Ashby and D.R.H. Jones, "Engineering Materials 2: An Introduction to Microstructures, Processing and Design", 4th edition, Elsevier, UK, 2012
4. Kirby W Beard, "Linden's Handbook of Batteries", 5th edition, McGraw Hill, New York, 2019
5. G.A Ozin and C.A. Andre, "Nanotechnology: A Chemical Approach to Nanomaterials", 2nd edition, Royal Society of Chemistry, Cambridge, 2005



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SEMESTER I

U25MI101	Python Programming and Applications	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand basic programming concepts using Python
- To apply Python for solving Mechatronics problems involving sensors, actuators, and automation
- To build logical thinking and problem-solving skills applicable to real-world engineering systems and debug code for data acquisition and control

COURSE OUTCOMES:

- CO 1: Apply basic Python programming constructs using IDEs to develop simple applications Apply
- CO 2: Apply control structures and user-defined functions to solve computational problems using Python Apply
- CO 3: Apply Python data structures and file handling techniques to manage and process data effectively Apply
- CO 4: Apply concepts of object – oriented and modular programming in Python Apply
- CO 5: Analyze sensor data and system responses using Python libraries such as NumPy and Matplotlib, and evaluate control algorithms in hardware simulation environments Analyze

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	-	-	2	-	-	-	-	1	-	2	2
CO 3	3	3	2	-	2	-	-	-	-	-	-	2	2
CO 4	3	2	2	-	2	-	-	-	2	-	-	3	2
CO 5	3	3	2	3	3	-	-	-	2	2	2	3	2

SYLLABUS:

UNIT I: INTRODUCTION TO PYTHON PROGRAMMING & DEVELOPMENT TOOLS

6 + 6

History and features of Python – Python IDEs: Thonny, PyCharm, Jupyter – Data types: Numbers, Strings, Lists, Tuples, Sets, Dictionaries – Variables, Constants, Operators, Expressions – Input and Output functions – Type casting and basic programs

UNIT II: CONTROL STRUCTURES AND FUNCTIONS

6 + 6

Decision Making: if, if-else, elif – Loops: while, for, range() – Loop control: break, continue, pass – Functions: definition, arguments, return values – Scope and recursion

UNIT III: PYTHON DATA STRUCTURES AND FILE HANDLING

6 + 6

Lists: operations, slicing, methods – Dictionaries: creation, methods – Sets and Tuples – File handling: opening, reading, writing, appending, closing files – Working with CSV files


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UNIT IV: OBJECT-ORIENTED PROGRAMMING AND MODULES**6 + 6**

Classes and Objects – Constructor and Destructor– Inheritance and Polymorphism – Creating and importing modules – Exception handling

UNIT V: INTRODUCTION TO MECHATRONICS APPLICATIONS USING PYTHON**6 + 6**

Introduction to interfacing with hardware (simulation or via PySerial) – Basics of numpy and matplotlib for data visualization – Plotting sensor data – Simple control system simulation – Basic AI models – Mini project: line follower algorithm logic/ temperature control system

LIST OF EXPERIMENTS

1. Simple I/O and arithmetic operations
2. Displaying sensor names and ranges
3. Writing simple math programs for basic mechanical formulas
4. Logic-based mechanical system emulation
5. Writing control logic for robot movement
6. Simulating conditional operations of an automated gate
7. File handling for sensor data logs
8. Storing sensor data in lists/dictionaries
9. Logging data from a virtual sensor to a CSV file
10. OOP-based actuator control mock-ups
11. Creating a class for motor and sensor objects
12. Developing a reusable module for a data acquisition system
13. Data plotting using matplotlib
14. Plotting sensor data (e.g., temperature, distance)
15. Logic implementation for a basic robotic task

CONTACT PERIODS:

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

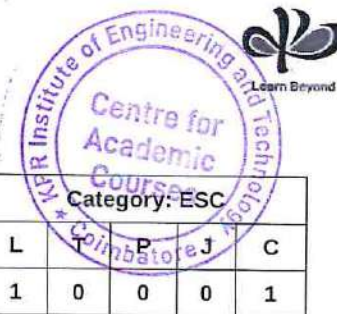
TEXTBOOKS:

1. Reema Thareja, Python Programming: Using Problem Solving Approach, 3rd edition, Oxford University Press, New Delhi, 2023
2. John V. Guttag, 2. John V. Guttag, Introduction to Computation and Programming Using Python, 3rd edition, MIT Press, Cambridge, Massachusetts, 2021

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Updated for Python 3, 2nd edition, Shroff/O'Reilly Publishers, Mumbai, 2016
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", 1st edition, Pearson India Education Services Pvt. Ltd., Bengaluru, 2016
3. <https://python-iitk.vlabs.ac.in/List%20of%20experiments.html>
4. <http://greenteapress.com/wp/think-python/>


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SEMESTER I

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

QP PATTERN: A

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 smart 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	3	2
CO 2	3	3	2	2	1	1	-	1	1	1	1	3	3
CO 3	3	2	3	1	2	1	-	1	2	2	1	3	2
CO 4	3	2	1	3	3	1	-	1	-	1	-	2	3
CO 5	3	2	1	1	2	1	1	1	-	1	1	2	3

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: SMART SYSTEMS AND ANALYTICS

6

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


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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

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


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SEMESTER I



U25MI102	Electrical and Electronics for Mechatronics	Category: PCC				
		L	T	P	J	C
		1	0	4	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the concept of circuit analysis and working principles of DC and AC machines
- To equip students with the knowledge to analyse the operation and characteristics of different measuring instruments and semiconductor devices
- To develop an ability to integrate electronic systems into mechatronic applications

COURSE OUTCOMES:

CO 1:	Explain the basic electrical concepts with suitable examples	Understand
CO 2:	Explain the constructional features and working principles of electrical machines	Understand
CO 3:	Demonstrate the operating principles and working of measuring instruments	Apply
CO 4:	Apply the operating principles of semiconductor devices and analyze basic electronic circuits for practical applications	Apply
CO 5:	Describe the digital logic concepts and techniques to design, analyze, and implement basic combinational circuits	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: ELECTRIC CIRCUITS

3 + 12

Basic Electrical Concepts: Voltage, Current, Power and Energy – Ohm's law and Kirchoff's laws – Mesh and nodal analysis – Series, Parallel networks, Brief introduction to capacitor and inductor

UNIT II: ELECTRICAL MACHINES

3 + 12

Construction, Working principle and speed–torque characteristics: DC and AC (single phase and three phase induction) motor – Types – Torque equation, Linear actuators, Servo Control and Stepper Control

UNIT III: INSTRUMENTS AND MEASUREMENT SYSTEMS

3 + 12

Functional elements of Instrument – Units and Standards of Measurements – Measurement accuracy and error – Digital Multimeter, Digital Storage Oscilloscope, Data Acquisition Systems

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UNIT IV: SEMICONDUCTOR DEVICES AND APPLICATIONS**3 + 12**

Construction and Characteristics: PN Junction diode, Zener diode, SCR – Applications in Mechatronics and Automation

UNIT V: DIGITAL SYSTEMS**3 + 12**

Number base conversion – Boolean algebra: simplification of Boolean function – Logic gates – Combinational circuits: Adders, Multiplexer and Demultiplexer

LIST OF EXPERIMENTS

1. Industry Visit: Electrical Machines
2. Industry Visit: Special Machines
3. Industry Visit: Measuring Instruments
4. Industry Visit: Automation
5. Ohm's Law and Kirchhoff's Laws
6. SCR Characteristics
7. Verification of basic and universal gates
8. Half Adder and Full Adder

CONTACT PERIODS:

Lecture: 15 Periods Tutorial: - Periods Practical: 60 Periods Project: - Periods Total: 75 Periods

TEXTBOOKS:

1. Salivahnan S, Rengaraj R, Venkatakrishnan R, "Basic Electrical, Electronics and Measurement Engineering", 1st edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2021
2. Bhattacharya S K, "Electrical Machines", 4th edition, McGraw Hill Education, New Delhi, 2017

REFERENCES:

1. Sawhney A K, "A Course in Electrical & Electronic Measurement and Instrumentation", 18th edition, Dhanpat Rai & Co., New Delhi, 2015
2. Mitchel E Schultz, "Basic Electronics" 10th edition, McGraw Hill Publishers, New Delhi, 2017
3. Morris Mano M, Micheal D Ciletti, "Digital Design, 6th edition, Pearson, Noida, 2018



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SEMESTER I

U25LEG01	German for Engineers - I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

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	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	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

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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



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SEMESTER I

U25LEG02	Japanese for Engineers - I (Common to all programmes)					Category: HSMC				
						L	T	P	J	C
						1	0	2	0	2

QP PATTERN: A

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	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	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

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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


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SEMESTER I

U25LEG03	French for Engineers - I (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

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	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	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)


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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



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SEMESTER I

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

QP PATTERN: A

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	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	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

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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 (kō) 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, "Prathamik 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


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SEMESTER I

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

QP PATTERN: A

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 吗 – Learning abbreviated questions with 呢 – Practice dialogues: exchanging names and personal details

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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


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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

QP PATTERN: A

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	-	-
CO 2	-	-	-	-	-	3	3	3	-	-	3	-	-
CO 3	-	-	-	-	-	3	3	-	-	-	3	1	-
CO 4	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 5	-	-	-	-	-	3	3	3	-	-	3	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


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


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SEMESTER I

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

QP PATTERN: A

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 Thina 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	-	-	-
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 3	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 5	-	-	-	-	-	-	3	3	-	2	-	-	-

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

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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


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SEMESTER I & II

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

QP PATTERN: A

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 5: Present the identified solution to all the stakeholders	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	2	1
CO 2	1	2	3	2	-	-	-	-	1	1	1	2	3
CO 3	1	2	3	2	-	-	-	-	1	1	1	2	2
CO 4	1	2	3	2	-	-	-	-	1	1	1	3	2
CO 5	1	2	3	2	-	-	-	-	1	1	1	2	2

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 EMPATHIZE STAGE

3 + 6

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

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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

CONTACT PERIODS:

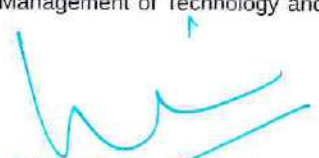
Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

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


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SEMESTER I & II

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

QP PATTERN: A

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	2	1
CO 2	3	3	3	-	2	2	-	-	-	-	2	3	2
CO 3	3	2	-	-	2	-	-	-	-	-	-	3	2

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

- Identifying computer components
- Installation and debugging of Operating System

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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

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



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SEMESTER I & II

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

QP PATTERN: A

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	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 4	3	2	1	1	-	-	-	1	2	1	1	-	-
CO 5	3	2	1	1	-	-	-	1	2	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)

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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

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



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SEMESTER II

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

QP PATTERN: A

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

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

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

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SEMESTER II



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

QP PATTERN: A

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	-	-	-	-	-	-	-	-	-	3	3
CO 2	3	2	-	-	-	-	-	-	-	-	-	3	3
CO 3	3	2	-	-	-	-	-	-	-	-	-	3	3
CO 4	3	2	-	-	-	-	-	-	-	-	-	3	3
CO 5	2	2	-	2	1	-	-	-	-	-	-	3	3

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

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UNIT IV: INVERSE LAPLACE TRANSFORM

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

6 + 6

UNIT V: Z-TRANSFORM

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

6 + 6

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

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



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SEMESTER II

U25PH205	Physics for Electrical and Electronics Engineering (Common to EE, MI)	Category: BSC				
		L	T	P	J	C
		2	0	0	2	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the role of materials in electronics, solar energy, and thermoelectric applications
- To analyze the efficiency, stability, and challenges of photovoltaic and energy storage materials
- To explore emerging materials (2D, wide-bandgap semiconductors) and sensor technologies

COURSE OUTCOMES:

CO 1:	Understand the fundamentals of conductors, semiconductors, and insulators in electronic devices	Understand
CO 2:	Apply the knowledge of thermoelectric materials for energy harvesting applications	Apply
CO 3:	Compare Li-ion, solid-state, and supercapacitor materials for energy storage systems.	Analyze
CO 4:	Apply optoelectronic materials and emerging 2D materials for electronic device fabrication	Apply
CO 5:	Design sensor systems using piezoelectric, pyroelectric, and shape-memory materials	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: MATERIALS FOR ELECTRONICS AND SOLAR ENERGY

6 + 6

Basics of conductors, semiconductors, and insulators – Engineering materials: ceramics, polymers, and composites – Photovoltaics: Working of solar cells, types of materials (silicon-based, thin-film, organic, and perovskite solar cells) – Efficiency, stability, and material challenges in PV technology

UNIT II: MATERIALS FOR THERMOELECTRICITY

6 + 6

Thermoelectric effects (Seebeck, Peltier, Thomson) – Thermoelectric figure of merit (ZT), and material properties (σ , S, κ) – Thermoelectric materials (Bi_2Te_3 , PbTe, oxides) Applications – Waste heat recovery, cooling technologies – Hybrid vehicles

UNIT III: ENERGY STORAGE MATERIALS

6 + 6

Energy storage systems for portable electronics and electric vehicles – Li-ion Batteries – Sodium-ion – potassium-ion – magnesium-ion-multivalent batteries – Solid-state batteries (ceramic & polymer electrolytes) – Supercapacitor materials (carbon-based, transition metal oxides, conducting polymers)

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UNIT IV: OPTOELECTRONIC AND EMERGING MATERIALS**6 + 6**

Transparent Conducting Oxides, Nonlinear Optics, LED, Photodetectors (Si, InGaAs), Emerging Materials & Applications – 2D materials (graphene, Transition Metal Dichalcogenides) for flexible electronics – Wide-bandgap semiconductors (SiC, GaN) for power devices

UNIT V: MATERIALS FOR SENSOR APPLICATIONS**6 + 6**

Principles of sensor operation – Inductance, capacitance, and resistance – Piezoelectric materials- pyroelectric materials, electroactive polymers, magneto-resistive and shape memory alloys – Applications of sensors in temperature, pressure, motion, and light detection

LIST OF PROJECTS

1. Design and Testing of a Mini Solar Cell Panel
2. Material Characterization of Photovoltaic Layers
3. Recycling Silicon Waste for Low-Cost Solar Panels
4. Fabrication of a Simple Thermoelectric Generator (TEG)
5. ZT Calculation of a Thermoelectric Material
6. Waste Heat Recovery System for Industrial Exhaust
7. Comparison of Li-ion and Na-ion Battery Performance
8. Development of a Solid-State Electrolyte
9. High-Capacitance Supercapacitor Using Carbon Nanomaterials
10. Fabrication of a Transparent Electrode Using ITO or Graphene
11. Design a Simple LED Circuit with Color-Tuning Capability
12. Photodetector Using 2D Material (Graphene or MoS₂)
13. Multifunctional Sensor Using Piezoelectric Material
14. Smart Glove with Embedded Sensors
15. Design of a Pyroelectric Motion Detector

CONTACT PERIODS:

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

TEXTBOOKS:

1. Safa Kasap, Principles of Electronic Materials and Devices, 4th Edition, McGraw-Hill Education, New Delhi 2018
2. N. M. Ravindra, Thermoelectrics: Fundamentals, Materials Selection, Properties, and Performance, ISBN 978-3-319-96339-6, Springer, 2019
3. Robert Huggins, Energy Storage: Fundamentals, Materials and Applications, ISBN: 9783319212395, Springer, 2016

REFERENCES:

1. J. Wilson and J. F. B. Hawkes, Optoelectronics: An Introduction to Materials and Devices, 3 edition, ISBN-13-978-9352866663, Pearson, 2018
2. Jacob Fraden Handbook of Modern Sensors: Physics, Designs, and Applications" 5th Edition, Springer, 2016
3. https://onlinecourses.nptel.ac.in/noc21_mm03/preview


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SEMESTER II

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

QP PATTERN: A

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: Utilize the ecosystem and biodiversity conservation concepts to address environmental issues Apply
- CO 2: Implement atmospheric and hydrospheric concepts for water quality parameter determination. Apply
- CO 3: Develop effective strategies to manage land-use challenges, agricultural issues, and waste management practices Apply
- CO 4: Utilize technological tools to monitor environmental issues, resource recovery, and pollution control processes Apply
- CO 5: Implement sustainable development strategies for green practices and waste management Apply

CO - PO MAPPING:

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

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)


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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. Hydrosphere – Hydrological Cycle – Water Quality Parameters, water pollution – Causes, effects, control measures, Overutilization of Ground Water – Water Conservation Strategies, Microplastics as emerging pollutants-Causes, effects and control measures 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. E-waste-causes, effects and control measures. 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 & Disaster management cycle – Floods, Landslides, Land Clearing Projects – Dam sites, Highways projects. Resettlement and Rehabilitation (R&R). Population – Global and national growth patterns, Population explosion, Role of information Technology (IT) in Environmental studies and human health monitoring. 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 Development – Introduction, Concepts and Strategies, Sustainable Practices and Circular Economy – 5Rs, Zero Waste Lifestyle. Sustainable Agriculture, 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. Estimation of hardness (total, temporary, permanent) in water samples
2. Iodometric / Argentometric determination of available chlorine in a sample of bleaching powder.
3. Estimation of dissolved oxygen in water.
4. Determination of nitrate/ammonium estimation — colorimetric tests for nitrate/ammonium to study N availability
5. Recovery of Aluminum from waste materials.
6. Photocatalytic degradation of dye using TiO_2 .
7. Synthesis of biodiesel from vegetable oil.
8. Coir pith composting and application study.
9. Determination of conductivity, TDS and turbidity test for potable water

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

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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



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SEMESTER II

U25MI201	C Programming and Applications	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamentals of C programming in the context of engineering problem solving
- To develop algorithmic thinking and structured programming practices
- To strengthen skills in embedded C relevant to microcontrollers and mechatronic applications

COURSE OUTCOMES:

CO 1:	Apply C programming concepts and development tools to write and debug basic programs for general and embedded systems	Apply
CO 2:	Apply control structures and logical operations to implement decision-making in mechatronics systems	Apply
CO 3:	Apply the concepts of functions, arrays, and pointers to develop efficient C programs for data storage, sensor data processing, and basic string manipulation	Apply
CO 4:	Apply structures, unions, and file operations for data logging in real-time systems	Apply
CO 5:	Apply memory management, modular programming, and preprocessor directives to build efficient C programs for sensor data and application integration	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: INTRODUCTION TO C PROGRAMMING & DEVELOPMENT TOOLS

6 + 6

Introduction to programming languages – Procedural vs. Embedded – C language fundamentals – Keywords, constants, variables, data types – Input and output statements – Data types and memory allocation – Compilation, Debugging, and Execution – Use of IDEs – Introduction to Embedded C: similarities and differences

UNIT II: CONTROL STRUCTURES AND LOGICAL OPERATIONS

6 + 6

Operators: Arithmetic, Logical, Bitwise – Control structures: if, else, switch, while, for, do-while – Use of decision-making in mechatronic applications (sensor thresholds, modes)

UNIT III: FUNCTIONS, ARRAYS, AND POINTERS

6 + 6

Function definition and calling – recursion basics – Arrays: 1D and 2D – data storage, averaging sensor arrays – Pointers: basics, pointer arithmetic, call by reference – String handling functions

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UNIT IV: STRUCTURES, UNIONS, AND FILE HANDLING**6 + 6**

User-defined data types – Structures and Unions – Nested structures for real-time systems – File operations: read/write for logging data – Application in data acquisition and diagnostics

UNIT V: ADVANCED CONCEPTS IN C PROGRAMMING AND APPLICATIONS**6 + 6**

Dynamic Memory Allocation – Memory management for large sensor data arrays – Command – line Arguments: Accepting inputs during program execution – Error Handling in C –Preprocessor Directives: #define, #include, #ifdef, macros, conditional compilation – Modular Programming in C: Multi-file program structure, header files and implementation files –Parameters to understand efficiency of program – Application Integration

LIST OF EXPERIMENTS

1. Basic interface and Introduction
2. LED blinking simulation
3. Displaying sensor data
4. Motor direction control using decision logic
5. Timer-based delay logic
6. Writing reusable functions for sensor averaging pointer-based buffer for ADC values
7. Struct-based data logging
8. Simulate file creation for robot movement logs
9. Program to allocate memory for sensor data using malloc
10. Write modular code with header files for temperature control logic
11. Use of macros and conditional compilation for debug vs. release modes
12. Simple command-line tool to simulate user input and control flow

CONTACT PERIODS:

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

TEXTBOOKS:

1. Yashavant Kanetkar, "Let Us C", 17th edition, BPB Publications, New Delhi, 2023
2. David D. Railey and Kenny A.Hunt , "Computational Thinking for Modern problem Solver", 1st edition, CRC Press, New York, 2014

REFERENCES:

1. Paolo Ferragina and Fabrizio Luccio, "Computational Thinking First Algorithms", Then Code",1st edition, Springer International Publishing, Switzerland, 2018
2. Reema Thareja, "Programming in C", 2nd edition, Oxford University Press, New Delhi, 2016
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1st edition, Oxford University Press, New Delhi, 2009
4. Online Resources: NPTEL, Tinkercad Circuits, Keil uVision tutorials


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SEMESTER II

U25MI202	3D Modelling and Assembly	Category: ESC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamentals of sketching, drafting, and 3D modelling for mechatronic components
- To develop skills in parametric modelling using features, patterns, and configurations
- To enable simulation of assemblies and mechanisms with proper documentation, dimensioning, and BOM generation

COURSE OUTCOMES:

CO 1: Demonstrate competency with multiple drawing and modification commands	Apply
CO 2: Create three-dimensional solid models and Apply industry standards in the preparation of technical mechanical drawings	Apply
CO 3: Apply advanced modeling tools like multibody design, shell/rib features, and configuration table to create parametric models	Apply
CO 4: Assemble mechanical and robotic systems using appropriate mating techniques and simulate kinematic motions	Apply
CO 5: Create detailed 2D engineering drawings with annotations, GD & T, and develop a BOM for assemblies	Apply

CO - PO MAPPING:

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

LIST OF EXPERIMENTS

1. SKETCHING AND DRAFTING: Sketch entities – lines, rectangles, circles, polygons, splines, arcs, ellipses, centerlines; Sketch tools – offset, convert, trim; Sketch relations; Reference geometry – planes, axis, mate; references; Drawing views; Annotations. Lab Exercises: A. Individual part modelling of a bearing and a valve B. Individual part modelling of various couplings (rigid, flexible etc.)
2. 3D MODELING AND EVALUATIONS: Boss and cut features – extrudes, revolves, sweeps, lofts; Fillets and chamfers; Linear, circular and fill patterns; Dimensions; Feature conditions – start and end; Mass properties; Materials. Lab Exercises: C. 3D Modelling of machine building components (gears, shafts, brackets) D. 3D Modelling of robotic accessories (grippers, mounts, end-effectors)
3. ADVANCED MODELLING TOOLS AND CONFIGURATIONS: Multibody Part Design – Shell and Rib Features, Draft and Mirror Features; Design Tables and Configurations, Import/Export File Handling. Lab Exercises: E. Multi-configuration modelling of actuators F. Parametric modelling of a servo bracket with varying dimensions

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4. 3D ASSEMBLY AND SIMULATIONS: Inserting components; Standard mates – coincident, parallel, perpendicular, tangent, concentric, distance, angle; Reference geometry – planes, axis, mate references. Lab Exercises: G. Assembly and Simulation of four bar and slider crank mechanisms H. Assembly and Simulation of a 4 axis Robotic arm
5. TECHNICAL DRAWING AND DOCUMENTATION: Detailing and Drawing Generation from 3D to 2D, Assembly Drawings with BOM, GD & T (Geometric Dimensioning & Tolerancing), Title Blocks, Revision Tables and Tolerances. Lab Exercises: I. Create Engineering drawings for modeled parts J. BOM generation for assemblies and exploded views

CONTACT PERIODS:

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

REFERENCES:

1. Matt Lombard, "SolidWorks 2013 Bible", Wiley Publishing Inc, Canada, 2013
2. Paul Tran, "SolidWorks 2023: A Power Guide for Beginners and Intermediate Users", CAD Artifex, 2023.
3. David C. Planchard and Marie P. Planchard, "Engineering Design with SolidWorks 2022 and Video Instruction", SDC Publications, 2022
4. Sham Tickoo, "SolidWorks 2022 for Designers", CADCIM Technologies, 2022
5. <https://www.solidworks.com/support/training/classroom-training-courses>


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SEMESTER II



U25MI203	Manufacturing and Mechatronics Practice Laboratory	Category: PCC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To develop foundational fabrication and machining skills through hands-on practice in sheet metal work, welding, carpentry, turning, threading, drilling, and knurling operations
- To familiarize students with essential electrical and electronic assembly techniques, including soldering and circuit building.
- To integrate mechanical and electrical components by applying sensor-actuator principles in basic pneumatic control tasks for practical problem-solving

COURSE OUTCOMES:

- CO 1: Apply fabrication processes such as cutting, drilling, tapping, and welding to create mechanical components Apply
- CO 2: Demonstrate soldering techniques to assemble functional electronic circuits Apply
- CO 3: Apply pneumatic control principles to operate and troubleshoot actuators and sensors Apply
- CO 4: Use basic machining tools to produce components with turning, threading, and knurling operations Apply
- CO 5: Use basic machining tools to produce components with drilling, reaming and boring operations Apply

CO - PO MAPPING:

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

LIST OF EXPERIMENTS

- Introduction to Fabrication Fabrication of sheet metal tray/funnel/any innovative model using cutting, drilling, tapping, polishing and assembly operation
- Preparation of MS plate for Lap, Butt and Tee joints using arc welding
- Constructing a T-joint or a half-lap joint using carpentry
- Soldering of a simple circuit consists of THC and SMD components
- Introduction to Sensors and Actuators Test the response and range of the inductive and capacitive proximity sensor to various materials
- Perform direct control of a single-acting cylinder for both extension and retraction
- Perform direct and indirect control of the double-acting cylinder
- Basic Machining Practices Basic machining Part 1: Turning, tapered turning, and grooving
- Basic machining Part 2: External Threading and Internal Threading, and diamond knurling

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10. Basic machining Part 3: Drilling, reaming, and boring

CONTACT PERIODS:

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

REFERENCES:

1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjhar Roy S.K., "Elements of Workshop Technology Vol. I & II", 15th edition, Media Promoters & Publishers Pvt. Ltd., Mumbai, 2019
2. R.S. Khurmi, J.K. Gupta, "A Textbook of Workshop Technology", 11th edition, S. Chand & Company Ltd., New Delhi, 2018
3. Clarence W. de Silva, "Sensors and Actuators: Engineering System Instrumentation", 2nd edition, CRC Press, New Delhi, 2015



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SEMESTER II

U25MI204	Mechanics for Mechatronics	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamental principles of statics and dynamics, including force systems, equilibrium, and friction
- To develop the ability to analyze mechanical systems involving particles and rigid bodies in motion
- To impart knowledge on kinematics and kinetics to solve real-world mechanical engineering problems with the concepts of work, energy and power

COURSE OUTCOMES:

- CO 1:** Analyze the composition and resolution of forces and apply equilibrium conditions to static structures and machines **Apply**
- CO 2:** Apply the principles of friction and solve problems involving dry friction in systems like wedges, ladders, and belts **Apply**
- CO 3:** Apply laws of motion, work-energy, and impulse-momentum principles to solve particle and rigid body dynamics problems **Apply**
- CO 4:** Evaluate work, power, and energy concepts in machines and apply Bernoulli's and Archimedes' principles in relevant contexts **Apply**
- CO 5:** Determine mechanical advantage and efficiency in various mechanisms including lifting machines, belt drives, and oscillatory systems **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: FORCES AND EQUILIBRIUM

9

Composition of Forces – Principle of Resolution – Varignon's Principle of Moments – Lami's theorem, Levers: Simple and Compound – Couple – Principle of Equilibrium – Trusses – Centroids and Centre of Mass – Moment of Inertia – Principal Moment of Inertia – Mass moment of Inertia

UNIT II: KINEMATICS OF RIGID BODIES AND DYNAMICS OF PARTICLES

9

Displacement - Velocity and Acceleration and their Relationship – Relative Motion – Curvilinear Motion – Projectile Motion. Dynamics of Particles: Newton's Law, Work – Energy and Impulse – Momentum Principles – Impact of Elastic Bodies. Kinematics of Rigid Body: Translation - Rotation about a Fixed Axis – General Plane Motion

UNIT III: KINETICS OF RIGID BODIES AND FRICTION

9

Kinetics of Rigid Body. Laws of Dry Friction, Sliding Friction – Types of Friction – Friction Force – Equilibrium Analysis of Simple Systems with Sliding Friction – Ladder, Wedge and Belt Friction

UNIT IV: WORK POWER ENERGY

9

Engine Power – Dynamometer – Law of Conservation of Energy – Archimedes Principle – Buoyancy – Newton's Law of Collision of Elastic Bodies – Bernoulli's Theorem

UNIT V: DRIVING COMPONENTS OF MECHANISMS

9

Mechanical Advantage and Efficiency – Lifting Machines and their Types – Belt Drives: Types and Characteristics – Velocity Ratio, Slip, Power and Tension – Pulley, Springs and Pendulums

CONTACT PERIODS:

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

TEXTBOOKS:

1. Vela Murali, "Engineering Mechanics", 2nd edition, Oxford University Press, New Delhi, 2018
2. S. S. Bhavikatti, "Engineering Mechanics", 8th edition, New Age International Publishers, New Delhi, 2021

REFERENCES:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers: Statics and Dynamics", 8th edition, Tata McGraw-Hill Publishing company, New Delhi, 2014
2. S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, Engineering Mechanics, 4th edition, TMH Education, New Delhi, 2016
3. Sanjay Bansal, R.K. Bansal, "A Textbook of Engineering Mechanics", 8th edition, Laxmi Publications Pvt Ltd, New Delhi, 2011



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SEMESTER II

U25LEG05	German for Engineers - II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

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: 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



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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


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SEMESTER II

U25LEG06	Japanese for Engineers - II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

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 Remember vocabulary and phrases
- 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 Apply with improved accuracy

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: 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


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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: ～が大好きです / ～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: そうですね / 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



U25LEG07	French for Engineers - II (Common to all programmes)	Category: HSMC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

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: 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

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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


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SEMESTER II

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

QP PATTERN: A

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 Remember vocabulary and phrases
- 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 Apply with improved accuracy

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: 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

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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 – Question 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, "Prathamik 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


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SEMESTER II

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

QP PATTERN: A

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

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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


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SEMESTER II

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

QP PATTERN: A

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 Understand profession
- CO 2:** Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Understand Body, Intention and Competence of an individual, etc
- 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	2	-
CO 2	-	-	-	-	-	-	-	2	3	-	-	2	-
CO 3	-	-	-	-	-	-	-	-	3	-	1	2	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	1	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	2	-

SYLLABUS:

UNIT I: INTRODUCTION-BASIC HUMAN ASPIRATION, ITS FULFILLMENT THROUGH ALL ENCOMPASSING6 + 3 RESOLUTION

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)

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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 Govindarajan, 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


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SEMESTER II

U25MCC07	Tamil and Technology (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

QP PATTERN: A

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
CO 3	-	-	-	-	-	-	3	3	-	2	-	2	1
CO 4	-	-	-	-	-	-	3	3	-	2	-	1	2
CO 5	-	-	-	-	-	-	3	3	-	2	-	1	2

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 beads – Archeological evidences – Gem stone types described in Silappathikaram

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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



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SEMESTER III

U25MA302	Probability and Statistics (Common to BM, CE, CH, EC, EE, ME, MI)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

COURSE OBJECTIVES:

- To introduce the fundamental concepts of probability and statistics relevant to engineering
- To facilitate with students, use their understanding of statistical methods for data analysis and inference in their areas of study
- To develop probabilistic models to handle uncertainty and charts to check for quality control in engineering systems

COURSE OUTCOMES:

CO 1:	Explain the fundamental concepts of probability and examine discrete probability distributions	Understand
CO 2:	Apply suitable continuous distributions, such as uniform, exponential and normal to interpret and analyse statistical data	Apply
CO 3:	Calculate and evaluate covariance and correlation to examine the relationship between two random variables using pairs of random variables	Apply
CO 4:	Determine the estimation theory of parameters, testing of hypotheses for means and apply the Chi-square test for attribute independence	Apply
CO 5:	Perform analysis of variances to compare the means of multiple samples and apply control charts to check for quality control	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
CO 2	3	2	-	-	2	-	-	-	-	-	-	1	1
CO 3	3	2	-	-	2	-	-	-	-	-	-	1	1
CO 4	3	2	-	-	2	-	-	-	-	-	-	2	2
CO 5	3	2	-	-	2	-	-	-	-	-	-	2	2

SYLLABUS:

UNIT I: ONE-DIMENSIONAL DISCRETE RANDOM VARIABLES

6 + 6

Probability – Conditional probability, independence – Baye's theorem – Discrete random variables, probability mass functions – Cumulative distribution functions – Mean and variance – Binomial, Poisson and geometric distributions

UNIT II: ONE-DIMENSIONAL CONTINUOUS RANDOM VARIABLES

6 + 6

Continuous random variables – Probability density functions – Cumulative distribution functions – Mean and variance – Uniform, exponential, normal distributions

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UNIT III: TWO-DIMENSIONAL PROBABILITY DISTRIBUTIONS**6 + 6**

Two dimensional discrete and continuous random variables – Marginal probability distributions – Independence – Covariance – Correlation

UNIT IV: INFERENCE STATISTICS**6 + 6**

Estimation - Point estimation – Interval estimation – Hypothesis testing – Hypotheses concerning means – Large, small samples - Chi square test for independence of attributes

UNIT V: ANOVA AND STATISTICAL QUALITY CONTROL**6 + 6**

Analysis of variance – Completely randomized designs – Randomized block designs – Control charts for measurements ($\bar{X}$, R charts) – Control charts for attributes (p, np)

LIST OF EXPERIMENTS

1. One-Dimensional Discrete Random Variables – Mean and Variance of discrete RVs. – Discrete Probability distributions
2. One-Dimensional Continuous Random Variables – Mean and Variance of Continuous RVs. – Continuous Probability distributions
3. Two- Dimensional Probability Distributions – Marginal Probability distributions – Covariance and Correlation
4. Inferential Statistics – Estimation theory – Testing of hypotheses
5. ANOVA and SQC – Analysis of Variance. – Control charts ($\bar{X}$, R, p, np)

CONTACT PERIODS:

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

TEXTBOOKS:

1. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", Wiley, 2018
2. Richard A. Johnson, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 2017

REFERENCES:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability & Statistics for Engineers & Scientists", Pearson Education, New Delhi, 2016
2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi 2020
3. Sheldon M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic press, USA, 2020
4. Robert V. Hogg, Elliot Tanis and Dale Zimmerman, "Probability and Statistical Inference", Pearson Education, USA, 2014


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SEMESTER III

U25MEG04	Engineering Thermodynamics (Common to ME, MI)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To comprehend fundamental thermodynamic principles and laws relevant to modern engineering applications
- To analyze energy systems and evaluate their efficiency and sustainability
- To apply thermodynamic concepts in real-world systems including HVAC, renewable energy, and electric vehicle applications

COURSE OUTCOMES:

- CO 1: Demonstrate the fundamental thermodynamic concepts and the application of the first law in engineering systems **Apply**
- CO 2: Apply the second law of thermodynamics to evaluate the performance of thermal systems and identify sources of irreversibility **Apply**
- CO 3: Interpret the thermodynamic properties of pure substances and mixtures using standard tables and charts **Apply**
- CO 4: Analyze thermodynamic relations and simulate system performance using simulation software for various thermodynamic cycles **Analyze**
- CO 5: Infer psychrometric processes and propose efficient HVAC and modern thermal management solutions **Analyze**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: FUNDAMENTAL AND FIRST LAW

9

Basic concepts – System, control volume, properties, state, process, equilibrium and cycle – Zeroth law and temperature scales – First law for closed systems (energy balance) and open systems (Steady Flow Energy Equation) – Applications to engineering devices: Turbines, compressors, pumps, nozzles, boilers, and condensers – Simulation – Introduction to energy conversion – Efficiency – Sustainability perspective


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UNIT II: SECOND LAW AND ENTROPY

9

Limitations of the first law – Kelvin–Planck and Clausius statements – Reversibility and the Carnot cycle – Entropy as a property – The principle of entropy increase – Entropy generation – Introduction to Exergy (Availability) and irreversibility – Second law efficiency for thermal systems – Applications: Performance evaluation of heat engines – Refrigerators – Heat pumps

UNIT III: PROPERTIES OF PURE SUBSTANCE AND GAS MIXTURES

9

Properties of pure substances – P-V-T surfaces – Phase diagrams – Thermodynamic property tables – T-S and Mollier (h-s) diagrams for steam – Ideal Gas Model and Equations of State for real gases (e.g., Van der Waals) – Thermodynamic properties of gas mixtures: Dalton's and Amagat's Laws – Introduction to modern and eco-friendly working fluids (low-GWP refrigerants)

UNIT IV: THERMODYNAMICS RELATIONS AND APPLICATIONS

9

Fundamental thermodynamic relations: Maxwell relations – T-ds equations – Clapeyron equation – Application to property estimation and specific heats – Performance analysis of gas power cycles and vapor power cycles – Simulation

UNIT V: PSYCHROMETRY AND MODERN APPLICATIONS

9

Psychrometric properties – Psychrometric chart – Analysis of psychrometric processes using simulation – Sensible heating and cooling – Humidification and dehumidification – Adiabatic saturation – Evaporative cooling – Air conditioning load calculations – Applications in modern thermal management systems: Electric Vehicle cabin cooling/heating – Data center cooling – Sustainable HVAC design

CONTACT PERIODS:

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

TEXTBOOKS:

1. P. K. Nag, "Engineering Thermodynamics", 7th Edition, McGraw Hill Education, 2025
2. Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", 10th Edition, McGraw Hill, 2023
3. R. K. Rajput, "Engineering Thermodynamics", 6th Edition, Laxmi Publications, 2023

REFERENCES:

1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, "Fundamentals of Engineering Thermodynamics", 9th Edition, Wiley India, 2020
2. Adrian Bejan, J. A. Jones, "Advanced Engineering Thermodynamics", 4th Edition, Wiley, 2016
3. P. Chattopadhyay, "Engineering Thermodynamics", 2nd Edition, Oxford University Press, 2016


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SEMESTER III

U25MEG05	Fluid Mechanics and Machinery (Common to ME, MI)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the fluid properties and their flow dynamics
- To solve the fluid flow problems and analyze the performance of the hydraulic machines
- To impart knowledge of dimensional analysis in fluid flow

COURSE OUTCOMES:

CO 1:	Determine the properties of fluids and solve fluid dynamics problems	Apply
CO 2:	Apply concepts of boundary layer, flow through pipes, and loss estimation methods to compute and analyze performance of pipe flow systems in engineering applications	Apply
CO 3:	Use the principles of dimensional analysis and similitude to develop dimensionless parameters and predict prototype performance from model studies in fluid systems	Apply
CO 4:	Investigate the performance of pumps using velocity triangles, efficiencies and characteristic	Analyze
CO 5:	Evaluate the performance characteristics of turbines using velocity triangles, efficiencies and specific speed	Analyze

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: FLUID PROPERTIES, STATICS AND DYNAMICS

9 + 6

Importance and applications of fluid mechanics – Units and Dimensions – Properties of fluids – Mass density – Specific weight – Specific volume – Specific gravity – Viscosity – Compressibility – Surface tension – Capillarity – Pressure and its measurement (description only) – Introduction to fluid kinematics and dynamics: types of fluid flow – Continuity equation – Euler's equation of motion – Bernoulli's equation and its applications – Momentum equation – Moment of momentum equation

UNIT II: BOUNDARY LAYER AND FLOW THROUGH PIPES

9 + 6

Boundary layer concepts – Types of boundary layer thickness – Hagen – Poiseuille equation – Losses in pipes – Loss due to friction and Darcy Weisbach equation – Moody diagram – Minor losses – Hydraulic gradient and total energy line – flow through pipes in parallel and series – Simulation of flow over a flat plate to visualize boundary layer growth using simulation software

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UNIT III: DIMENSIONAL ANALYSIS

9 + 6

Introduction to dimensional analysis – Dimensional homogeneity – Methods of dimensional analysis – Similitude and its types – Dimensionless numbers – Model analysis and model laws – Undistorted and distorted models

UNIT IV: HYDRAULIC PUMPS

9 + 6

Definition and classifications – Efficiencies – Centrifugal pumps – Working principle – Velocity triangles – Work done by impeller – Specific speed – Performance curves Reciprocating pumps – Working principle – Indicator diagram – Pressure vessel – Simple problems – Performance curve generation using simulation software

UNIT V: HYDRAULIC TURBINES

9 + 6

Classification of turbines – Pelton Francis and Kaplan turbine: Working principles – Heads and efficiencies – Velocity triangles – Work done by the runner – Draft tube – Specific speed – Unit quantities – Performance curves – Simple problems – Performance curve generation using simulation software

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 11th Edition, Laxmi Publications, 2024
2. P. N. Modi, S. M. Seth, "Hydraulics & Fluid Mechanics including Hydraulic Machines", 23rd Edition, Standard Book House, 2022

REFERENCES:

1. A. K. Jain, "Fluid Mechanics Including Hydraulic Machine", 13th Edition, Khanna Publishers, 2021
2. Frank M. White, "Fluid Mechanics", 9th Edition, Tata McGraw Hill, 2020
3. R. K. Rajput, "A Text Book of Fluid Mechanics and Hydraulic Machines", 6th Edition, S Chand & Co Ltd, 2020



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SEMESTER III

U25MI301	Sensors and Signal Processing	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25RPH01 - Engineering Physics

COURSE OBJECTIVES:

- To understand the concept of measurements and sensors
- To learn the different sensors used to measure various physical parameters
- To learn the fundamentals of signal processing circuits used in mechatronics system development

COURSE OUTCOMES:

CO 1:	Infer the basic concepts of measurement systems and sensors	Understand
CO 2:	Demonstrates the sensor's basic working principles based on the change in R, L, and C and smart sensors	Apply
CO 3:	Apply the working principle and applications of proximity, optical, magnetic, and heading sensors	Apply
CO 4:	Build the basic concepts of the signals and operational amplifier for filter applications	Apply
CO 5:	Choose a suitable signal conditioning system to enhance the quality of the signal	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: INTRODUCTION TO MEASUREMENT AND SENSORS

6 + 6

Basics of Measurement – Classification of errors– Static and dynamic characteristics of transducers – Classification of sensors – Sensor Output Signal Types – Sensor calibration techniques

UNIT II: TRANSDUCTION PRINCIPLE- RESISTIVE, INDUCTIVE, CAPACITIVE

6 + 6

Resistive transducers: Potentiometer, RTD, Thermistor – Thermocouple – Strain gauge, Inductive transducer: LVDT, Capacitive transducers – Introduction to Smart Sensors

UNIT III: PROXIMITY, OPTICAL, MAGNETIC AND HEADING SENSORS

6 + 6

Accelerometer – GPS, Ultrasonic Ranging, Bio sensors, Opto-electronic sensors, Fiber optic sensor– Magnetic Sensors – Hall Effect – Current sensor Heading Sensors – Compass, gyroscope

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UNIT IV: FUNDAMENTALS OF SIGNALS AND OPERATIONAL AMPLIFIERS**6 + 6**

Standard signals – Operations on signal – Classification of signals – Periodic and aperiodic signal, odd and even signal, energy and power signal, causal and non-causal signal – Ideal op-amp– DC characteristics – Bias, offset, thermal drift – AC characteristics – Frequency response, slew rate – Case Study on Low pass and high pass filter

UNIT V: SIGNAL CONVERTERS AND PROCESSING**6 + 6**

Design of S/H circuit, D/A converter (weighted resistor and R– 2R ladder types), A/D converters (Successive approximation types), DC bridges: Classification of resistances – Wheatstone bridge. AC bridges: Maxwell's inductance bridge, Basics of Virtual Instrumentation and Data Logging.

LIST OF EXPERIMENTS

1. Determination of load, torque, and force using a strain gauge
2. Determination of the characteristics of various temperature sensors (Thermocouple, RTD & Thermistors)
3. Study the characteristics of the Hall Effect sensor and its applications
4. Measurement of water level using capacitive level sensor
5. Measurement of speed, position, and direction using encoders
6. Measurement of linear and angular displacement using potentiometer
7. Measurement of torque using torque sensor

CONTACT PERIODS:

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

TEXTBOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th edition, Dhanpat Rai & Company Private Limited, New Delhi, 2015
2. Patranabis D, "Sensors and Transducers", 2nd edition, PHI, New Delhi, 2011

REFERENCES:

1. Patranabis D, "Principles of Industrial Instrumentation", Tata McGraw-Hill, Third edition, 2010
2. John G. Webster, HalitEren, "Measurement, Instrumentation, and Sensors Handbook", (2014), Second Edition, CRC Press.
3. Ramon Pallas.Amey and John G.Webster, "Sensors and Signal Conditioning", 2nd edition, John Wiley & Sons, 2012



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SEMESTER III

U25MI302	Electronic Devices and Digital Circuits	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To infer the operation and characteristics of semiconductor devices
- To understand the basics of digital logic circuits
- To design the combinational and sequential logic circuits

COURSE OUTCOMES:

CO 1: Outline the operation and characteristics of semiconductor devices	Apply
CO 2: Demonstrate the operation, input and output characteristics of BJT, JFET and MOSFET	Apply
CO 3: Compute the Boolean functions using K-Map method	Apply
CO 4: Design of the combinational logic circuits	Apply
CO 5: Construct the synchronous sequential circuits and VHDL programming	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: SEMICONDUCTOR DEVICES

6 + 6

Construction and operation of LED, LASER, LDR and Photo diode – V-I Characteristics – SiC and GaN – Rectifiers: types and analysis – Applications

UNIT II: TRANSISTOR AND APPLICATIONS

6 + 6

Transistor: Types, construction, operation and characteristics of BJT, JFET, and MOSFET – Transistor Configuration: CB, CE and CC – Applications

UNIT III: DIGITAL ELECTRONICS FUNDAMENTALS

6 + 6

Boolean postulates and laws – Minimization of Boolean expressions – Canonical forms – Karnaugh map, Tabulation Method – Don't care conditions

UNIT IV: COMBINATIONAL LOGIC CIRCUITS

6 + 6

Adder – Subtractor – Multiplexer / Demultiplexer – Encoder / Decoder – Applications

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UNIT V: SEQUENTIAL LOGIC CIRCUITS

6 + 6

Latches: SR – SR, JK, D and T Flip flops – Analysis and design of clocked sequential circuits – Design of synchronous and asynchronous counters – Introduction to VHDL programming – Applications

LIST OF EXPERIMENTS

1. Determine the volt–ampere characteristics of the LED and photodiode
2. Determine the DC output voltage of the halfwave and full wave rectifiers
3. Obtain the input and output characteristics of the common emitter transistor configuration
4. Design of the multiplexer and demultiplexer circuits using basic gates
5. Design and simulation of encoder and decoder circuits
6. Design of SR and JK flip–flops using NAND gates and verify its truth table
7. Simulation of synchronous and asynchronous counters

CONTACT PERIODS:

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

TEXTBOOKS:

1. Salivahanan S, Sureshkumar N, Vallavaraj A, "Electronic Devices and Circuits", 3rd edition, Tata McGraw–Hill India, 2010.
2. Morris Mano M, Michael D Ciletti, "Digital Design", 6th edition, Pearson, 2018

REFERENCES:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electronic Devices and Circuits", 4th edition, McGraw-Hill India, 2015
2. Yang, "Fundamentals of Semiconductor Devices", 1st Edition, McGraw-Hill International, 2017
3. Thomas L.Floyd, "Digital Fundamentals", 11th edition, Prentice Hall, 2015
4. Anand Kumar A, "Fundamentals of Digital Circuits", 2nd edition, PHI Learning, 2013

SEMESTER III

U25EEG04	Electrical Drives and Control (Common to ME, MI)	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the basic concepts of power semiconductor devices and electric drives
- To acquire the knowledge in the characteristics and operation of DC, AC drives and servo motors
- To understand the control techniques and applications of DC and AC drives

COURSE OUTCOMES:

CO 1:	Infer the construction and operation of power semiconductor devices	Apply
CO 2:	Apply the characteristics of various types of electric drives to determine the steady state stability	Apply
CO 3:	Demonstrate the operation and control techniques of DC motor drives	Apply
CO 4:	Demonstrate the operation and control strategies of AC motor drives and servo motors	Apply
CO 5:	Select the motor drives for industrial applications	Apply

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: POWER SEMICONDUCTOR DEVICES

6 + 6

Basic components of electric drive system – Load characteristics – Types of electric motor drives – Power electronic switches (SCR, MOSFET, IGBT) – Selection of drives

UNIT II: DRIVE CHARACTERISTICS

6 + 6

Electric drive – Equations governing motor load dynamics – Steady state stability – Multi quadrant Dynamics – Selection of power rating – Speed torque characteristics – Various types of loads

UNIT III: DC DRIVES

6 + 6

Converter: Types – 2 pulse and 6 pulse converter – Speed control of DC motors using controlled rectifiers – DC choppers: Control strategies – Four quadrant operation – BLDC motors – Principle of operation – Drive schemes

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UNIT IV: AC DRIVES**6 + 6**

Inverter: types – VSI and CSI operation – Induction motor drives – Torque equation – Speed control of 3-phase induction motor – Stator voltage and frequency control – Rotor resistance control: Slip power recovery scheme – Inverter fed induction motor drive – Servo Mechanism

UNIT V: APPLICATIONS OF DRIVES**6 + 6**

Selection of motor – Digital techniques in speed control – Microcontroller based control of electric drives – Drive applications in robotic process automation

LIST OF EXPERIMENTS

1. VI characteristics of power semiconductor devices (SCR, MOSFET and IGBT)
2. Load on DC shunt motor
3. Load test on three phase induction motor
4. Single phase half controlled and fully controlled converter
5. Speed control of DC motor drive
6. Speed control of induction motor drive
7. Speed control of BLDC motor drive
8. Simulation of speed control of DC and AC drive

CONTACT PERIODS:

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

TEXTBOOKS:

1. Bimbhra B.S., "Power Electronics", 5th edition, Khanna Publishers, New Delhi, 2018
2. Vedam Subrahmanyam, "Electric Drives: Concepts and Applications", 2nd edition, McGraw Hill, New Delhi, 2017

REFERENCES:

1. Singh M.D. and Kanchandhani K.B., "Power Electronics", 2nd edition, McGraw Hill, New Delhi, 2017
2. Theraja B.L. and Theraja A.K., "A Text Book of Electrical Technology", Revised edition, S. Chand and Co. Ltd., New Delhi, 2015
3. Gopal K. Dubey, "Fundamentals of Electrical Drives", 2nd edition, Narosa Publishing House, New Delhi, 2022


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SEMESTER III

U25ADG02	Data Structures and Algorithms (Common to AD, BM, EC, EE, MI)	Category: PCC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of ADT and data structure types
- To learn linear and non linear data structures
- To explore tree and graph data structures

COURSE OUTCOMES:

- CO 1:** Implement linear data structures such as lists, stacks and queues using array-based and linked-list-based techniques **Apply**
- CO 2:** Apply searching and sorting techniques to solve real-time data organization problems **Apply**
- CO 3:** Apply tree-based data structures including binary trees, binary search trees and AVL trees to perform efficient data representation, traversal and manipulation **Apply**
- CO 4:** Apply graph representations and graph algorithms to solve problems involving traversal, shortest paths, topological ordering and minimum spanning trees **Apply**
- CO 5:** Explain the analysis of algorithms, time and space complexity **Understand**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: LINEAR DATA STRUCTURES – LIST, STACKS, QUEUES

9 + 6

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list-based implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of linked list: Polynomial ADT, Radix sort, Multilist. Stack ADT – Operations – Applications – Symbol balancing - Evaluating arithmetic expressions – Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – DeQueue – Applications of queues

UNIT II: SEARCHING, SORTING AND HASHING TECHNIQUES

9 + 6

Searching: Linear Search—Binary Search. Sorting: Bubble sort-Insertion sort-Selection sort- Merge sort - Quick sort. Hashing – Hash Functions – Separate Chaining – Open Addressing –Rehashing – Extendible Hashing

UNIT III: NON-LINEAR DATA STRUCTURES – TREES

9 + 6

Tree ADT – Tree traversals – Binary Tree ADT – Expression trees – Binary search tree ADT –AVL Trees

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UNIT IV: NON-LINEAR DATA STRUCTURES - GRAPHS

9 + 6

Introduction to Graph – Types of graph-Representation of graphs – Graph traversal: Breadth-first traversal – Depth-first traversal – Topological ordering –Dijkstra's algorithm- Minimum spanning tree algorithms – Prims algorithm - Kruskal's Algorithm

UNIT V: ALGORITHM ANALYSIS

9 + 6

Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non recursive algorithms.

LIST OF EXPERIMENTS

1. A small library stores the list of newly arrived books in an array-based structure. The librarian wants to maintain the order of arrival. Given the arrival sequence: "AI Basics", "Data Science", "Python 101", "Algorithms", "Machine Learning", Insert them into an array-based List ADT. A book "Cyber Security" arrives and must be inserted at position 3. Later, "Python 101" is removed as it's damaged. Design the array-based List ADT operations to update the list and display the final order.
2. A hospital needs to maintain a waiting list of patients dynamically as patients arrive and get treated. Insert patients: Jofin, Priya, Abdul, Meera in order. A senior citizen "Ravi" should be added after Priya. "Abdul" leaves before consultation. Using Linked List ADT, show how the list changes after each operation.
3. An airport check-in counter processes passengers using a circular queue system. Passengers arriving in order: P1, P2, P3, P4, P5. The queue size is 4 due to staff shortage. • Enqueue all passengers in order and show how overflow occurs. Two passengers are processed (dequeued). P6 and P7 arrive. Simulate these operations using array-based circular queue and show rear/front updates.
4. A bank uses a linked-list-based queue for serving customers. Customers: A, B, C arrive. Then D arrives. B and C are served. Implement the queue operations and show the dynamic linked list changes.
5. A sports event records running times of participants. The unsorted times are 15.2, 12.8, 20.5, 11.6, 19.3. The coach wants to sort the times to shortlist top performers. Apply Bubble Sort and Insertion Sort separately to sort the timings. Show the status of the list after each pass for both algorithms.
6. An online store wants to quickly sort product prices for discount analysis. Prices are 499, 199, 999, 350, 150, 750. Use Quick Sort (first element as pivot) and show partition steps. Use Merge Sort and show the splitting and merging stages.
7. A college stores roll numbers of students in a system. For a particular exam, the roll numbers are sorted [101, 115, 130, 145, 152, 170, 185]. • Apply Binary Search and show mid calculations for each iteration. Compare it with how Linear Search would behave for the same case. A teacher wants to find whether roll number 152 is present.
8. A company stores employee IDs in a hash table of size 10. Employee IDs: [1001, 1123, 1198, 1455, 1677]. Apply open addressing and closed addressing hashing techniques and show the optimal one.
9. A university stores student scores in a BST for quick rank retrieval. Scores: [75, 60, 90, 45, 65, 85, 95]. Construct the BST. Apply inorder, preorder, and postorder traversal. Later, student scores 45, 65 and 75 need removal due to correction. Show the tree after each deletion and state the rule used.
10. A delivery company wants to find the fastest delivery route between warehouses in a city. Given a weighted graph (distances between warehouses): $A \rightarrow B : 4$ $A \rightarrow C : 2$ $B \rightarrow D : 5$ $C \rightarrow B : 1$ $C \rightarrow D : 8$ $D \rightarrow E : 6$ Apply Dijkstra's algorithm starting from A and determine: Shortest path from A to all other warehouses. Distance table update for each step.
11. A telecom company wants to lay cables between cities at minimum cost. The network between cities is modeled as a weighted graph. Apply Prim's algorithm to find the Minimum Spanning Tree and list the edges selected at each step, growing MST, total cost.
12. A power grid network wants to connect electricity stations with minimal wiring cost. The weighted edges between stations are provided. Apply Kruskal's algorithm by sorting edges by weight.

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Reema Thareja, "Data Structures and Algorithms", 1st edition, Oxford University Press, 2025
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Techno Series, 2024

REFERENCES:

1. R. Venkatesan, S. Lovelyn Rose, "Data Structures", 2nd Edition, Wiley, 2019
2. Seymour Lipschutz, "Data Structures", 2nd Edition, McGraw Hill Education, 2017
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Pearson Education Asia, 2013



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SEMESTER III

U25MI303	Manufacturing Processes Laboratory	Category: PCC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To provide hands-on exposure to casting, forming, machining, sheet metal, welding, finishing and advanced manufacturing processes
- To train students in selecting machines, tools, cutting parameters and process variables for common manufacturing operations
- To enable students to prepare process plans, operation sheets, CNC simulation outputs and time-cost estimates for simple components

COURSE OUTCOMES:

CO 1: Prepare sand moulds, demonstrate basic casting practice and identify simple casting defects	Apply
CO 2: Perform turning, drilling and milling operations by selecting suitable tools and cutting parameter	Apply
CO 3: Perform sheet metal and welding operations and inspect common process defects	Apply
CO 4: Select grinding wheels and demonstrate grinding or surface finishing processes for common applications	Apply
CO 5: Prepare a complete process plan with CNC simulation, operation sheet, time estimate and cost estimate for a selected component	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	1	1	1	1
CO 2	3	2	1	2	1	-	-	1	2	1	1	2	1
CO 3	3	2	2	1	1	-	-	1	1	1	1	2	2
CO 4	2	1	1	1	2	-	-	1	1	1	1	2	1
CO 5	3	2	2	2	3	-	-	1	2	1	2	3	2

LIST OF EXPERIMENTS

- Study of foundry tools, pattern allowances and preparation of a simple green sand mould
- Preparation of a simple casting route and identification of common casting defects using sample components
- Demonstration of rolling/drawing process for simple sections and observation of plastic deformation
- Lathe operations: facing, plain turning and step turning with selection of speed, feed and depth of cut
- Drilling operation: hole making, countersinking/counterboring and preparation of operation sheet
- Milling operation: plain or slot milling with selection of cutter, work holding and machining parameters
- CNC part programming and simulation for a simple turned or milled component using basic G/M codes
- Sheet metal operation: shearing and bending of a simple bracket/cover with bend allowance calculation.
- Welding practice: arc welding/GMAW/GTAW on simple joints and inspection of common weld defects
- Resistance spot welding demonstration and evaluation of joint quality for thin sheet components

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11. Grinding operation: surface/cylindrical grinding with grinding wheel selection for a given application
12. Demonstration/study of MAF and non-traditional processes: USM, AWJM, ECM and EDM using samples or simulation

CONTACT PERIODS:

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

TEXTBOOKS:

1. Groover, M. P., "Fundamentals of Modern Manufacturing", John Wiley and Sons Inc., 6th edition, 2015
2. Kalpakjian, S., "Manufacturing Engineering and Technology", Pearson Education India Edition, 6th edition, 2018

REFERENCES:

1. Rao, P. N., "Manufacturing Technology, Vol. 1 & 2", Tata McGraw Hill, 2013
2. Fitzpatrick, M., "Machining and CNC Technology", McGraw-Hill Education, 4th edition, 2013
3. Mishra, P. K., "Nonconventional Machining", Narosa Publishing House, New Delhi, 2018
4. Jain, V. K., "Advanced Machining Processes", Allied Publishers, New Delhi, 12th edition, 2010



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SEMESTER III

U25MNC02	Essence of Indian Traditional Knowledge (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- Understand the Concept of culture in ancient, medieval and modern period.
- Know the need and importance of Indian languages and Literature.
- Understand the various religion and philosophy in various periods.

COURSE OUTCOMES:

CO 1: Understand Philosophy of Indian culture

Understand

CO 2: Distinguish the Indian languages and literature.

Understand

CO 3: Learn the philosophy of ancient, medieval and modern Indian

Remember

CO 4: Acquire the information about the fine arts in India

Apply

CO 5: Know the contribution of scientists different eras

Understand

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: INTRODUCTION TO CULTURE

5

Culture, Civilization, Culture and heritage, General characteristics of culture, Importance of culture in human literature, Indian culture, Ancient India, Medieval India, Modern India

UNIT II: INDIAN LANGUAGES AND LITERATURE

5

Indian Languages and Literature-I: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, Literature of south India Indian Languages and Literature-II: Northern Indian Languages & literature, Temples and Temple types, Sculptors 's specialties, Temples Individualities Festivals and hopes

UNIT III: RELIGION AND PHILOSOPHY

5

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (Selected Movements only)

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UNIT IV: ARTS, SCIENCE, TECHNOLOGY& ENGINEERING IN INDIA**5**

Indian painting, Handicrafts, Music, Divisions of Indian classical music, Modern Indian music, Dance and drama, Indian architecture (ancient, medieval and modern), Science and technology in India, Development of science in different periods, Sushruta and Charaka, sages of South India, herbal treatments, Surgery methods of healers, Yoga and pranayama practices, Herbal usages and medication-making methods.

UNIT V: EDUCATION SYSTEM IN INDIA**5**

Education in ancient, Medieval and modern India, Aims of education, subjects, languages, science and scientists of Ancient India, Medieval India and Modern India

CONTACT PERIODS:

Lecture: 25 Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 25 Periods

TEXTBOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN: 978-8187276333, 2007.

REFERENCES:

1. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
2. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN: 9788120810990, 2014.
3. S. Narain, "Examinations in Ancient India", Arya Book Depot, 1993.
4. NCERT, "Position Paper on Arts, Music, Dance and Theatre", 2000.
5. B. Kumar Mohanta & Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", 2012.


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SEMESTER III

U25MCC08	Professional Skill Development - I (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		15 hours				1

COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

CO - PO MAPPING:

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

GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods


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SEMESTER IV

U25MA403	Numerical Methods and Partial Differential Equations (Common to CE, EE, ME, MI)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

COURSE OBJECTIVES:

- To provide knowledge of numerical methods for solving nonlinear equations, systems of linear equations, interpolation, differentiation, and integration problems
- To develop the ability to formulate and solve partial differential equations using standard analytical techniques
- To impart an understanding of Fourier series and boundary value problems arising in heat flow and wave propagation

COURSE OUTCOMES:

CO 1: Apply numerical methods to solve systems of linear equations and compare the efficiency of various solution techniques	Apply
CO 2: Apply interpolation techniques to estimate unknown values and analyze the accuracy of the approximations	Apply
CO 3: Implement numerical differentiation and integration methods to obtain approximate solutions and evaluate their accuracy	Apply
CO 4: Apply standard methods to solve partial differential equations and interpret the resulting solutions under given conditions	Apply
CO 5: Apply Fourier series and partial differential equation techniques to solve heat and wave equations under different boundary conditions	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	2
CO 3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO 4	3	2	-	-	-	-	-	-	-	-	-	2	2
CO 5	3	2	-	-	-	-	-	-	-	-	-	2	2

SYLLABUS:

UNIT I: SYSTEM OF EQUATIONS

9

Solution of nonlinear equations – Newton Raphson method, Regular false – Solution of system of linear equations – Gauss elimination method, Iterative solution of linear systems by Gauss-Seidel method

UNIT II: INTERPOLATION

9

Interpolation with equal intervals – Newton's forward and backward difference formulae, Interpolation with unequal intervals – Lagrange Interpolation

UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION

9

Approximation of derivatives using interpolation polynomials for an equal interval – Numerical Integration – Trapezoidal rule, Simpson's 1/3 rule, evaluation of double integrals by Trapezoidal rule

UNIT IV: PARTIAL DIFFERENTIAL EQUATIONS

9

Formation of Partial Differential Equations – Lagrange's linear equation – Solution of second-order homogeneous partial differential equations with constant coefficients

UNIT V: BOUNDARY VALUE PROBLEM

9

Fourier Series solutions – One-dimensional wave equation – One-dimensional heat flow equation (unsteady state) – Two-dimensional heat flow equation (Steady state, Cartesian form only)

CONTACT PERIODS:

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

TEXTBOOKS:

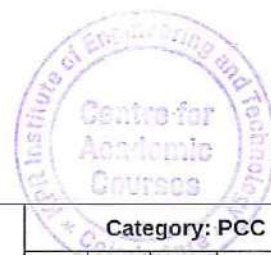
1. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", Tata McGraw Hill, New Delhi, 2021
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018

REFERENCES:

1. Curtis F Gerald and Patrick O Wheatly, "Applied Numerical Analysis", Pearson Education, New Delhi, 2017
2. Grewal, B S and Grewal J S, "Numerical Methods in Engineering and Science", , Khanna Publishers, New Delhi, 2015
3. Bali N.P., & Manish Goyal, "Engineering mathematics", 12th edition, Lakshmi Publication, 2016
4. Peter V.O`Neil, "Advanced Engineering Mathematics", Cengage, 2016



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SEMESTER IV

U25MI401	Microcontroller and Embedded Systems	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25MI302 - Electronic Devices and Digital Circuits

COURSE OBJECTIVES:

- To familiarize the architecture and assembly language programming of microprocessor and microcontroller
- To perform embedded C programming using the PIC 18 microcontroller's architecture
- To interface peripherals and external I/O's with the microcontroller using embedded C programming

COURSE OUTCOMES:

CO 1:	Interpret the basic concepts of the 8085 microprocessor and the 8051 Microcontroller	Understand
CO 2:	Develop assembly language programming for the 8051 Microcontroller	Apply
CO 3:	Model the architecture of the PIC 18 Microcontroller	Apply
CO 4:	Perform embedded C programming using the PIC 18 microcontroller	Apply
CO 5:	Develop the embedded C program for the peripheral and external I/O's	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	-	-	-	-	-	2	2	1
CO 2	3	2	1	2	3	-	-	-	-	-	2	3	2
CO 3	3	2	3	3	3	-	-	-	-	-	2	3	2
CO 4	3	2	3	3	3	-	-	-	-	-	2	3	3
CO 5	3	2	3	3	3	-	-	-	-	-	2	3	3

SYLLABUS:

UNIT I: INTRODUCTION TO MICROPROCESSOR AND MICROCONTROLLER

9

8085 Microprocessor Architecture and Pin diagram – Addressing modes – Registers – ALU, Bus systems – Instruction sets – Interrupts – Microprocessor Vs Microcontroller – 8051 Microcontroller Architecture – Features and Specifications.

UNIT II: ASSEMBLY LANGUAGE PROGRAMMING

9

Fundamentals of Assembly Language Programming – Instruction to Assembler – Basic Arithmetic and Logical Programming – Interfacing and Programming of Serial Communication – Stepper motor interfacing of 8051 Microcontroller

UNIT III: PIC 18 MICROCONTROLLER

9

Architecture of PIC 18 – Pin Description – Memory organization – Program memory – Data Memory – I/O Ports – Timers – Counters – External hardware interrupts – USART – ADC.

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UNIT IV: EMBEDDED C PROGRAMMING USING PIC 18 MICROCONTROLLER

9

Introduction to Embedded C Programming – Assembly language programming Vs Embedded C programming – Programming Structure – Data types – memory models – Infinite loops and interrupts handling – I/O port programming – Timer programming – Counter programming – Serial communication.

UNIT V: PERIPHERAL INTERFACING

9

Switch keypad – LCD – LED – ADC and DAC – I/O Programming – Sensors – Relays – Solenoid Valve and Heater – Stepper Motors – PWM Programming – Closed Loop Control Programming of DC Motors – Traffic Light control

CONTACT PERIODS:

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

TEXTBOOKS:

1. Ramesh Goankar, "Microprocessor 8085 Architecture, Programming and Interfacing", 6th Edition, Penram International Publishers, Mumbai, 2013.
2. Mazidi, Muhammad Ali, McKinlay, Rolin D. & Causey, Danny, "PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18", 2nd edition, Pearson Education Asia, Noida, 2021.

REFERENCES:

1. Frank Vahid and Tony Givagis, "Embedded System Design", Wiley, 2018
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Elsevier, 2013
3. Muhammad Ali Mazidi, Janice Gillipse Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C", 2nd edition, Pearson Education India, 2007.



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SEMESTER III & IV

U25CSG11	Object Oriented Programming Using Java (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce object-oriented programming concepts and Core Java programming fundamentals
- To develop Java applications using classes, inheritance, polymorphism, interfaces, and exception handling mechanisms
- To provide programming skills in multithreading, collections framework, and file handling using Java APIs
- To enable students to develop modular and reusable Java applications using standard libraries and object-oriented design principles

COURSE OUTCOMES:

- CO 1: Describe object-oriented programming concepts and Java fundamentals for developing simple applications Understand
- CO 2: Develop Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages Apply
- CO 3: Develop Java programs incorporating exception handling and multithreading concepts Apply
- CO 4: Develop Java applications using collections, generics, and related utility classes Apply
- CO 5: Develop Java applications using file handling, stream processing, and object serialization techniques 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
CO 2	3	2	2	2	-	-	-	-	-	-	1	1	2
CO 3	3	2	2	2	-	-	-	-	-	-	2	1	2
CO 4	3	2	2	2	-	-	-	-	-	-	2	2	2
CO 5	3	2	2	2	-	-	-	-	-	-	2	2	2

SYLLABUS:

UNIT I: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND JAVA BASICS

9

Procedure-Oriented vs Object-Oriented Java Features and Platform: JVM, JRE, JDK – Java Program Structure & Memory Layout – Classes and Objects – Static and non-static members, static and non-static Methods, Constructors – Access Modifiers, Abstraction and Encapsulation – Scanner and System classes

UNIT II: INHERITANCE AND POLYMORPHISM

9

Inheritance and types – Polymorphism: Method Overloading and Overriding – Abstract Classes and Methods – Interfaces. Java packages : Built in and user defined packages

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UNIT III: EXCEPTION HANDLING AND MULTITHREADING

9

Exception Handling: try, catch, throw, throws, finally – Built in exception classes and User defined Exceptions – Multithreading: Thread Lifecycle, Creating Threads, Thread Class and Runnable Interface, Thread Priorities, Synchronization – Inter-thread Communication, Deadlock prevention

UNIT IV: COLLECTIONS FRAMEWORK AND GENERICS

9

Collections Framework – Generics and Type Safety – Wrapper Classes and Autoboxing/Unboxing – Interfaces and Classes: List, Set, Map, Queue – Implementations: ArrayList, LinkedList, HashSet, TreeSet, HashMap, TreeMap – Iterators – Comparator and Comparable Interfaces

UNIT V: JAVA I/O AND FILES

9

Java I/O Framework – Input and Output Streams – Readers and Writers – File I/O using File, FileReader, FileWriter, BufferedReader, BufferedWriter and Files – Console Input using Scanner and Console – Serialization and Deserialization – Object Streams

CONTACT PERIODS:

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

TEXTBOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay S. Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020

REFERENCES:

1. J. Nino and F. A. Hosch, "An Introduction to Programming and OO Design using Java", 1st Edition, John Wiley & Sons, 2018
2. Paul Deitel and Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015
3. E. Balagurusamy, "Programming with Java", 6th Edition, McGraw Hill Education, 2019



SEMESTER IV

U25MEG06	Theory of Machines (Common to ME, MI)	Category: PCC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

PRE-REQUISITES:

- U25MEG03 - Engineering Graphics / U25RMEG01 - Engineering Graphics
- U25ME201 - Engineering Mechanics / U25RMEG03 - Engineering Mechanics

COURSE OBJECTIVES:

- To design linkages and cams for desired output motions and analyze the speed relationships in various gear train systems
- To understand and evaluate the force-motion interactions in machine components and achieve dynamic balance in mechanical systems
- To analyze control mechanisms and vibration behaviour for stable mechanical system performance

COURSE OUTCOMES:

CO 1:	Perceive the concept mechanisms and compute the velocity and acceleration of different links in a mechanism	Apply
CO 2:	Develop cam profiles for specified follower motions and use gear train analysis methods to solve engineering problems	Apply
CO 3:	Analyze the dynamic forces acting on machine components and measure the degree of unbalance for mass systems	Analyze
CO 4:	Investigate the functional behavior of governors and gyroscopes for controlling system stability	Evaluate
CO 5:	Interpret the interdependence of vibration parameters for dynamic system analysis	Evaluate

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASICS OF MECHANISMS AND KINEMATICS OF LINKAGE MECHANISMS

9 + 6

Classification of mechanisms – Kinematic concepts and definitions – Degree of freedom – Mobility – Kutzbach criterion – Gruebler's criterion – Grashof's Law – Kinematic inversions of four bar chain and slider crank chains – Straight line generators – Universal Joint – Geneva mechanism – Ratchet and Pawl mechanisms – Robot gripper mechanisms – Displacement – Velocity and acceleration analysis of simple mechanisms – Graphical method – Demonstration of linkage mechanism using simulation software

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UNIT II: KINEMATICS OF CAM MECHANISMS, GEARS AND GEAR TRAINS

9 + 6

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity – Parabolic – Simple harmonic – Cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Spur Gear terminology and definitions – Law of toothed gearing – Gear trains – Speed ratio – Train value – Parallel axis gear trains – Epicyclic gear trains – Velocity ratio of epicyclic gear trains by tabular method

UNIT III: FORCE ANALYSIS AND BALANCING

9 + 6

Dynamic force analysis – Inertia force and Inertia torque – D'Alembert's principle – Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod – Bearing loads – Crank shaft – Static and dynamic balancing – Balancing of rotating masses

UNIT IV: MECHANISMS FOR CONTROL

9 + 6

Governors – Types – Centrifugal governors – Gravity controlled centrifugal governors – Spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves – Gyroscopes – Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in automobiles, ships and airplanes

UNIT V: VIBRATION

9 + 6

Basic features of vibratory systems – Degrees of freedom – Single degree of freedom – Free vibration – Equations of motion – Natural frequency – Types of damping – Damped vibration – Torsional vibration of shaft – Critical speeds of shafts – Forced vibration – Harmonic disturbances – Vibration isolation

LIST OF EXPERIMENTS

1. Dynamic analysis of cam mechanism – Determination of cam profile and jump speed
2. Simple and compound gear trains – Determinations of velocity ratio and torque
3. Balancing of rotating masses and reciprocating masses
4. Experiment on motorized gyroscope – Comparison of theoretical and experimental precessional velocity
5. Universal governors (Watt, Porter, Proell and Hartnell) – Determination of centrifugal force and equilibrium speed
6. Whirling of shaft and compound pendulum – Determination of natural frequency
7. Two rotor system – Comparison of theoretical and experimental torsional frequency
8. Vibrating table – Determination of transmissibility ratio
9. Velocity and acceleration on rigid body using simulation software
10. Active force and torque on four bar mechanism using simulation software
11. Modelling of vehicle dynamics using simulation software

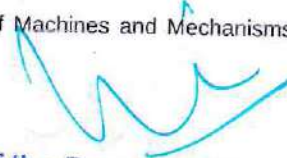
CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Rattan S.S, "Theory of Machines", 5th Edition, Tata McGraw Hill, 2019
2. Uicker J.J, Pennock G.R and Shigley J.E, "Theory of Machines and Mechanisms", 5th Edition, Oxford University Press, 2017

REFERENCES:


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1. Ghosh A and Mallick A.K, "Theory of Mechanisms and Machines", 3rd Edition, Affiliated East-West Press Pvt. Ltd, 1998
2. Robert L. Norton, "Kinematics and Dynamics of Machinery", 3rd Edition, Tata McGraw Hill, 2020
3. Khurmi R.S and Gupta J.K, "Theory of Machines", 14th Edition, S Chand Publications, 2020



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SEMESTER IV

U25MI402	Metrology and CNC	Category: PCC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the basic operation of measuring instruments
- To provide hands-on experience in dimensional and surface finish measurement
- To provide hands-on experience in CNC manufacturing and programming

COURSE OUTCOMES:

- CO 1: Explain measurement needs, metrology terms, and the use of common linear measuring instruments for Understand dimensional inspection
- CO 2: Demonstrate angular, optical, and surface measurement methods to measure geometric features and surface parameters Apply
- CO 3: Apply limits, fits, tolerances, and GO/NO-GO gauges to inspect machined parts Apply
- CO 4: Execute the CNC machine architecture, operation, coordinate systems, work holding devices Apply
- CO 5: Develop and execute CNC turning and milling programs using G- and M-codes, and validate part dimensions using metrology instruments. 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	1	1	1
CO 2	3	2	1	3	-	-	-	1	2	1	1	2	1
CO 3	3	2	2	2	-	-	-	1	1	1	1	-	1
CO 4	2	1	1	2	-	-	-	1	1	1	1	2	1
CO 5	3	2	2	3	-	-	-	1	2	1	2	3	2

SYLLABUS:

UNIT I: LINEAR MEASUREMENT

3 + 6

Accuracy vs. Precision, Calibration, Construction and working of Vernier Calipers, Micrometers, and Height Gauges. Introduction to Slip Gauges. Concept of Limit Gauges (Go/No-Go).

UNIT II: ANGULAR & OPTICAL METROLOGY

3 + 6

Bevel Protractor and Sine Bar usage. Working principle of Profile Projector. Terminology and stylus probe measurement. Basic gear and thread measurement

UNIT III: ADVANCED METROLOGY & SENSORS

3 + 6

Introduction to Coordinate Measuring Machines (CMM) and probes. Working principles of Load cells (Force) and Strain gauges (Torque). Thermocouples and RTDs

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UNIT IV: CNC MACHINE ARCHITECTURE**3 + 6**

CNC vs NC, Slideways, and Ball screws. Open-loop vs. closed-loop control systems. Automatic Tool Changers (ATC). Clamping devices for Lathe and Mill.

UNIT V: CNC PROGRAMMING BASICS**3 + 6**

Absolute (G90) vs Incremental (G91) Coordinates. Common G-codes (G00, G01, G02, G03) and M-codes. Introduction to Canned Cycles for drilling and turning. Introduction to CNC simulation.

LIST OF EXPERIMENTS

1. Measurement using Vernier Caliper, Micrometer, and Height Gauge
2. Measurement of component profiles using Profile Projector
3. Dimensional measurement using Coordinate Measuring Machine
4. Measurement of surface roughness (Ra) using Surface Roughness Tester.
5. Measurement of Force, Torque, and Temperature using standard setups
6. Programming and machining for Turning and Threading operations
7. Programming and machining for Pocketing and Contouring operations

CONTACT PERIODS:

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

TEXTBOOKS:

1. Venkateshan S P, "Mechanical Measurements", 2nd edition, Springer Cham, 2022.
2. Micheal Fitzpatrick, "Machining and CNC Technology", 4th edition, McGraw-Hill, 2018.
3. Peter Smid, "CNC Programming Handbook", 3rd edition, Industrial Press, Inc., 2007

REFERENCES:

1. Jain R.K., "Engineering Metrology", Special edition, Khanna Publishers, 2022.
2. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson education, 2014.
3. Rao P N, "Manufacturing Technology Metal Cutting and Machine Tools", 3rd edition, Tata McGraw-Hill, 2013.
4. GCodeTutor – CNC Program Simulator



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SEMESTER IV

U25MI403	Microcontroller and Embedded Systems Laboratory	Category: PCC				
		L	T	P	J	C
		0	0	2	2	2

QP PATTERN: A

COURSE OBJECTIVES:

- To learn about microcontroller and Embedded programming
- To develop assembly language and Embedded C programming to perform I/O interfacing
- To control the real-world application using Embedded C programming

COURSE OUTCOMES:

CO 1: Perform the arithmetic and logical operations using microprocessors and microcontrollers by means of assembly language programming	Apply
CO 2: Experiment with embedded C program for the given applications	Apply
CO 3: Make use of sensors, actuators and other I/O's with microcontrollers	Apply
CO 4: Design, monitor and logging the sensory data using microcontrollers	Apply
CO 5: Develop the application to acquire and transfer of data using IoT platform	Apply

CO - PO MAPPING:

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

LIST OF EXPERIMENTS

- Performing Arithmetic functions using the 8085 Microprocessor using Assembly language programming
- Sorting an array of data into ascending and descending order using the 8085 Microprocessor using assembly language programming
- Interfacing of switch and LED with 8051 Microcontroller using assembly language programming
- Study on editing, debugging and simulation of Embedded C programming in software platform
- Interfacing of stepper motor to rotate in clockwise and anti-clockwise using Embedded C programming
- Development of Embedded C Programming to Interface LCD Screen
- Detection and counting of the object using Embedded C Programming
- Data logging of Real time temperature data using Embedded C programming
- Development of Embedded C Program for the actuation of pneumatic cylinders for the required sequence
- Development of Embedded C Program to monitor the level of water and transfer the data using IoT module
- Development of Embedded C Program for PID Controller Implementation

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12. PROJECT - Design and development of an embedded system for real-time monitoring and control applications by applying the concepts of microcontroller programming, embedded system design, and peripheral interfacing.

CONTACT PERIODS:

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

TEXTBOOKS:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd edition, Pearson Education, 2008

REFERENCES:

1. Mazidi, Muhammad Ali, McKinlay, Rolin D. & Causey Danny, "PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18", 2nd Edition, Pearson Education Asia, Noida, 2021
2. Michael Barr, Anthony Massa, "Programming Embedded Systems: With C and GNU Development Tools", 2nd Edition, O'Reilly Media, 2006.


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SEMESTER III & IV

U25CSG13	Object Oriented Programming Using Java Laboratory (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of object-oriented programming using Java for developing modular and reusable applications
- To apply inheritance, polymorphism, exception handling, and multithreading concepts in developing robust Java applications
- To develop collection-based and file-processing applications using Java I/O, generics, and collections framework for real-world problem solving

COURSE OUTCOMES:

- CO 1:** Implement the fundamental concepts of object-oriented programming, Java program structure, classes, objects, and encapsulation principles Apply
- CO 2:** Develop Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages Apply
- CO 3:** Implement exception handling and multithreading mechanisms for developing reliable and concurrent applications Apply
- CO 4:** Utilize collections framework, generics, and sorting mechanisms for efficient data management and processing Apply
- CO 5:** Develop file handling and object persistence applications using Java I/O streams, serialization, and deserialization techniques 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	-	-
CO 2	3	2	1	1	-	-	-	-	-	-	1	-	1
CO 3	3	2	1	1	-	-	-	-	-	-	1	2	1
CO 4	3	2	1	1	-	-	-	-	-	-	1	2	1
CO 5	3	2	2	2	-	-	-	-	-	-	2	2	1

LIST OF EXPERIMENTS

- Design and implementation of Java programs demonstrating classes, objects, constructors, and methods
- Development of applications illustrating static and non-static members, access modifiers, abstraction, and encapsulation
- Implementation of console-based applications using Scanner and System classes for input and output processing
- Design and implementation of applications demonstrating inheritance and its various types
- Development of applications illustrating compile-time and runtime polymorphism using method overloading and method overriding
- Implementation of applications using abstract classes, interfaces, and dynamic method dispatch mechanisms
- Design and development of modular Java applications using built-in and user-defined packages
- Implementation of robust exception handling mechanisms using built-in and user-defined exceptions

9. Development of multithreaded applications using Thread class and Runnable interface
10. Design and implementation of synchronized multithreaded applications with inter-thread communication
11. Development of applications demonstrating thread lifecycle management and deadlock prevention techniques
12. Implementation of generic collection-based applications using List, Set, Map, and Queue interfaces
13. Design of applications utilizing Comparator and Comparable interfaces for customized sorting operations
14. Development of file processing applications using Java I/O streams, readers, writers, and buffered streams
15. Implementation of object persistence mechanisms using serialization and deserialization techniques

CONTACT PERIODS:

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

REFERENCES:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020



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SEMESTER IV

U25MNC03	Indian Constitution (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the evolution and importance of the Constitution.
- To understand salient features of the Indian Constitution and philosophy of Fundamental Rights
- To gain the knowledge about the state government and local level administration

COURSE OUTCOMES:

- CO 1: Understand the historical background of the Constitution making and its importance for building a democratic India
- CO 2: Understand the value of Fundamental Rights and Duties for becoming a good citizen of India Understand
- CO 3: Analyze the powers of the Central Government Analyze
- CO 4: Understand the role and responsibilities of State and Local Administration Understand
- CO 5: Apply knowledge in strengthening constitutional institutions like Election Commission and UPSC for sustaining democracy Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO 1	-	-	-	-	-	1	2	3	-	-	-	1	-
CO 2	-	-	-	-	-	1	2	3	-	-	-	1	-
CO 3	-	-	-	-	-	1	2	3	-	-	-	1	-
CO 4	-	-	-	-	-	1	2	3	-	-	-	1	-
CO 5	-	-	-	-	-	1	2	3	-	-	-	1	-

SYLLABUS:

UNIT I: HISTORICAL BACKGROUND OF INDIAN CONSTITUTION

5

Introduction to Indian Constitution: Constitution Meaning of the term, History of Making of the Indian Constitution, Evolution of the Indian Constitution, Drafting Committee (Composition and Working).

UNIT II: FEATURES OF INDIAN CONSTITUTION

5

Philosophy and salient features of the Indian Constitution, Citizenship, Fundamental Rights, Duties and their significance, Directive Principles of State Policy, Rights Protective Mechanisms in India; Right to Education Act 2009; Right to Information 2005.

UNIT III: UNION GOVERNMENT

5

Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister and Council of Ministers (with Powers and Functions), Cabinet and Central Secretariat, Union Judiciary (Supreme Court).

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UNIT IV: STATE GOVERNMENT AND LOCAL ADMINISTRATION

5

Governor, Chief Minister and Council of Ministers, State Secretariat – Roles and Responsibilities, District Administration, Head, Municipalities – Mayor and Role of Elected Representatives, Panchayati Raj, Zila Panchayat – Roles and Responsibilities, Block Level and Village Level Organizational Hierarchy

UNIT V: CONSTITUTIONAL INSTITUTIONS

5

Election Commission of India – Powers and Functions, Electoral Process in India, Methods of Constitutional Amendments and their Limitations, Important Constitutional and Emergency Provisions. Case Studies.

CONTACT PERIODS:

Lecture: 25 Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 25 Periods

TEXTBOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India Pvt. Ltd., New Delhi.
2. Subash Kashyap, "Indian Constitution", National Book Trust.

REFERENCES:

1. M. Laxmikanth, "Indian Polity", McGraw Hill Education India, 2013.
2. M. P. Jain, "Indian Constitution Law," 7th Edition, Lexis Nexis, 2014.
3. Raj Kumar, "Ambedkar and Constitution", Commonwealth Publication Pvt. Ltd., New Delhi, 2011



SEMESTER IV

U25MCC09	Professional Skill Development - II (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

CO - PO MAPPING:

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

GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods

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