KPR Institute of Engineering and Technology

Learn Beyond

(Autonomous, Affiliated to Anna University)

CURRICULUM AND SYLLABI

REGULATIONS – 2025

Department of

Mechatronics Engineering

Learn Beyond

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 - Chinese I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Français pour les Ingénieurs – French I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Nihongo no Enginia – Japanese I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Hindi for Engineers - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Deutsch für Ingenieure – German I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Induction Program - Universal Human Values I	-	-	-	-	-	✓	✓	✓	-	-	✓	✓	-
	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	✓	✓	-	✓	-	-	-
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	-
	Computer Fundamentals and Coding Essentials	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
II	English Proficiency II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Mathematical Transforms	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	✓
	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 - Chinese II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Hindi for Engineers - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Français pour les Ingénieurs – French II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Nihongo no Enginia – Japanese II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Deutsch für Ingenieure – German II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Universal Human Values II	-	-	-	-	-	-	-	✓	✓	-	✓	✓	-
	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	✓	✓	-	✓	-	✓	✓
	Design Thinking	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Biology for Engineers	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	-
	Computer Fundamentals and Coding Essentials	✓	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓
III	English Proficiency III	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Probability and Statistics for Engineering Systems	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓
	Sensors and Signal Processing	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓
	Control Systems Engineering	✓	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓
	Electronic Devices and Digital Circuits	✓	✓	✓	-	✓	-	-	-	✓	-	✓	✓	-
	Kinematics and Dynamics of Machinery	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓
	Manufacturing Processes	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Data Structures and Algorithms	✓	✓	✓	✓	-	-	-	-	✓	✓	-	✓	✓
	Social Survival and Relationship Skills	-	-	-	-	-	✓	✓	✓	✓	-	✓	✓	✓
	Life and Emotional Resilience Skills	-	-	-	-	-	✓	-	✓	✓	-	✓	✓	✓
	Survival Skills in Nature / Outdoor Survival Skills	-	-	-	-	✓	✓	✓	✓	-	-	✓	✓	-
	Communication and Conflict Resolution Skill	-	-	-	-	-	-	✓	✓	✓	-	✓	✓	✓
	Legal Awareness and Civic Responsibility Skills	-	-	✓	-	-	✓	-	✓	-	-	✓	✓	-
	Financial Survival Skills	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	-	-
	Digital and Cyber Safety Skills	-	-	-	-	✓	✓	✓	✓	✓	-	✓	✓	-
	Disaster Preparedness and Management Skills	-	✓	-	-	-	✓	✓	✓	✓	✓	✓	✓	-
	Health, Hygiene, and Wellness Skills	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓	-
	Personal Safety and First Aid Skills	✓	-	-	✓	✓	✓	✓	✓	✓	-	✓	-	-
	Pitch Deck for Startup	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	-
	Business Intelligence for Engineers	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-
	Managerial Skills for Engineers	-	-	-	-	-	✓	-	✓	✓	✓	✓	✓	✓
	Innovation for Enterprise	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	Research Manuscript Writing	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	-
	Ethical Research Practices	✓	✓	✓	-	-	-	✓	-	-	-	✓	✓	-
	ESG and Business Sustainability	✓	-	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	-
	Sustainable Engineering	✓	-	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	-
	Introduction to Computer Aided Engineering	✓	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓
IV	English Proficiency IV	-	-	-	-	-	-	-	✓	✓	-	✓	✓	✓
	Numerical Methods for Engineers	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓
	Microcontroller and Embedded Systems	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓
	Electrical Drives and Control	✓	✓	✓	✓	✓	-	-	-	✓	-	✓	✓	✓
	Fluid Mechanics and Applications	✓	✓	✓	✓	✓	✓	-	✓	-	-	-	✓	✓
	Metrology and CNC	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓	✓
	Microcontroller and Embedded Systems Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	-	✓	✓	✓
	Java Programming	✓	✓	✓	✓	-	-	-	✓	✓	-	✓	✓	✓
	Gardening and Waste Management	✓	-	-	-	-	✓	-	✓	-	-	✓	✓	-
	Painting and Surface Maintenance	✓	✓	-	-	✓	✓	-	✓	-	-	✓	-	-
	Basic Carpentry and Home Improvement Skills	✓	-	✓	-	✓	✓	-	✓	-	-	✓	-	-
	HVAC (Heating, Ventilation, and Air Conditioning) Maintenance	✓	-	-	-	✓	✓	✓	✓	-	-	✓	✓	✓
	Basic Vehicle Maintenance	✓	✓	✓	-	✓	✓	-	✓	✓	-	✓	✓	✓
	Basic Electrical and Wiring Skills	✓	-	-	-	✓	✓	✓	-	-	-	✓	✓	-
	Plumbing and Sanitary Maintenance Skills	✓	-	-	-	-	✓	✓	-	-	-	✓	-	-
	Basic Home Appliance Repair and Maintenance	✓	-	-	✓	✓	✓	✓	✓	-	-	✓	-	-
	Pitch Deck for Startup	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	-
	Business Intelligence for Engineers	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-
	Managerial Skills for Engineers	-	-	-	-	-	✓	-	✓	✓	✓	✓	✓	✓
	Innovation for Enterprise	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	-	✓	✓
	Research Manuscript Writing	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	-
	Ethical Research Practices	✓	✓	✓	-	-	-	✓	-	-	-	✓	✓	-
	ESG and Business Sustainability	✓	-	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	-
	Sustainable Engineering	✓	-	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	-
	Robot Operating System	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓

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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 U25LEG02 U25LEG03 U25LEG04 U25LEG09	Deutsch für Ingenieure – German I Nihongo no Enginia – Japanese I Français pour les Ingénieurs – French I Hindi for Engineers - I Chinese for Engineers - Chinese I	HSMC	TwL	1	-	2	-	2
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	தமிழர் மரபு / Heritage of Tamils	MCC	Tamil Courses	1	-	-	-	1
11	U25MCC03 U25MCC04 U25MCC05	Design Thinking Computer Fundamentals and Coding Essentials @ Biology for Engineers $	MCC	MCC	1	-	2	-	2
Total									**6**

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

SEMESTER II

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25ENG02	English Proficiency II	HSMC	L	-	-	2	-	1
2	U25MA204	Mathematical Transforms	BSC	TwL	2	-	2	-	3
3	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 U25LEG06 U25LEG07 U25LEG08 U25LEG10	Deutsch für Ingenieure – German II Nihongo no Enginia – Japanese II Français pour les Ingénieurs – French II Hindi for Engineers - II Chinese for Engineers - Chinese II	HSMC	TwL	1	-	2	-	2
Total									**21**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
10	U25MCC06	Universal Human Values II	MCC	MCC	2	1	-	-	3
11	U25MCC07	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MCC	Tamil Courses	1	-	-	-	1
12	U25MCC03 U25MCC04 U25MCC05	Design Thinking Computer Fundamentals and Coding Essentials @ Biology for Engineers $	MCC	MCC	1	-	2	-	2
Total									**6**

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

SEMESTER III

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25ENG03	English Proficiency III	HSMC	L	-	-	2	-	1
2	U25MA302	Probability and Statistics for Engineering Systems	BSC	TwL	2	-	2	-	3
3	U25MI301	Sensors and Signal Processing	PCC	TwL	2	-	2	-	3
4	U25MI302	Control Systems Engineering	PCC	TwL	2	-	2	-	3
5	U25MI303	Electronic Devices and Digital Circuits	PCC	TwL	2	-	2	-	3
6	U25MI304	Kinematics and Dynamics of Machinery	PCC	T	3	-	-	-	3
7	U25MI305	Manufacturing Processes	PCC	TwP	1	-	-	2	2
8	U25CSG18	Data Structures and Algorithms	ESC	TwL	2	-	2	-	3
Total									**21**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MNC01 U25MNC02 U25MNC03 U25MNC04 U25MNC05 U25MNC06 U25MNC07 U25MNC08 U25MNC09 U25MNC10	Personal Safety and First Aid Skills Health, Hygiene, and Wellness Skills Disaster Preparedness and Management Skills Digital and Cyber Safety Skills Financial Survival Skills Legal Awareness and Civic Responsibility Skills Communication and Conflict Resolution Skill Survival Skills in Nature / Outdoor Survival Skills Life and Emotional Resilience Skills Social Survival and Relationship Skills	MNC	MNC	1	-	-	-	-

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No	Course Code	Title	Category	Type	L	T	P	J	C
10	U25MCC08 U25MCC09 U25MCC10 U25MCC11 U25MCC12 U25MCC13 U25MCC14 U25MCC15	Sustainable Engineering ESG and Business Sustainability Research Manuscript Writing Ethical Research Practices Pitch Deck for Startup Innovation for Enterprise Managerial Skills for Engineers Business Intelligence for Engineers	MCC	MCC	1	-	-	-	1
11	U25MCC93	Introduction to Computer Aided Engineering	MCC	MCC	1	-	-	-	1
		Total							**2**

SEMESTER IV

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25ENG04	English Proficiency IV	HSMC	L	-	-	2	-	1
2	U25MA404	Numerical Methods for Engineers	BSC	TwL	2	-	2	-	3
3	U25MI401	Microcontroller and Embedded Systems	PCC	T	3	-	-	-	3
4	U25MI402	Electrical Drives and Control	PCC	TwL	2	-	2	-	3
5	U25MI403	Fluid Mechanics and Applications	PCC	T	2	-	-	-	2
6	U25MI404	Metrology and CNC	PCC	TwL	1	-	2	-	2
7	U25MI405	Microcontroller and Embedded Systems Laboratory	PCC	L	-	-	4	-	2
8	U25CSG19	Java Programming	ESC	TwL	2	-	2	-	3
9	-	Open Elective I	OEC	T	3 2	- -	- 2	- -	3
		Total							**22**
		MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)							
10	U25MNC11 U25MNC12 U25MNC13 U25MNC14 U25MNC15 U25MNC16 U25MNC17 U25MNC18	Basic Home Appliance Repair and Maintenance Plumbing and Sanitary Maintenance Skills Basic Electrical and Wiring Skills Basic Vehicle Maintenance HVAC (Heating, Ventilation, and Air Conditioning) Maintenance Basic Carpentry and Home Improvement Skills Painting and Surface Maintenance Gardening and Waste Management	MNC	MNC	1	-	-	-	-
11	U25MCC08 U25MCC09 U25MCC10 U25MCC11 U25MCC12 U25MCC13 U25MCC14 U25MCC15	Sustainable Engineering ESG and Business Sustainability Research Manuscript Writing Ethical Research Practices Pitch Deck for Startup Innovation for Enterprise Managerial Skills for Engineers Business Intelligence for Engineers	MCC	MCC	1	-	-	-	1

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Learn Beyond

No	Course Code	Title	Category	Type	L	T	P	J	C
12	U25MCC94	Robot Operating System	MCC	MCC	1	-	-	-	1
Total									2

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

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28.04.2026

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Learn Beyond

SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

CO - PO MAPPING:

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

SYLLABUS:

LIST OF EXPERIMENTS

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

LEARN BEYOND CONTENT:

- Readathon – Reading online articles – Book Review

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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

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Learn Beyond

SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Solve engineering problems involving systems of equations and matrix-based methods **Apply**

CO 2: Use differential calculus to solve and optimize engineering processes **Apply**

CO 3: Apply integration techniques to find areas and volumes in engineering models **Apply**

CO 4: Interpret physical scenarios like motion and system changes using calculus concepts **Apply**

CO 5: Understand and apply concepts of matrix transformations and characteristic values to engineering models such as vibrations and stability **Understand**

CO - PO MAPPING:

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

LEARN BEYOND CONTENT:

- Structural systems – Dynamic systems – Flow systems

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1:	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

LEARN BEYOND CONTENT:

- Torsional Pendulum – Hologram – Fiber optics communication system

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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

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

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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

PRE-REQUISITES:

- - Nil -

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

LEARN BEYOND CONTENT:

- Preparation of biodegradable plastic
- Polymer composites preparation from waste polymeric materials
- Electroplating of copper on metallic objects
- Electroless Ni plating on objects
- Electrolysis of water with generation of hydrogen
- Fabricate a working model of a dye-sensitized solar cell (DSSC) using nanocrystalline TiO_2, natural dye (such as anthocyanin from blackberries/hibiscus/tea), and measure its photovoltaic performance
- Chemical etching of a metal foil – Lithography mimic
- Demonstration of Czochralski Crystal Growth using sugar or alum

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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
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, "Nanochemistry: A Chemical Approach to Nanomaterials", 2nd edition, Royal Society of Chemistry, Cambridge, 2005

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SEMESTER I

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

PRE-REQUISITES:

- - Nil -

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

LEARN BEYOND CONTENT:

- Creating reusable libraries for sensor data processing
- Case Study: Writing a modular program for sensor input, processing, and actuator decision
- Mini project: Develop a mini project in any one of the following themes as an implementation of python 1) Robotics application 2) Smart home application 3) Automotive applications 4) Industrial Automation Application

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

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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	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Understand the foundational concepts of AI, ML, DL, and key OpenAI generative tools **Understand**

CO 2: Explain the interplay of AI, wearables, and big data in emerging technologies like the Metaverse and Edge AI **Understand**

CO 3: Describe the key components and uses of IoT, cloud computing, and cybersecurity, including common threats **Understand**

CO 4: Interpret the core principles and practical uses of blockchain, RPA, and digital marketing strategies **Understand**

CO 5: Recognize the key concepts and applications of 3D printing, digital manufacturing, AR/VR, Metaverse, and ethical considerations in AI **Understand**

CO - PO MAPPING:

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

LEARN BEYOND CONTENT:

- Case Study of Digital Technologies of Real time application

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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Learn Beyond

SEMESTER I

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

PRE-REQUISITES:

- - Nil -

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

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

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

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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

LEARN BEYOND CONTENT:

- Design and simulate rectifier circuits with capacitor filter
- Explore real-world circuit examples in consumer electronics applications

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

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

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

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

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

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

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

LIST OF EXPERIMENTS

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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Learn Beyond

SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

SYLLABUS:

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

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

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

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

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

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

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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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

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. Schumancher, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain, 1973

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SEMESTER I

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

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UNIT III: FOLK AND MARTIAL ARTS 3

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

UNIT IV: THINAI CONCEPT OF TAMILS 3

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

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

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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Learn Beyond

SEMESTER I & II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

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

SYLLABUS:

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

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

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

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

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

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

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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

LEARN BEYOND CONTENT:

- Design Thinking for Digital Transformation

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

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

CO - PO MAPPING:

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

1. Identifying computer components

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

LEARN BEYOND CONTENT:

- Introduction to Debugging and IDEs

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	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).

UNIT V: BASIC LABORATORY TESTS **15**

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

LEARN BEYOND CONTENT:

- Lab-on-a-Chip

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

CO - PO MAPPING:

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

SYLLABUS:

LIST OF EXPERIMENTS

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

LEARN BEYOND CONTENT:

- TED Talks – Podcast creation – Peer Interview

CONTACT PERIODS:

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

TEXTBOOKS:

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

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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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Learn Beyond

SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

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

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

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

CO - PO MAPPING:

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

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

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

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

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

UNIT V: Z–TRANSFORM **6 + 6**

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

LIST OF EXPERIMENTS

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

LEARN BEYOND CONTENT:

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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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

PRE-REQUISITES:

- - Nil -

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 MoS_2)
13. Multifunctional Sensor Using Piezoelectric Material
14. Smart Glove with Embedded Sensors
15. Design of a Pyroelectric Motion Detector

LEARN BEYOND CONTENT:

- Perovskite solar cell fabrication techniques – Hybrid thermoelectric – photovoltaic systems

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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Learn Beyond

SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1:	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 biodesel from vegetable oil.
8. Coir pith composting and application study.
9. Determination of conductivity, TDS and turbidity test for potable water

LEARN BEYOND CONTENT:

- Mapping Indian biodiversity hotspots using GIS tools or visual mapping software.
- Determination of BOD & COD tests for wastewater to assess organic pollution.

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- Measurement of noise levels in different environments using a dosimeter.
- Visit to Waste-to-energy feasibility demo (biogas digester)
- Field survey and GPS-based mapping of waste dump sites or urban agriculture sites.
- Simulation of disaster management cycle (Preparedness → Response → Recovery → Mitigation).

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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SEMESTER II

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

PRE-REQUISITES:

- - Nil -

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)

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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

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

LEARN BEYOND CONTENT:

- Creating reusable libraries for sensor data processing
- Case Study: Writing a modular program for sensor input, processing, and actuator decision
- Mini Project: Develop a mini project in any one of the following themes as an implementation of C. 1) Robotics application 2) Smart home application 3) Automotive applications 4) Industrial Automation Application

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:

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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

PRE-REQUISITES:

- - Nil -

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

SYLLABUS:

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
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

LEARN BEYOND CONTENT:

- Kinematic and Dynamic Modeling of a 6–DOF Articulated Robot for Precision Assembly Tasks
- Design and Development of a Lightweight Go–Kart Frame for High Performance

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

PRE-REQUISITES:

- - Nil -

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

SYLLABUS:

LIST OF EXPERIMENTS

1. Introduction to Fabrication Fabrication of sheet metal tray/funnel/any innovative model using cutting, drilling, taping, polishing and assembly operation
2. Preparation of MS plate for Lap, Butt and Tee joints using arc welding
3. Constructing a T-joint or a half–lap joint using carpentry
4. Soldering of a simple circuit consists of THC and SMD components
5. Introduction to Sensors and Actuators Test the response and range of the inductive and capacitive proximity sensor to various materials
6. Perform direct control of a single–acting cylinder for both extension and retraction
7. Perform direct and indirect control of the double-acting cylinder

8. Basic Machining Practices Basic machining Part 1: Turning, tapered turning, and grooving
9. Basic machining Part 2: External Threading and Internal Threading, and diamond knurling
10. Basic machining Part 3: Drilling, reaming, and boring

LEARN BEYOND CONTENT:

- Demonstration on welding using 8 DOF robotic arm
- Taper turning and threading using CNC Lathe

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

PRE-REQUISITES:

- - Nil -

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 – Varingon'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

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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

LEARN BEYOND CONTENT:

- Determine the Centre of mass and centre of Inertia of an irregular polygon with brief concepts of dimensioning and measurement
- Modelling Static Friction in SolidWorks

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases **Remember**

CO 2: Describe people, homes, weather, and daily routines using structured sentences with correct grammar **Understand**

CO 3: Read and interpret simple texts such as product labels, menus, signs, and weather updates **Understand**

CO 4: Write short messages or descriptions related to everyday topics like hobbies, weather, or family **Understand**

CO 5: Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy **Apply**

CO - PO MAPPING:

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

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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Learn Beyond

SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases **Remember**

CO 2: Describe people, homes, weather, and daily routines using structured sentences with correct grammar **Understand**

CO 3: Read and interpret simple texts such as product labels, menus, signs, and weather updates **Understand**

CO 4: Write short messages or descriptions related to everyday topics like hobbies, weather, or family **Understand**

CO 5: Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	-	-
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: ～がすきです / ～がきらいです – Describing abilities: ～がじょうずです / ～がへたです – Vocabulary: Hobbies, sports, entertainment terms – Inviting someone using ～ませんか – Accepting or declining invitations: いいですね / ちょっと – Grammar: Verb forms for expressing preference and intention – Particle: が for subject in expressions of ability and preference – Kanji: Verbs related to hobbies (見, 聞, 読, 書, 食) – Nouns related to interests – Cultural note: Popular hobbies in Japan – Seasonal pastimes – Communication norms in social invitations

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

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

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

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

LIST OF EXPERIMENTS

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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

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SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases — **Remember**

CO 2: Describe people, homes, weather, and daily routines using structured sentences with correct grammar — **Understand**

CO 3: Read and interpret simple texts such as product labels, menus, signs, and weather updates — **Understand**

CO 4: Write short messages or descriptions related to everyday topics like hobbies, weather, or family — **Understand**

CO 5: Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy — **Apply**

CO - PO MAPPING:

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

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases — **Remember**

CO 2: Describe people, homes, weather, and daily routines using structured sentences with correct grammar — **Understand**

CO 3: Read and interpret simple texts such as product labels, menus, signs, and weather updates — **Understand**

CO 4: Write short messages or descriptions related to everyday topics like hobbies, weather, or family — **Understand**

CO 5: Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy — **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: 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: केलिए - केपास – Emphatic words: ही - भी – Cultural note: Indian market etiquette – Bargaining norms – Respectful phrases for shopkeepers – Currency handling

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

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

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

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

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

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

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

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

LIST OF EXPERIMENTS

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1: Engage in simple conversations while shopping, dining, or asking for information using appropriate vocabulary and phrases — **Remember**

CO 2: Describe people, homes, weather, and daily routines using structured sentences with correct grammar — **Understand**

CO 3: Read and interpret simple texts such as product labels, menus, signs, and weather updates — **Understand**

CO 4: Write short messages or descriptions related to everyday topics like hobbies, weather, or family — **Understand**

CO 5: Apply core grammatical rules such as adjective endings, possessive pronouns, and prepositions of place with improved accuracy — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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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

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

PRE-REQUISITES:

- U25MCC01 - UNIVERSAL HUMAN VALUES - I

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

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

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

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

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	3	-	1	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 ENCOMPASSING RESOLUTION **6 + 3**

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

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

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

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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 Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd
3. B P Banerjee, Foundations of Ethics and Management, Excel Books, 2005
4. B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

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SEMESTER II

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

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	1	1
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	1
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 beats – Archeological evidences – Gem stone types described in Silappathikaram

UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

CONTACT PERIODS:

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

TEXTBOOKS:

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

REFERENCES:

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

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SEMESTER III

		Category: HSMC				
U25ENG03	**English Proficiency III (Common to all programmes)**	**L**	**T**	**P**	**J**	**C**
		0	**0**	**2**	**0**	**1**

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To enhance students' oral communication skills for both academic and professional settings
- To enable students to present ideas clearly and confidently in presentations, interviews, and speeches

COURSE OUTCOMES:

CO 1: Demonstrate effective oral communication skills in academic and professional contexts **Apply**

CO 2: Apply communication strategies to express ideas fluently and respond appropriately in real-time speaking situations **Apply**

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	-

SYLLABUS:

LIST OF EXPERIMENTS

1. Transactional Model of Communication – Barriers to effective communication – Para Language: pitch, volume, tone, and speed of delivery – Personal narrative – Storytelling – Pep talk – Listening and responding skills
2. Importance of oral communication in academics and profession – Oral presentations: planning, structuring, and delivering – Describing processes and products – Group discussions and technical debates – Data Interpretation – Interactive Speaking: Handling Queries and Feedback
3. Understanding formal vs. informal speech – Interview skills: Common questions & STAR technique – Virtual communication etiquette – Networking Conversations – Public speaking and motivational talks – Feedback and self-evaluation techniques

CONTACT PERIODS:

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

TEXTBOOKS:

1. Ashraf M. Rizvi & Priyadarshi Patnaik, "Effective Technical Communication" 3rd Edition, McGraw Hill, 2024
2. Thomas L. Means, "English and Communication for Colleges", 4th Edition, Cengage India Private Limited, 2017

REFERENCES:

1. Dale Carnegie, "The Quick and Easy Way to Effective Speaking" Rupa Publications India, 2015
2. Rob Freire & Tamara Jones, "Q: Skills for Success: Listening & Speaking, Level 4", 3rd edition, Oxford University Press, 2019

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Learn Beyond

SEMESTER III

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

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations
- U25MA102 - Matrices and Calculus

COURSE OBJECTIVES:

- To introduce the fundamental concepts of probability and statistics relevant to engineering
- To apply statistical methods for data analysis and inference
- To develop probabilistic models to handle uncertainty and aid decision-making in engineering systems

COURSE OUTCOMES:

CO 1: Apply probability axioms and Bayes' theorem to compute conditional probabilities and moments of random variables in engineering systems — **Apply**

CO 2: Apply binomial, Poisson, normal, and exponential distributions to model engineering scenarios with appropriate parameter estimation — **Apply**

CO 3: Apply correlation coefficients and regression analysis to interpret relationships between variables in engineering data — **Apply**

CO 4: Apply hypothesis testing procedures using t, chi-square, and F distributions to make statistical inferences in engineering problems — **Apply**

CO 5: Apply Monte Carlo simulation techniques using R to model system reliability, failure rates, and signal processing applications — **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: PROBABILITY AND RANDOM VARIABLES — **6 + 6**

Axioms of probability – Conditional probability and Bayes' theorem – Discrete and continuous random variables – Probability mass and density functions – Expectation and variance

UNIT II: DISCRETE AND CONTINUOUS DISTRIBUTIONS — **6 + 6**

Binomial, Poisson, and Geometric distributions – Uniform, Exponential, and Normal distributions Moment generating functions – Applications in computing scenarios

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UNIT III: JOINT DISTRIBUTIONS AND CORRELATION **6 + 6**

Joint, marginal, and conditional distributions – Covariance and correlation coefficients – Regression analysis – Applications in data analysis

UNIT IV: HYPOTHESIS TESTING **6 + 6**

Sampling distributions – Null and alternative hypotheses – Type I and Type II errors – Tests based on Normal, t, Chi-square, and F distributions – Goodness-of-fit tests

UNIT V: STATISTICAL MODELING AND SIMULATION **6 + 6**

Introduction to statistical modeling – Simulation techniques using R – Case studies in computing applications – load modeling – system failure rates- signal processing

LIST OF EXPERIMENTS

1. Probability and Random Variables – Calculate conditional probabilities from simulated contingency tables – Implement Bayesian updating for diagnostic scenarios
2. Discrete and Continuous Distributions – Simulate and visualize discrete distributions (e.g., Binomial, Poisson, Geometric) – Simulate and visualize continuous distributions (e.g., Uniform, Exponential, Normal)
3. Joint Distributions and Correlation – Perform simple linear regression and interpret model output – Plot regression line – Calculate Pearson and Spearman correlation coefficients
4. Hypothesis Testing – Chi-square tests for independence and goodness-of-fit – Compute and interpret p-values and confidence intervals
5. Statistical Simulation – Implement Monte Carlo simulations for probabilistic problems – Analyze results of simulations (mean, standard deviation, convergence)

LEARN BEYOND CONTENT:

- Kalman Filters for Dynamic State Estimation – Extreme Value Theory for Engineering Risk Assessment

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", 7th Edition, Wiley, 2020
2. Jay Devore,"Probability and Statistics for Engineering and the Sciences", 8th Edition, Cengage Learning, 2012

REFERENCES:

1. C. Gupta and V.K. Kapoor , "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 2020
2. Sheldon M. Ross," Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition, Academic Press, 2020
3. John J. Kinney, "Probability: An Introduction with Statistical Applications", 2nd Edition, Wiley, 2016

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SEMESTER III

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

PRE-REQUISITES:

- U25PH101 - Engineering Physics
- U25MI102 - Electrical and Electronics for Mechatronics

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

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

LEARN BEYOND CONTENT:

- IOT Enabled Sensors, FFT, Digital filtering using MATLAB / PYTHON

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	Control Systems Engineering	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- U25MA204 - Mathematical Transforms

COURSE OBJECTIVES:

- To acquire the knowledge of system modeling and response
- To understand the behavior of the system in the time and frequency domains
- To acquire the concept of stability and compensators

COURSE OUTCOMES:

CO 1:	Compute the transfer function of electrical and mechanical systems	**Apply**
CO 2:	Apply the performance of Linear Time Invariant (LTI) system using the time domain approach and design of the controllers	**Apply**
CO 3:	Develop the response of LTI system using the frequency domain approach	**Apply**
CO 4:	Construct a stability assessment of an LTI system using the Routh-Hurwitz criterion, root locus, and Lyapunov's stability	**Apply**
CO 5:	Outline the compensators using the Bode plot	**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
CO 2	3	3	1	1	2	-	-	-	-	-	-	1	2
CO 3	3	2	1	1	2	-	-	-	-	-	-	1	3
CO 4	3	2	1	1	2	-	-	-	-	-	-	1	3
CO 5	3	2	1	1	-	-	-	-	-	-	-	1	2

SYLLABUS:

UNIT I: SYSTEM MODELING AND REPRESENTATION **6 + 6**

Control system – Basic elements – Feed forward and feedback control theory – Electrical and mechanical transfer function models – Block diagram reduction – Signal flow graph

UNIT II: TIME RESPONSE ANALYSIS **6 + 6**

Transient response – Steady state response –Type and order – Performance of first order and second order system – Steady state error – Controllers: P, PI and PID

UNIT III: FREQUENCY RESPONSE ANALYSIS **6 + 6**

Frequency response – Frequency domain specifications – Bode plot – Polar Plot

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UNIT IV: STABILITY ANALYSIS **6 + 6**

Concept of stability – Characteristic equation – Routh Hurwitz criterion – Relative stability – Root locus concept – Lyapunov's stability

UNIT V: DESIGN OF COMPENSATORS **6 + 6**

Need for compensators – Design of compensators using Bode plot – Lag, lead and lag – lead compensation

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of armature-controlled DC motor
2. Determination of transfer function parameters of field-controlled DC motor
3. Simulation of first order and second order systems
4. Simulation of Type I and II systems
5. Simulation of P, PI and PID controllers
6. Stability analysis of linear time invariant systems
7. Design of lag and lead compensator

LEARN BEYOND CONTENT:

- Controllability and Observability – Pole placement – Robotics control systems

CONTACT PERIODS:

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

TEXTBOOKS:

1. Norman S. Nise, "Control System Engineering", 6th edition, John Wiley & Sons, 2018
2. Ogata K, "Modern Control Engineering", 5th edition, PHI, 2012

REFERENCES:

1. Nagrath J and Gopal M, "Control System Engineering", 5th edition, New Age International Publishers, 2007
2. Benjamin C. Kuo and Farid Golnaraghi, "Automatic Control Systems",10th edition, McGraw-Hill Education, 2017
3. Bhattacharya S K, "Control System Engineering", 3rd edition, Pearson Education, 2013

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SEMESTER III

U25MI303	Electronic Devices and Digital Circuits	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To infer the operation and characteristics of semiconductor devices
- To understand the basics of digital logic circuits
- To design the combinational logic circuits and sequential 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	-	-	1	-	-	-	-	-	1	2	-
CO 2	3	3	1	-	1	-	-	-	1	-	1	2	-
CO 3	3	3	1	-	1	-	-	-	1	-	1	2	-
CO 4	3	3	2	-	1	-	-	-	2	-	1	2	-
CO 5	3	3	1	-	1	-	-	-	2	-	1	2	-

SYLLABUS:

UNIT I: SEMICONDUCTOR DEVICES **6 + 6**

Construction and operation of LED, LASER, LDR and Photo diodes – 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

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 and implement 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

LEARN BEYOND CONTENT:

- Clipper and Clamper circuits – Amplifier and Oscillators circuits – Design of DC power supply circuit

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

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SEMESTER III

U25MI304	Kinematics and Dynamics of Machinery	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- U25MI204 - Mechanics for Mechatronics

COURSE OBJECTIVES:

- To understand the motion of mechanisms through velocity and acceleration diagrams
- To examine cam profiles, gear trains, and dynamic forces to evaluate system performance
- To apply vibration, balancing, and control techniques to ensure stability and regulate mechanical systems

COURSE OUTCOMES:

CO 1: Construct and use velocity and acceleration diagrams of planar mechanisms and linkages to determine motion characteristics — **Apply**

CO 2: Examine cam profiles and gear trains to determine motion transmission characteristics and gear performance under specified motion constraints — **Analyze**

CO 3: Differentiate dynamic forces and energy variations in reciprocating and rotating systems to determine their effect on system performance — **Analyze**

CO 4: Use vibration and balancing techniques in mechanical systems to ensure dynamic stability — **Apply**

CO 5: Integrate mechanical control mechanisms to determine their influence on speed regulation and system stability — **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	-	-	2	2	2	-	3	2
CO 2	3	3	1	3	2	-	-	1	1	1	2	3	3
CO 3	3	3	1	3	-	-	-	1	1	1	-	3	3
CO 4	3	2	1	2	2	2	-	2	2	2	1	3	2
CO 5	3	3	1	3	2	1	-	1	1	1	2	3	3

SYLLABUS:

UNIT I: KINEMATICS OF MACHANISMS — **9**

Mechanisms: classifications – Terminology, definitions and concepts – Degree of freedom – Mobility – Kutzbach and Grubler's criterion – Grashoff's law – Kinematics inversions of four bar and slide crank chain. Kinematics analysis in simple mechanisms – Velocity and acceleration polygons – Graphical methods – Linkage mechanism demonstration through computer approach

UNIT II: KINEMATIC ANALYSIS OF CAMS AND GEARS — **9**

Cams – Classifications – Displacement diagrams and cam profiles – Uniform velocity, Parabolic, Simple harmonic and cycloidal motion – Derivatives of follower motion – Layout of plate cam profiles. Spur gear – Law of toothed gearing – Involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – Law of toothed gearing – Gear trains – Speed ratio – Parallel axis gears trains – Epicyclic gear trains.

UNIT III: DYNAMIC FORCE ANALYSIS 9

Introduction – D' Alembert's principle – Static and inertial force analysis of a reciprocating engine. Equivalent dynamic system. Turning moment diagram – Four stroke engine – Multicylinder engine – Design of flywheel of IC engine – Design of flywheel rim – Design of flywheel of punching press

UNIT IV: BALANCING AND VIBRATION 9

Static and dynamic balancing of rotating masses – Balancing of reciprocating masses. Introduction to vibration – Terminologies - Single degree of freedom – Damped and undamped – Free and forced vibration – Vibration isolation and transmissibility. Transverse vibrations of shafts – Whirling of shaft –Torsional vibration of single rotor and two rotors' systems.

UNIT V: CONTROL MECHANISMS FOR SPEED AND STABILITY 9

Governors – Centrifugal governors – types and their characteristics – Working principle of electronic governor. Gyroscope – Gyroscopic effects on the movement of airplanes and ships – Gyroscope stabilization.

LEARN BEYOND CONTENT:

- Vibration analysis of machines using software

CONTACT PERIODS:

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

TEXTBOOKS:

1. Rattan, S.S, "Theory of Machines", 5th edition, Tata McGraw–Hill, New Delhi, 2019.
2. Khurmi, R.S and Gupta, K, "Theory of Machines", 14th Revised Edition, S. Chand & Co. Ltd, New Delhi, 2020.
3. Bansal R.K., "Theory of Machines", Laxmi Publications Pvt Ltd., New Delhi, 20th edition 2016

REFERENCES:

1. Joseph Edward Shigley and John Joseph Uicker Jr., J.E., "Theory of Machines and Mechanisms", 4th edition, Oxford University Press, England, 2014.
2. Norton R. L, Kinematics and Dynamics of Machinery, McGraw-Hill Education, 2017
3. Singh, V.P., "Theory of Machines", 6th edition, Dhanpat Raj & Co., New Delhi, 2017
4. https://onlinecourses.nptel.ac.in/noc20_me21/preview
5. https://onlinecourses.nptel.ac.in/noc22_me96/preview

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SEMESTER III

U25MI305	Manufacturing Processes	Category: PCC				
		L	T	P	J	C
		1	0	0	2	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To impart fundamental knowledge on traditional and non–traditional manufacturing processes
- To acquire the practical knowledge of the manufacturing processes
- To demonstrate the application of manufacturing processes in different components

COURSE OUTCOMES:

CO 1: Apply sand casting steps, pattern and mold elements, casting defects, and rolling and drawing in bulk forming — **Apply**

CO 2: Build machining fundamentals, turning, drilling, milling, and basic CNC concepts and advantages — **Apply**

CO 3: Construct the sheet metal operations and welding processes, joints, and common defects — **Apply**

CO 4: Perform the surface finishing, grinding processes, grinding wheel selection, and magnetic abrasive finishing — **Apply**

CO 5: Prepare a process plan for a selected component by selecting a suitable advanced process, with time & cost estimate — **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: CASTING AND FORMING PROCESSES — **3 + 6**

Casting: steps in sand casting, pattern and mould basics, simple casting defects. Metal forming: rolling and drawing of simple sections; concept of plastic deformation in bulk forming

UNIT II: MATERIAL REMOVAL PROCESSES — **3 + 6**

Basic machining concepts: cutting tool, chip formation, speed – feed – depth of cut. Overview of lathe turning, drilling, and milling operations. Introductory concepts of CNC machining and their advantages over conventional machining

UNIT III: SHEET METAL AND WELDING PROCESSES — **3 + 6**

Basic sheet metal operations: shearing, bending and deep drawing; applications. Welding: arc welding, GMAW/GTAW and resistance spot welding – principle, joints and common weld defects

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UNIT IV: FINISHING PROCESSES **3 + 6**

Need for surface finishing; surface and cylindrical grinding. Grinding wheel: abrasives, grade and selection for common applications. Introduction to Magnetic Abrasive Finishing

UNIT V: ADVANCED MANUFACTURING PROCESSES **3 + 6**

Need for non–traditional processes. Basic principle, major elements and typical applications of: Ultrasonic Machining (USM), Abrasive Water Jet Machining (AWJM), Electrochemical Machining (ECM) and Electrical Discharge Machining (EDM). Concept of process planning PROJECT WORK (30 Hours): Integrated Manufacturing Mini Project – Selection of a simple mechanical / mechatronic component (e.g., bracket, cover, coupling); identification of suitable casting/forming route, machining, sheet-metal and/or welding operations; preparation of process plan and operation sheet, selection of machines, tools and cutting parameters; preparation of basic CNC part program/simulation; estimation of time and cost; documentation and presentation of the complete manufacturing route as a project report.

LEARN BEYOND CONTENT:

- Subtractive manufacturing vs additive manufacturing; prototyping vs production

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** 30 Periods **Total:** 45 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. Michael Fitzpatrick, 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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Learn Beyond

SEMESTER III

U25CSG18	Data Structures and Algorithms (Common to BM, EC, EE, MI)	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- U25CSG01 - Problem Solving and C Programming

COURSE OBJECTIVES:

- To apply appropriate data structures for efficient data organization
- To utilize basic algorithmic techniques for problem solving
- To develop programs using linear and non-linear data structures
- To demonstrate simple searching, sorting, and graph techniques for real-world applications

COURSE OUTCOMES:

CO 1:	Illustrate linear data structures for organizing data	**Apply**
CO 2:	Apply stack and queue operations to solve computational problems	**Apply**
CO 3:	Use searching and sorting techniques for data processing	**Apply**
CO 4:	Apply tree and heap structures for hierarchical data representation	**Apply**
CO 5:	Utilize graph algorithms for solving basic network problems	**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
CO 2	3	2	1	1	-	-	-	-	1	1	-	1	2
CO 3	3	2	1	1	-	-	-	-	1	1	-	2	2
CO 4	3	2	1	1	-	-	-	-	1	1	-	2	2
CO 5	3	2	1	1	-	-	-	-	1	1	-	2	3

SYLLABUS:

UNIT I: LINEAR DATA STRUCTURES – LIST **6 + 6**

Introduction to data structures – Basic idea of algorithms – Asymptotic Notations and its properties – Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list-based implementation – Singly, Circular, Doubly linked lists – Basic operations – Applications

UNIT II: STACKS, QUEUES & RECURSION **6 + 6**

Stack ADT – Operations – Applications – Balancing symbols – Expression evaluation – Infix to postfix. Queue ADT – Operations – Circular Queue – Priority Queue – DeQueue – Applications. Recursion – simple problems

UNIT III: SEARCHING, SORTING, AND HASHING TECHNIQUES **6 + 6**

Searching : Linear Search – Binary Search. Sorting : Bubble, Selection, Insertion. Divide and conquer methodology: Merge sort – Quick sort. Hashing : Hash Functions – Separate Chaining – Open Addressing

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UNIT IV: NON-LINEAR DATA STRUCTURES – TREES **6 + 6**

Tree ADT – Tree traversals – Binary Tree ADT – Expression trees – Binary search tree ADT – AVL Trees – Priority Queue– Binary Heap – Applications of trees

UNIT V: NON-LINEAR DATA STRUCTURES - GRAPHS **6 + 6**

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

LIST OF EXPERIMENTS

1. Implement operations on singly linked list (insert, delete, display)
2. Implement Stack and evaluate arithmetic expressions
3. Implement Queue (simple and circular) for task scheduling
4. Implement Linear Search and Binary Search
5. Implement sorting algorithms: Bubble, Selection, Insertion
6. Implement Merge Sort and Quick Sort
7. Implement hashing technique for storing/searching records
8. Implement Binary Search Tree operations
9. Implement Heap / Priority Queue
10. Implement Dijkstra's algorithm for shortest path

LEARN BEYOND CONTENT:

- B-Trees and B+ Trees

CONTACT PERIODS:

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

TEXTBOOKS:

1. Reema Thareja, "Data structures using C", 1st Edition, Oxford University Press, 2018
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2017
3. A A Putambekar, "Design and Analysis of Algorithms", 1st Edition, Technical Publications, 2015

REFERENCES:

1. R. Venkatesan, S. Lovelyn Rose, "Data Structures", 1st Edition, Wiley, 2019.
2. Seymour Lipschutz, "Data structures with C", 4th Edition, McGraw Hill Education, 2017

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SEMESTER III

U25MNC01	Personal Safety and First Aid Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To equip students with knowledge of basic first aid procedures and personal safety practices
- To enable effective response to common emergencies in campus, lab, and daily life

COURSE OUTCOMES:

CO 1: To perform basic first aid, ensure personal safety, and respond to emergencies effectively **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: PERSONAL SAFETY AND FIRST AID SKILLS **15**

Introduction to Personal Safety — Campus safety, electrical & lab safety, accident prevention — Basics of First Aid — ABC (Airway, Breathing, Circulation), CPR, wound management — Handling Emergencies — Burns, fractures, bleeding, choking, seizures — Transport and Emergency Communication — Calling for help, use of first aid kit, ambulance coordination — Demonstration and Simulation — Practical training with Red Cross/medical personnel

CONTACT PERIODS:

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

REFERENCES:

1. American Academy of Orthopaedic Surgeons (AAOS), "First Aid, CPR, and AED". Jones & Bartlett Learning, 2020

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SEMESTER III

		Category: MNC				
U25MNC02	Health, Hygiene, and Wellness Skills (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To promote physical, mental, and social well-being through hygiene and wellness practices

COURSE OUTCOMES:

CO 1: To develop habits supporting lifelong health, stress management, and hygiene **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: HEALTH, HYGIENE, AND WELLNESS SKILLS **15**

Personal Hygiene and Sanitation — Nutrition and Healthy Eating — Physical Fitness and Exercise — Mental Health and Stress Management — Substance Abuse Awareness — Wellness and Lifestyle Management

CONTACT PERIODS:

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

REFERENCES:

1. Donatelle R.J., "Health: The Basics". Pearson Education, 2019

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Learn Beyond

SEMESTER III

		Category: MNC				
U25MNC03	**Disaster Preparedness and Management Skills (Common to all programmes)**	**L**	**T**	**P**	**J**	**C**
		1	**0**	**0**	**0**	**0**

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop preparedness and response mechanisms for natural and man-made disasters

COURSE OUTCOMES:

CO 1: To understand disaster risk, safety procedures, and community participation **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: DISASTER PREPAREDNESS AND MANAGEMENT SKILLS **15**

Introduction to Disasters — Types, causes, impact — Disaster Management Cycle — Mitigation, preparedness, response, recovery — First Response Skills — Evacuation, firefighting, triage — Institutional Framework — NDMA, SDMA, local DM plans — Mock Drills and Case Studies — Campus Disaster Plan Preparation — Group project

CONTACT PERIODS:

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

REFERENCES:

1. Singh B., "Disaster Management: Future Challenges and Opportunities". Kanishka Publishers, 2008

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SEMESTER III

		Category: MNC				
U25MNC04	Digital and Cyber Safety Skills (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To create awareness on digital citizenship, data security, and responsible online behavior

COURSE OUTCOMES:

CO 1: To practice safe online communication and protect digital identity — **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: DIGITAL AND CYBER SAFETY SKILLS — **15**

Digital Literacy & Ethics — Cyber Threats and Malware — Password and Data Security — Safe Social Media Practices — Cyber Laws and Reporting Mechanisms — Practical Workshop — Creating strong passwords, phishing awareness, privacy settings

CONTACT PERIODS:

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

REFERENCES:

1. Whitman M.E. & Mattord H.J., "Principles of Information Security". Cengage Learning, 2018

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Learn Beyond

SEMESTER III

U25MNC05	Financial Survival Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop practical money management, budgeting, and basic financial literacy

COURSE OUTCOMES:

CO 1: To manage personal finances, savings, and basic investments **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	3	3	-	-

SYLLABUS:

UNIT I: FINANCIAL SURVIVAL SKILLS **15**

Basics of Personal Finance — Income, expenses, budgeting — Banking and Digital Payments — UPI, NEFT, savings accounts — Credit and Loans — EMI, credit cards, student loans — Investment Basics — FD, mutual funds, SIP, insurance — Tax Awareness — PAN, income tax basics — Financial Planning Workshop — Budget simulation, case studies

CONTACT PERIODS:

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

REFERENCES:

1. Kapoor J.R., Dlabay L.R., & Hughes R.J., "Personal Finance". McGraw-Hill Education, 2017

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SEMESTER III

		Category: MNC				
U25MNC06	Legal Awareness and Civic Responsibility Skills (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To instill understanding of basic legal rights and civic duties among students

COURSE OUTCOMES:

CO 1: To become aware of their constitutional rights, responsibilities, and consumer protection laws **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: LEGAL AWARENESS AND CIVIC RESPONSIBILITY SKILLS **15**

Indian Constitution and Fundamental Rights — Civic Responsibilities and Ethics — Legal Awareness: RTI, Consumer Rights, Cyber Law — Workplace & Gender Equality Laws — Public Grievance Redressal and Lok Adalat — Field Visit / Guest Lecture — Police station, legal aid centre

CONTACT PERIODS:

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

REFERENCES:

1. Basu D.D., "Introduction to the Constitution of India". LexisNexis, 2015

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SEMESTER III

U25MNC07	Communication and Conflict Resolution Skill (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To enhance interpersonal communication and conflict-handling abilities

COURSE OUTCOMES:

CO 1: To express effectively, listen empathetically, and resolve conflicts constructively **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: COMMUNICATION AND CONFLICT RESOLUTION SKILL **15**

Communication Basics– Verbal, non-verbal, digital — Active Listening and Feedback — Conflict Types and Resolution Models — Negotiation and Mediation Skills — Role Plays and Group Activities

CONTACT PERIODS:

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

REFERENCES:

1. Fisher R., Ury W., & Patton B., "Getting to Yes: Negotiating Agreement Without Giving In". Penguin Books, 2011

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Learn Beyond

SEMESTER III

U25MNC08	Survival Skills in Nature / Outdoor Survival Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To train students in self-reliance and basic outdoor survival techniques

COURSE OUTCOMES:

CO 1: To develop resilience and preparedness in outdoor or resource-limited conditions **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: SURVIVAL SKILLS IN NATURE / OUTDOOR SURVIVAL SKILLS **15**

Introduction to Outdoor Safety — Navigation & Orientation — Map reading, compass, GPS — Shelter, Fire, and Water — Food and First Aid in Nature — Teamwork and Leadership in Expeditions — Field Training / Trek

CONTACT PERIODS:

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

REFERENCES:

1. Wiseman J., "SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere". HarperCollins, 2014

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SEMESTER III

U25MNC09	Life and Emotional Resilience Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop coping skills, optimism, and mental resilience in academic and personal life

COURSE OUTCOMES:

CO 1: To build self-awareness, adaptability, and emotional regulation **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: LIFE AND EMOTIONAL RESILIENCE SKILLS **15**

Understanding Emotions — Stress and Coping Mechanisms — Mindfulness and Positive Thinking — Goal Setting and Motivation — Interactive Sessions / Reflection

CONTACT PERIODS:

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

REFERENCES:

1. Goleman D., "Emotional Intelligence: Why It Can Matter More Than IQ". Bantam Books, 2005

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SEMESTER III

		Category: MNC				
U25MNC10	Social Survival and Relationship Skills (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To help students build meaningful relationships and social intelligence in diverse environments

COURSE OUTCOMES:

CO 1: To demonstrate empathy, cooperation, and effective networking **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: SOCIAL SURVIVAL AND RELATIONSHIP SKILLS **15**

Social Etiquette and Adaptability — Team Dynamics and Collaboration — Building and Maintaining Relationships — Cultural Sensitivity and Inclusion — Community Engagement Activity

CONTACT PERIODS:

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

REFERENCES:

1. Goleman D., "Social Intelligence: The New Science of Human Relationships". Bantam Books, 2006

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SEMESTER III & IV

U25MCC08	Sustainable Engineering (Common to AD, AM, BM, CB, CE, CH, CHY, CS, EC, EE, ENG, IT, Maths, ME, MI, PHY, S & H (IET), SC, Tamil)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- Explain the principles of sustainability, SDGs, climate change, and environmental ethics

COURSE OUTCOMES:

CO 1: Explain the principles of sustainability, SDGs, climate change, and environmental ethics **Understand**

CO 2: Apply sustainable engineering principles such as green engineering, circular economy, LCA, and resource optimization in basic problem scenarios **Apply**

CO 3: Analyze sustainable solutions related to materials, energy systems, and campus practices to promote responsible environmental behavior **Analyze**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: INTRODUCTION TO SUSTAINABILITY 3

Definition of Sustainability — Triple Bottom Line (Economy, Environment, Society) — UN Sustainable Development Goals (SDGs) — Relevance to Engineers — Climate change, global warming, carbon footprint — Ecological footprint & environmental ethics — Sustainability in Indian context (Panchamrit, Mission LiFE)

UNIT II: SUSTAINABLE ENGINEERING PRINCIPLES 3

Concept of Green Engineering — Design for Environment (DfE) — Circular Economy principles — Life Cycle Assessment (LCA) — Basic concepts — Industrial symbiosis & resource optimization — Environmental Impact Assessment (EIA) — Overview

UNIT III: SUSTAINABLE MATERIALS AND MANUFACTURING 3

Sustainable materials — Green manufacturing concepts — Energy-efficient production — 3R (Reduce–Reuse–Recycle) in engineering materials

UNIT IV: SUSTAINABLE ENERGY SYSTEMS 3

Conventional vs Renewable energy — Solar, wind, hydro, biomass, hydrogen — Energy storage (batteries, supercapacitors) — Smart grids — Energy Audit — Basics — Net — zero buildings and green architecture

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UNIT V: SUSTAINABLE LIVING & SMART CAMPUS PRACTICES **3**

Water conservation & rainwater harvesting — Waste segregation, composting, e-waste management — Green mobility: EVs, cycling, public transport — Role of students in sustainable campus — Case studies of sustainable cities / industries — Capstone mini-activity (group-based)

LEARN BEYOND CONTENT:

- Capstone mini-activity: Carbon footprint of a hostel – Waste audit of their department – Energy efficiency survey – Life Cycle Assessment of a product – Water conservation proposal

CONTACT PERIODS:

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

TEXTBOOKS:

1. Israel Sunday Dunmade, Michael Olawale Daramola, Samuel Ayodele Iwarere, "Sustainable Engineering: Concepts and Practices", Springer, 2024
2. Ahmed Boubakeur, Piush Verma, Leila Mokhnache and Balwinder Raj, "Sustainable Energy and Fuels: Materials, Processing Methods and Development", Taylor & Francis, 2024

REFERENCES:

1. Kailas L. Wasewar and Sumita Neti Rao, "Sustainable Engineering, Energy and the Environment: Challenges and Opportunities", Apple Academic Press, 2022
2. John Littlewood, Robert J. Howlett and Lakhmi C Jain, "Sustainability in Energy and Buildings", Springer, 2023

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SEMESTER III & IV

U25MCC09	ESG and Business Sustainability (Common to AD, AM, BM, CB, CE, CH, CHY, CS, EC, EE, ENG, IT, Maths, ME, MI, PHY, S & H (IET), SC, Tamil)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- U25MCC08 - SUSTAINABLE ENGINEERING

COURSE OBJECTIVES:

- To introduce students to the fundamentals of Environmental, Social and Governance (ESG) frameworks and business sustainability, enabling them to understand how industries integrate ESG principles into engineering, decision-making, and responsible

COURSE OUTCOMES:

CO 1: Infer the key concepts of ESG, sustainability frameworks, and their relevance to engineering and business **Understand**

CO 2: Explain the environmental, social and governance practices of organizations using ESG indicators and real-world examples **Understand**

CO 3: Apply ESG principles to evaluate sustainable solutions for industries, campuses, or engineering systems **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: FUNDAMENTALS OF ESG & BUSINESS SUSTAINABILITY 3

Meaning of ESG: Environmental — Social — Governance; Difference between ESG, Sustainability & CSR — ESG for engineers — Global drivers: Climate risks, resource scarcity, stakeholder pressure — ESG frameworks (overview only): UN SDGs, GRI, SASB, SEBI BRSR (India) — ESG reporting — basic idea & simple examples — ESG in companies to reduce risks & improve value

UNIT II: ENVIRONMENTAL PILLAR OF ESG 3

Climate change basics & carbon emissions – Carbon footprint – Scope 1, 2, 3 (only concept) – Energy efficiency in industries – Pollution control basics (air/water/solid waste) – 3Rs + circular economy engineering examples – Water footprint & conservation – Environmental KPIs used by industries (conceptual): GHG emission intensity, Energy use, Waste recycled, Water usage.

UNIT III: SOCIAL PILLAR OF ESG 3

Workplace safety (OH&S) – Human rights & labour standards – Diversity, Equity & Inclusion (DEI) – Importance in tech – Community development & stakeholder engagement – Data privacy & cyber ethics (important for all engineering students) – Social KPIs: Safety incidents, Training hours, Gender diversity, Community impact.

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UNIT IV: GOVERNANCE PILLAR OF ESG 3

Ethical leadership & decision-making – Anti-bribery, anti-corruption basics – Transparency & accountability – Cybersecurity & data governance – Risk management basics (engineering + corporate risks) – Whistleblower protection – Governance KPIs: Board independence (concept only), Ethical compliance, Transparency levels

UNIT V: ESG APPLICATIONS, INVESTING & CASE STUDIES 3

ESG investing basics (no finance depth) – Steps to improve companies ESG score – Case studies (India + global) – ESG in engineering sectors – Activity: create a basic ESG scorecard for any company or campus practice

LEARN BEYOND CONTENT:

- Smart Cities & ESG Integration

CONTACT PERIODS:

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

TEXTBOOKS:

1. David Grayson, "Sustainability, ESG and the Responsibility of Business", Routledge, 2022
2. Martina Macpherson, Marie Lehmann, Daniel Ung, "ESG Investing and Analysis: A Practitioner's Handbook", CFA Institute Research Foundation, 2023

REFERENCES:

1. Mark Esposito, "Corporate Sustainability, ESG and the Future of Business", Cambridge University Press, 2023.

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SEMESTER III & IV

U25MCC10	Research Manuscript Writing (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the survey on related works and finalizing the problem statement
- To learn the general structure of a research article
- To document the final manuscript with all supporting data

COURSE OUTCOMES:

CO 1: Apply literature survey techniques to identify and formulate an appropriate problem statement **Apply**

CO 2: Implement an appropriate methodology to demonstrate a novel solution for the identified problem **Apply**

CO 3: Develop a final manuscript with all supporting information in a structured format **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	-
CO 3	3	2	1	-	-	-	-	-	-	-	1	2	-

SYLLABUS:

UNIT I: SELECTING PROBLEM STATEMENT **5**

Subject Selection — Narrowing the Topic — Literature Survey — Problem Identification and Solutions — Inferences

UNIT II: CORE ELEMENTS OF RESEARCH ARTICLE **5**

General Structure of a Research Article — Title — Abstract — Keywords — Main text Components — Introduction — Methods — Results — Discussion — Conclusion

UNIT III: STRUCTURING FINAL MANUSCRIPT **5**

Acknowledgements — References — Supplementary Data — Language, Review and Editing

CONTACT PERIODS:

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

REFERENCES:

1. Day, R.A. and Gastel, B., "How to Write and Publish a Scientific Paper", Cambridge University Press, 8th Edition, 2016.

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SEMESTER III & IV

		Category: MCC				
		L	T	P	J	C
U25MCC11	Ethical Research Practices (Common to all programmes)	1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the ethical principles of scientific research
- To learn the ethical issues due to plagiarism
- To infer the impact of unethical practices through a case study

COURSE OUTCOMES:

CO 1: Identify instances of misconduct in research using appropriate ethical guidelines **Apply**

CO 2: Apply plagiarism detection concepts to distinguish different levels of plagiarism **Apply**

CO 3: Examine cases of authorship mishandling using appropriate ethical guidelines and examples **Analyze**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: RESEARCH ETHICS 5

Research Ethics — Ethical Principles for Scientific Research — Misconduct in Research — Fabrication and Falsification of Data

UNIT II: PLAGIARISM 5

Plagiarism — Paraphrasing – Salami Slicing — Levels of Plagiarism — Dual Publication

UNIT III: UNETHICAL AUTHORSHIP 5

Inappropriate, Gift & Ghost authorship — Irrelevant References — Case Study

CONTACT PERIODS:

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

REFERENCES:

1. John G. D'Angelo, "Ethics in Science: Ethical Misconduct in Scientific Research", CRC Press, 2012

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Learn Beyond

SEMESTER III & IV

U25MCC12	Pitch Deck for Startup (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To apply entrepreneurial skills to identify opportunities and develop business models
- To design and deliver a compelling startup pitch deck to communicate the business effectively

COURSE OUTCOMES:

CO 1: Apply entrepreneurial principles to identify startup opportunities, conduct problem and market validation, develop value propositions, and create business models — **Apply**

CO 2: Construct and deliver an effective startup pitch deck that clearly communicates the venture's problem, solution, market, business model, and financials to stakeholders — **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	1	-
CO 2	3	2	1	1	-	-	-	-	3	3	2	1	-

SYLLABUS:

UNIT I: FOUNDATIONS OF STARTUPS AND IDEA VALIDATION — **9**

Introduction to entrepreneurship, startup lifecycle, and entrepreneurial mindset – Problem identification and opportunity recognition – Team formation, roles in startups, and co-founder dynamics – Design thinking and validation (problem interviews, customer persona, value proposition canvas) – Market analysis (TAM, SAM, SOM) and competitor analysis – Business model fundamentals (Lean Canvas/BMC) – Basics of IP, legal entity types, and ethics in startups

UNIT II: BUILDING AND PRESENTING THE PITCH DECK — **6**

Elements of an effective startup pitch deck (problem, solution, market, competition, product, business model, go–to–market, team, finances) – Best practices in structuring and visually designing a pitch deck – Principles of pitching: storytelling, communication, and Q&A handling – Creating and delivering a compelling team pitch to mentors or investors (with peer/mentor feedback)

LEARN BEYOND CONTENT:

- Digital Tools for Pitch Deck Creation and Startup Analytics

CONTACT PERIODS:

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

TEXTBOOKS:

1. Tim Cooley, "The Pitch Deck Book: A Step-by-Step Guide to Raising Seed Capital," 1st edition, Pitch Decks, 2023.
2. Keane Angle, "Storytelling for Startups: Mastering the Pitch Deck," 1st edition, STORY Pitch Decks, 2022.

REFERENCES:

1. Paul Getty, "The 12 Magic Slides: Insider Secrets for Raising Growth Capital," 1st edition, 2022.
2. Guy Kawasaki, "The Art of the Start 2.0: The Time-Tested, Battle-Hardened Guide for Anyone Starting Anything," 2nd edition, Harper Business, 2021.
3. Eric Ries, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses," Updated edition, Crown Business, 2021.

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SEMESTER III & IV

U25MCC13	Innovation for Enterprise (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To understand the role of innovation ecosystems, policies, and institutional support in fostering entrepreneurship within Higher Educational Institutions
- To apply design thinking, product development, market validation, and pre-incubation strategies to develop viable innovative solutions and startups

COURSE OUTCOMES:

CO 1: Apply knowledge of innovation ecosystems, policies, and legal frameworks to assess startup viability **Apply**

CO 2: Develop and validate innovative solutions using design thinking and market research methodologies **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	-	-	-	-	1	1
CO 2	3	2	1	1	2	-	-	-	3	3	-	-	-

SYLLABUS:

UNIT I: FOUNDATIONS OF INNOVATION AND ECOSYSTEM **9**

Innovation and Entrepreneurial Mindset: Defining innovation, creativity, and cultivating entrepreneurial attitudes – Role of HEIs in building and supporting Innovation & Entrepreneurship ecosystems – Overview of NEP 2020 and NISP 2019 policies – Innovation Pipeline: Idea-to-prototype journey with PoC validation and engagement with incubators – Legal Basics: Intellectual Property rights, startup legal structures and incorporation essentials

UNIT II: DESIGN THINKING AND PRE-INCUBATION **6**

Design Thinking – Product Design & Prototyping: Steps from ideation to MVP, focusing on utility and uniqueness – Market Research & Validation – Pre-incubation Support: Accessing resources and mentoring; key business plan elements including opportunity, product, management, and financials

LEARN BEYOND CONTENT:

- Emerging Technologies Driving Innovation
- Startup Funding and Venture Capital Ecosystem

CONTACT PERIODS:

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

TEXTBOOKS:

1. Mike Kennard, "Innovation and Entrepreneurship", 1st edition, Routledge, 2024

2. Charles A. O'Reilly and Michael L. Tushman, "Lead and Disrupt: How to Solve the Innovator's Dilemma", 2nd edition, Stanford Business Books, 2021.

REFERENCES:

1. Kaushik Kumar, Muralidhar Kurni (Eds.), "Design Thinking: A Forefront Insight", 1st edition, CRC Press, 2022
2. B. Mahesh Babu, "Design Thinking and Innovation: Creating Tomorrow, Today", Astitva Prakashan, 2024
3. 3. Frederic Kerrest, "Zero to IPO: Over $1 Trillion of Actionable Advice from the World's Most Successful Entrepreneurs", 1st edition, 2022

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SEMESTER III & IV

U25MCC14	Managerial Skills for Engineers (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To equip undergraduate engineering students with essential managerial and soft skills required to lead teams, manage projects, and communicate effectively in real-world industry settings.

COURSE OUTCOMES:

CO 1: Understand self-management, time management, and professional communication skills required for engineers **Understand**

CO 2: Understand leadership, team dynamics, and motivation principles in technical environments **Understand**

CO 3: Understand project management basics, conflict resolution, and career management for engineers **Understand**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: SELF-MANAGEMENT & COMMUNICATION SKILLS 6

Engineer's mindset vs Managerial mindset — Goal setting & time management techniques — Professional email, meetings & presentation skills — Giving/receiving feedback

UNIT II: LEADERSHIP & TEAM DYNAMICS 6

Difference between technical expert & leader — Basic leadership styles suitable for engineers — Building & managing technical teams — Motivation theories — Diversity & inclusion in teams

UNIT III: PROJECT MANAGEMENT BASICS & CAREER SKILLS 6

Introduction to Agile & Scrum for engineers — Basic project planning, risk identification — Conflict resolution & negotiation techniques — Performance reviews & career planning for engineers

CONTACT PERIODS:

Lecture: 18 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 18 Periods

REFERENCES:

1. Lucy C. Morse, Daniel L. Babcock, "Managing Engineering and Technology," 7th Edition, Pearson Education, 2023
2. Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler, "Crucial Conversations: Tools for Talking When Stakes Are High," 3rd Edition, McGraw-Hill Education, 2022

SEMESTER III & IV

U25MCC15	Business Intelligence for Engineers (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide understanding of how business intelligence (BI) concepts and tools are used to convert technical data into actionable business decisions in engineering-driven organizations (manufacturing, IT services, product development, R&D, etc.)

COURSE OUTCOMES:

CO 1: Understand the fundamental concepts of business intelligence and its strategic importance for engineers in industry **Understand**

CO 2: Understand core data handling, integration, and quality concepts that enable reliable business decisions **Understand**

CO 3: Understand BI applications, tools, and emerging trends relevant to engineering business environments **Understand**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: FUNDAMENTALS OF BUSINESS INTELLIGENCE 6

Meaning and evolution of BI — Why engineers must think like business people — BI users & standard reports — Data-driven vs intuition-driven decisions — Real industry examples — Ethics & privacy in BI — Hands-on: Analyzing a simple dashboard in Power BI / Google Data Studio.

UNIT II: DATA FOR BUSINESS DECISIONS 6

Data types & sources in engineering organizations — Need for data integration — Introduction to ETL (Extract-Transform-Load) — Data quality & profiling basics — Common data problems — Hands-on: Cleaning & integrating sample datasets using Excel + Power Query.

UNIT III: BI TOOLS, APPLICATIONS & FUTURE 6

Overview of popular BI tools — BI applications in engineering functions: Supply Chain, Quality Control, Project Management, CRM, Predictive Maintenance — Emerging trends.

CONTACT PERIODS:

Lecture: 18 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 18 Periods

REFERENCES:

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1. Ramesh Sharda, Dursun Delen, Efraim Turban, "Business Intelligence, Analytics, Data Science, and AI," 5th Global Edition, Pearson Education, 2024.
2. Rick Sherman, "Business Intelligence Guidebook: From Data Integration to Analytics," 1st Edition, Morgan Kaufmann (Elsevier), 2015 (Reprint 2023).
3. Greg Deckler, Belinda Allen, "Microsoft Power BI: The Complete Guide from Beginner to Expert," 3rd Edition, Holy Macro Books, 2024

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SEMESTER III

U25MCC93	Introduction to Computer Aided Engineering	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide foundational understanding of Finite Element Analysis and enable students to build basic simulation-ready models in ANSYS, including geometry preparation, meshing, and boundary condition setup.
- To develop the ability to perform structural simulations in ANSYS by applying loads, contacts, refined meshing strategies, and interpreting stress, deformation, and convergence results accurately.
- To equip students with skills to conduct advanced analyses such as thermal and assembly simulations, optimize designs, and generate complete engineering reports from ANSYS Workbench.

COURSE OUTCOMES:

CO 1: Use the fundamental principles of Finite Element Analysis and ANSYS Workbench tools to create geometry, assign material properties, generate meshes, and set up basic structural simulations. **Apply**

CO 2: Apply the simulation results by interpreting stress, deformation, strain, and factor of safety plots, and evaluate the influence of mesh quality on solution accuracy. **Apply**

CO 3: Analyze different loading scenarios, boundary conditions, and simulation reports by integrating structural, thermal, or assembly analyses, and provide engineering recommendations based on ANSYS results **Analyze**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASIC CONCEPTS OF FEA AND ANSYS WORKBENCH **5**

Introduction to FEA – Discretization, nodes and elements – Degrees of freedom – FEA workflow – ANSYS Workbench interface – Project schematic – Engineering data setup – Geometry import and cleanup – Sketching and defeaturing – Element types (1D, 2D, 3D) – Meshing fundamentals – Mesh controls and sizing – Mesh quality metrics – Boundary conditions (loads and constraints) – First static structural analysis – Stress and deformation contour plot.

UNIT II: STRUCTURAL ANALYSIS AND RESULTS INTERPRETATION **5**

Material models (linear elastic, isotropic) – Contact definitions (bonded, frictional) – Load application (forces, pressures, moments, torques) – Supports (fixed, remote) – Refined meshing – Adaptive mesh refinement – Hex vs Tet selection – Convergence study – Stress analysis – Strain and deformation evaluation – Factor of safety – Path and probe tools – Error diagnosis – Case studies (bracket, connecting rod, frame structures.

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UNIT III: ADVANCED SIMULATION AND REPORT GENERATION **5**

Assembly FEA – Multi-body contact modelling – Joint connections – Thermal analysis (steady-state) – Convection and heat flux – Thermo-structural coupling – Parametric study – Design variation – Optimization basics – Solver settings – Result validation – Documentation and reporting – Exporting contour plots – Engineering report preparation

LEARN BEYOND CONTENT:

- na

CONTACT PERIODS:

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

TEXTBOOKS:

1. Moaveni, S. (2015). Finite element analysis: Theory and application with ANSYS (4th ed.). Pearson Education
2. Seshu, P. (2003). Textbook of finite element analysis. Prentice-Hall of India.
3. Logan, D. L. (2012). A first course in the finite element method (5th ed.). Cengage Learning.

REFERENCES:

1. Reddy, J. N. (2019). An introduction to the finite element method (4th ed.). McGraw-Hill Education.
2. Cook, R. D., Malkus, D. S., Plesha, M. E., & Witt, R. J. (2002). Concepts and applications of finite element analysis (4th ed.). John Wiley & Sons.
3. . Liu, G. R., & Quek, S. S. (2013). The finite element method: A practical course. Butterworth-Heinemann.
4. ANSYS Inc. (2023). ANSYS Workbench user guide. ANSYS Documentation

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SEMESTER IV

		Category: HSMC				
U25ENG04	English Proficiency IV (Common to all programmes)	L	T	P	J	C
		0	0	2	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop clarity, correctness, and coherence in written communication by building foundational skills in grammar, sentence structure, and digital writing etiquette.
- To empower students to write effectively in academic, technical, and professional formats, including reports

COURSE OUTCOMES:

CO 1: Apply effective writing techniques in digital and professional communication **Apply**

CO 2: Develop technical and creative written texts **Create**

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	-

SYLLABUS:

LIST OF EXPERIMENTS

1. Importance of Writing in the Tech Era – Grammar for fluency – Drafting Email and Etiquette – Paragraph Writing: Unity and Coherence – Writing for Social Media: LinkedIn, Blogs – Tone and Style in Digital Communication – Resume and Cover Letter Writing – Common Writing Errors – Peer Review and Constructive Feedback
2. Writing Summaries of Technical Articles – Report Writing – Analytical Writing on Tech Trends – Writing on Sustainability and Smart Cities – Writing Technical Definitions and Descriptions – Case Study Writing
3. Abstract Writing for Projects – White Paper Writing on a Current Issue – Product/Service Review Writing – Script Writing for Presentations or Videos – Essay Writing on Ethical Tech Use – Creative Writing with a Tech Twist (Futuristic Fiction) – Writing for Newsletters / Campus Events

CONTACT PERIODS:

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

TEXTBOOKS:

1. Debra Daise & Charl Norloff, Q: Skills for Success: Reading and Writing, Level 4, 3rd Edition, Oxford University Press, 2019
2. Ashraf M. Rizvi & Priyadarshi Patnaik, "Effective Technical Communication" 3rd Edition, McGraw Hill, 2024

REFERENCES:

1. Peter Elbow, "Writing With Power: Techniques for Mastering the Writing Process", Oxford University Press Inc, 1998
2. William Strunk Jr, "The Elements of Style" Fingerprint Publishing, New Delhi, 2020

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Learn Beyond

SEMESTER IV

U25MA404	Numerical Methods for Engineers (Common to CE, EE, ME, MI)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations
- U25MA102 - Matrices and Calculus

COURSE OBJECTIVES:

- To introduce numerical techniques for solving algebraic and differential equations used in engineering analysis and simulation.
- To develop skills in interpolation, curve fitting, differentiation, and integration of experimental data.
- To implement and validate numerical algorithms using computational tools such as Python or MATLAB.

COURSE OUTCOMES:

CO 1: Illustrate different types of numerical errors and their influence on simulation accuracy with proper error analysis **Understand**

CO 2: Apply Gauss elimination, LU decomposition, and iterative methods to solve systems of engineering equations **Apply**

CO 3: Apply Lagrange interpolation and least squares regression techniques to model experimental data in engineering applications **Apply**

CO 4: Apply Trapezoidal and Simpson's rules to compute derivatives and integrals for engineering area and volume problems **Apply**

CO 5: Apply Runge-Kutta and predictor-corrector methods to solve ordinary differential equations in engineering dynamic systems **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	1	1
CO 2	3	3	2	2	3	-	-	-	-	-	2	1	2
CO 3	3	3	2	2	3	-	-	-	1	-	2	2	2
CO 4	3	3	2	2	3	-	-	-	1	-	2	2	2
CO 5	3	3	2	3	3	1	-	1	1	-	3	2	2

SYLLABUS:

UNIT I: FUNDAMENTALS OF NUMERICAL COMPUTATION **6 + 6**

Types of errors: absolute, relative, truncation, and round-off – Order of convergence – Stability and accuracy of algorithms – Error propagation and control in numerical computations

UNIT II: SOLUTION TO SYSTEM OF EQUATIONS **6 + 6**

Bisection method – Secant method – Gauss-Elimination method – LU decomposition – Gauss-Seidel iterative methods – Applications to engineering systems

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UNIT III: INTERPOLATION AND CURVE FITTING **6 + 6**

Lagrange interpolation – Divided difference method – Least squares fitting – linear models: Simple Linear Regression – Quadratic Polynomial Regression – nonlinear models: Exponential and Logistic Growth Models

UNIT IV: NUMERICAL DIFFERENTIATION AND INTEGRATION **6 + 6**

Finite difference for derivatives – Trapezoidal rule – Simpson's 1/3 rule – Applications to area and volume computations

UNIT V: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **6 + 6**

Euler's method – Taylors method – 4th order Runge - Kutta methods – Milne's Method – Adams-Bashforth method – Applications to engineering problems and dynamical systems.

LIST OF EXPERIMENTS

1. Error Analysis – Error Propagation in Series Evaluation – Stability Analysis of Iterative Algorithms
2. Equation Solving – Root Finding with the Secant Method – Solving Systems with LU Decomposition and Gauss-Seidel
3. Interpolation and Curve Fitting – Function Approximation with Interpolation – Modeling Experimental Data with Regression
4. Numerical Differentiation and Integration – Numerical Derivatives from Data – Area and Volume Computation
5. Numerical ODE Solvers – Comparing Euler and Runge-Kutta Solvers – Simulation of a Dynamic Engineering System

LEARN BEYOND CONTENT:

- Finite Difference Method for Partial Differential Equations (PDEs) - Adaptive Quadrature and Gaussian Quadrature

CONTACT PERIODS:

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

TEXTBOOKS:

1. Steven C. Chapra and Raymond P. Canale," Numerical Methods for Engineers", 7th Ed., McGraw-Hill, 2015
2. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics", 6th Ed., Narosa Publishing, 2020

REFERENCES:

1. E. Balagurusamy, "Numerical Methods", Tata McGraw-Hill, 2017
2. S.S. Sastry," Introductory Methods of Numerical Analysis", 9 th Ed., PHI Learning Pvt. Ltd., 2012
3. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury Learning and Information, 2019

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SEMESTER IV

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

PRE-REQUISITES:

- U25MI303 - 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

LEARN BEYOND CONTENT:

- ARM Processor Fundamentals

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 IV

U25MI402	Electrical Drives and Control	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- U21MI102 - Electrical and Electronics for Mechatronics

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, BLDC 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	**Understand**
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	2	1
CO 2	3	2	-	-	-	-	-	-	1	-	1	1	1
CO 3	3	2	1	-	2	-	-	-	1	-	2	2	2
CO 4	3	2	1	-	1	-	-	-	1	-	2	2	2
CO 5	3	2	1	1	1	-	-	-	1	-	2	3	2

SYLLABUS:

UNIT I: POWER SEMICONDUCTOR DEVICES **6 + 6**

VI and Switching Characteristics: SCR, Power BJT, Power MOSFET and IGBT – Triggering circuit – Snubber circuit

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 control – 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. Load test on three phase induction motor
2. Speed control of DC shunt motor
3. VI characteristics of Power semiconductor devices (SCR, MOSFET and IGBT)
4. Single phase Half controlled and fully controlled converter
5. Speed control of BLDC motor drive
6. Speed control of DC servomotor using PID controller
7. Simulation of speed control of DC and induction motor drive

LEARN BEYOND CONTENT:

- PMSM drive – Stepper motor – AI in drive control

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

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SEMESTER IV

U25MI403	Fluid Mechanics and Applications	Category: PCC				
		L	T	P	J	C
		2	0	0	0	2

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To explain and use fundamental fluid properties in engineering applications
- To measure fluid pressure and apply hydrostatic force and buoyancy principles
- To analyse fluid flow kinematics and dynamics to solve engineering problems

COURSE OUTCOMES:

CO 1:	Use fluid properties such as viscosity, surface tension, cavitation, and compressibility to solve basic fluid mechanics problems	**Apply**
CO 2:	Compute the fluid pressure using devices such as piezometer, manometer, and barometer	**Apply**
CO 3:	Compute hydrostatic forces on various surfaces and analyze buoyancy effects	**Apply**
CO 4:	Examine continuity equation and related concepts in kinematics of fluid flow	**Analyze**
CO 5:	Investigate the behavior of fluid flow using Bernoulli's equation, momentum principles, and flow measurement devices	**Analyze**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: PROPERTIES OF FLUIDS **6**

Concept of Fluid – Properties of Fluid – Viscosity – Vapor Pressure – Cavitation – Bulk Modulus – Compressibility – Meniscus Effect – Surface Tension – Pascal's Law

UNIT II: FLUID MEASUREMENT **6**

Measurement of Fluid Pressure – Barometer – Piezometer – Manometer – and Mechanical Gauge.

UNIT III: HYDROSTATIC FORCES **6**

Centre of Pressure – Vertical Plane Surface – Inclined Plane Surface – and Curved Plane Surface – D'Alembert's Principle – Fluid Masses Subjected to Acceleration along – Horizontal – Vertical and Inclined Plane – Buoyancy – Archimedes Principle – Metacentric Height

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UNIT IV: KINEMATICS OF FLUID FLOW 6

Classification of Fluid Flow – Methods of Describing Fluid Motion – Continuity Equation – Boundary Surface – Circulation – Streamline – Potential Function – Stream Function.

UNIT V: DYNAMICS OF FLUID FLOW 6

Equation of Fluid Motion – Bernoulli's Equation – Venturimeter – Orifice Meter – Pitot Tube – Free Liquid Jet – Impulse–momentum Principle – Control Volume Approach – Navier–Stokes Equation – Laminar Flow – Viscosity Measurements

LEARN BEYOND CONTENT:

- Reynolds Stresses – Reynolds Navier–Stokes Equation – Measurement of Turbulence

CONTACT PERIODS:

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

TEXTBOOKS:

1. Yunus A. Cengel and John M. Cimbala, "Fluid Mechanics: Fundamentals and Applications", 5th edition, McGraw-Hill, 2024
2. Frank M. White, "Fluid Mechanics", 9th edition, McGraw-Hill Education, 2022
3. Robert W. Fox, Alan T. McDonald, and Philip J. Pritchard, "Fox and McDonald's Introduction to Fluid Mechanics", 10th edition (Indian Adaptation), Wiley, 2021

REFERENCES:

1. Alfredo Soldati and Cristian Marchioli, "Fluid Mechanics for Mechanical Engineers", 1st edition, Springer, 2024
2. R.C. Hibbeler, "Fluid Mechanics", 2nd edition, Pearson, 2022

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Learn Beyond

SEMESTER IV

U25MI404	Metrology and CNC	Category: PCC				
		L	T	P	J	C
		1	0	2	0	2

PRE-REQUISITES:

- - Nil -

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 dimensional inspection — **Understand**

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 + 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 + 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 + 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 + 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

LEARN BEYOND CONTENT:

- Non-Destructive Testing

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** 30 Periods **Total:** 75 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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Learn Beyond

SEMESTER IV

U25MI405	Microcontroller and Embedded Systems Laboratory	Category: PCC				
		L	T	P	J	C
		0	0	4	0	2

PRE-REQUISITES:

- - Nil -

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

SYLLABUS:

LIST OF EXPERIMENTS

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

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11. Development of Embedded C Program for PID Controller Implementation

LEARN BEYOND CONTENT:

- ARM Processors and types

CONTACT PERIODS:

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

TEXTBOOKS:

1. Ramesh Goankar, "Microprocessor 8085 Architecture, Programming and Interfacing", 6th Edition, Penram International publishers, Mumbai, 2013

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

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Learn Beyond

SEMESTER IV

U25CSG19	Java Programming (Common to BM, EC, EE, MI)	Category: ESC				
		L	T	P	J	C
		2	0	2	0	3

PRE-REQUISITES:

- U25CSG01 - Problem Solving using C Programming

COURSE OBJECTIVES:

- To describe object-oriented programming paradigm and its principles
- To implement programs with Core Java features and API
- To develop applications with Java Collections

COURSE OUTCOMES:

CO 1:	Apply basic java constructs to build simple Java applications	**Apply**
CO 2:	Implement object oriented programming concepts for real time applications and create packages	**Apply**
CO 3:	Utilize Java exception handling techniques to ensure robust program execution	**Apply**
CO 4:	Implement multithreaded programming for concurrent applications and various I/O streams for file handling	**Apply**
CO 5:	Develop Java collection framework to manage and process the data	**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	-	2	1	-
CO 2	3	2	1	1	-	-	-	1	1	-	2	2	-
CO 3	3	2	1	1	-	-	-	1	1	-	2	2	2
CO 4	3	2	1	1	-	-	-	1	1	-	2	2	2
CO 5	3	2	1	1	-	-	-	1	1	-	2	2	2

SYLLABUS:

UNIT I: OBJECT ORIENTED DEVELOPMENT AND JAVA BASICS **6 + 6**

Object Oriented Programming – Concepts – Abstraction – Encapsulation – Characteristics of Java – Java Environment – JVM, JRE and JDK – Basic Structure of Java Program – Classes – Constructors – Methods – Static members – Data Types – Variables – Type Casting – Operators – Control Flow Statements – Command Line Arguments

UNIT II: PACKAGES AND INHERITANCE **6 + 6**

Defining a Package – Importing Packages – Inheritance – Super classes and Sub classes – Access Modifiers – this and super keywords – Constructors in sub classes – Polymorphism – Method Overloading – Method Overriding – Abstract Classes and Abstract Methods – Interfaces – Defining and Implementing Interfaces – Extending Interfaces – Object Class

UNIT III: EXCEPTION HANDLING **6 + 6**

Exceptions – Types of Exceptions – try, catch and finally – throw and throws – Checked and Unchecked Exceptions – Exception Hierarchy – Built-in Exceptions – User Defined Exceptions – Chained Exceptions – Try-with-resources – Stack Trace Elements

UNIT IV: I/O STEAMS AND MULTITHREADING **6 + 6**

Input / Output Basics – Scanner Class – File Handling using File Class – Reading from and Writing to Files – Basic File Operations – Introduction to Streams – Byte Streams and Character Streams – Introduction to Multithreading – Thread Life Cycle – Creating Threads using Thread Class and Runnable Interface

UNIT V: COLLECTIONS **6 + 6**

Collections Framework Overview – List, Set and Map – ArrayList – HashSet – HashMap – Basic Operations – Iterator – equals() and hashCode() methods – Simple programs using collections

LIST OF EXPERIMENTS

1. Write a Java program to create a class with private data members and public methods to demonstrate encapsulation
2. Develop a Java program to implement constructor overloading and method overloading
3. Develop a Java program to demonstrate inheritance and run-time polymorphism
4. Develop a Java program to implement abstract classes and interfaces
5. Develop a Java program to create and use packages
6. Develop a Java program to demonstrate exception handling using try, catch, throw, and finally
7. Develop a Java program to read from and write to a file
8. Develop a Java program to create multiple threads using Thread class and Runnable interface
9. Develop a Java program to store and process data using ArrayList, HashSet, and HashMap.

LEARN BEYOND CONTENT:

- Database connectivity using JDBC
- Comparable and Comparator interfaces

CONTACT PERIODS:

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

TEXTBOOKS:

1. Herbert Schildt and Danny Coward, "Java: The Complete Reference", 13th Edition, McGraw Hill Education, 2023
2. Cay S. Horstmann, "Core Java, Volume I: Fundamentals", 13th Edition, Pearson Education, 2024

REFERENCES:

1. Kathy Sierra, Bert Bates and Trisha Gee, "Head First Java", 3rd Edition, O'Reilly Media, 2022
2. Joshua Bloch, "Effective Java", 3rd Edition, Addison-Wesley, 2018
3. Paul Deitel and Harvey Deitel, "Java SE 17 for Programmers", Pearson Education, 2021
4. E. Balagurusamy, "Programming with JAVA", 7th Edition, McGraw Hill Education, 2024

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SEMESTER IV

U25MNC11	Basic Home Appliance Repair and Maintenance (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop practical skills for identifying, troubleshooting, and repairing basic household electrical and electronic appliances

COURSE OUTCOMES:

CO 1: To operate, maintain, and perform minor repairs on home appliances **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASIC HOME APPLIANCE REPAIR AND MAINTENANCE **15**

Introduction to Household Appliances — Types, safety, and components — Electrical Safety & Tools — Multimeter, insulation, wiring checks — Troubleshooting Small Appliances — Iron box, mixer grinder, fan, etc. — Repair of Electronic Gadgets – TV, induction stove, washing machine basics — Preventive Maintenance & Energy Efficiency — Hands-on Practice / Workshop

CONTACT PERIODS:

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

REFERENCES:

1. Herman S.L., "Electricity and Electronics for HVAC Technicians". Cengage Learning, 2016
2. Becker H.P., "The Complete Guide to Home Appliance Repair". Prentice Hall, 2003

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SEMESTER IV

U25MNC12	Plumbing and Sanitary Maintenance Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To impart fundamental plumbing skills related to installation and maintenance of water supply and sanitation systems

COURSE OUTCOMES:

CO 1: To identify plumbing tools, fix minor leaks, and maintain sanitary fittings **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: PLUMBING AND SANITARY MAINTENANCE SKILLS **15**

Introduction to Plumbing Systems — Water supply, drainage, and sanitation basics — Plumbing Tools and Materials — Pipe Fitting and Jointing — PVC, GI, CPVC pipes — Tap, Valve, and Tank Maintenance — Sanitary Fixtures and Leak Repairs

CONTACT PERIODS:

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

REFERENCES:

1. Wright D.J., "Plumbing: A Practical Guide for Level 2". Routledge, 2017

2. Fletcher R., "The Plumbing Engineering Handbook". ASPE, 2016

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SEMESTER IV

U25MNC13	Basic Electrical and Wiring Skills (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To train students in safe handling, installation, and maintenance of residential electrical systems

COURSE OUTCOMES:

CO 1: To understand domestic wiring systems and perform basic electrical repairs safely **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASIC ELECTRICAL AND WIRING SKILLS **15**

Electrical Safety and Basics — Tools and Components — Wires, switches, MCB, earthing — Domestic Wiring and Circuits — Series, parallel, distribution board — Installation of Fixtures — Lights, fans, sockets — Fault Detection and Testing — Continuity, short circuit checks — Hands-on Wiring Practice

CONTACT PERIODS:

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

REFERENCES:

1. Lowe J., "Electrical Installation Work". Routledge, 2017

2. Surjit Singh, "Electrical Wiring, Estimating and Costing". Dhanpat Rai & Co., 2017.

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SEMESTER IV

U25MNC14	Basic Vehicle Maintenance (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide practical knowledge of basic vehicle operation, inspection, and maintenance

COURSE OUTCOMES:

CO 1: To able to check and maintain two-wheelers and four-wheelers for routine upkeep **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASIC VEHICLE MAINTENANCE **15**

Introduction to Vehicle Systems — Engine, transmission, electrical, brake — Routine Checks and Maintenance — Oil, coolant, battery, tyre pressure — Troubleshooting Minor Issues — Starting trouble, lighting faults — Basic Servicing Procedures — Filter replacement, lubrication — Road Safety and Driving Etiquette — Practical Workshop

CONTACT PERIODS:

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

REFERENCES:

1. Halderman J.D., "Automotive Technology: Principles, Diagnosis, and Service". Pearson Education, 2017

2. Erjavec J., "Automotive Technology: A Systems Approach". Cengage Learning, 2015

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SEMESTER IV

U25MNC15	HVAC (Heating, Ventilation, and Air Conditioning) Maintenance (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To introduce students to HVAC systems and basic maintenance practices

COURSE OUTCOMES:

CO 1: To understand HVAC components and perform preventive and minor maintenance **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: HVAC (HEATING, VENTILATION, AND AIR CONDITIONING) MAINTENANCE **15**

Fundamentals of HVAC Systems — Components and Operation — Compressors, condensers, filters, ducts — Air Conditioning Basics — Cooling cycle, refrigerants, thermostat — Cleaning and Filter Maintenance — Energy Efficiency and Safety — Hands-on Practice / Demonstration

CONTACT PERIODS:

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

REFERENCES:

1. Whitman W.C., Johnson W.M., Tomczyk J.A., & Silberstein E., "Refrigeration and Air Conditioning Technology". Cengage Learning, 2016
2. Trott A.R. & Welch T., "Refrigeration and Air-Conditioning". Butterworth-Heinemann, 2000

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SEMESTER IV

		Category: MNC				
U25MNC16	Basic Carpentry and Home Improvement Skills (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To develop woodworking and basic repair skills for home furniture and fittings

COURSE OUTCOMES:

CO 1: To learn to use carpentry tools safely and perform simple woodwork and repairs **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: BASIC CARPENTRY AND HOME IMPROVEMENT SKILLS **15**

Introduction to Carpentry Tools and Materials — Measurement, Marking, and Cutting — Joinery and Fastening Techniques — Furniture Repair and Polishing — Basic Home Fixtures and Installations — Workshop Practice

CONTACT PERIODS:

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

REFERENCES:

1. Feirer J.L., "Cabinetmaking and Millwork". McGraw-Hill Education, 2006

2. Jackson A., Day D., "Collins Complete Woodworker's Manual". HarperCollins, 1996

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SEMESTER IV

U25MNC17	Painting and Surface Maintenance (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To provide knowledge of surface preparation, painting techniques, and minor repairs

COURSE OUTCOMES:

CO 1: To gain practical exposure to painting, polishing, and maintenance of building surfaces **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: PAINTING AND SURFACE MAINTENANCE **15**

Types of Paints and Coatings — Surface Preparation — Cleaning, sanding, priming — Application Techniques — Brush, roller, spray — Wall Putty and Finishing — Safety, Waste Disposal, and Maintenance — Hands-on Painting Practice

CONTACT PERIODS:

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

REFERENCES:

1. Patrick M., "Practical House Painting and Decorating". Routledge, 2000

2. Friedman D., "Painting and Finishing Techniques". Taunton Press, 1997

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SEMESTER IV

U25MNC18	Gardening and Waste Management (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To promote environmental stewardship through gardening, composting, and waste segregation skills

COURSE OUTCOMES:

CO 1: To design small gardens, manage organic waste, and practice sustainable waste handling **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: GARDENING AND WASTE MANAGEMENT **15**

Basics of Gardening — Soil, seed, and plant selection — Plant Care and Maintenance — Watering, pruning, pest control — Composting and Organic Waste Management — Solid Waste Segregation and Recycling — Campus Clean-up / Garden Activity — Sustainability and Green Practices

CONTACT PERIODS:

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

REFERENCES:

1. Hartmann H.T, Kester D.E, Davies F.T, & Geneve R.L, "Plant Propagation: Principles and Practices". Pearson Education, 2018
2. Jain M.S, Singh J, Kalamdhad A, "Organic Solid Waste Management: Rotary Drum Composting". Springer, 2025

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SEMESTER IV

U25MCC94	Robot Operating System	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

PRE-REQUISITES:

- - Nil -

COURSE OBJECTIVES:

- To introduce students to the fundamentals of Robotic Operating System (ROS2) and Gazebo simulation, including key concepts such as nodes, topics, services, and actions, as well as the development of ROS2 packages
- To equip students with the knowledge and skills required to apply ROS2 to mobile and industrial robots, including navigation, SLAM, robot arm control, perception, and communication
- To provide students with hands-on experience working with ROS2 and Gazebo, allowing them to design, implement, and test robotic applications using these tools

COURSE OUTCOMES:

CO 1: Program ROS2 packages and utilize ROS2 concepts such as nodes, topics, services, and actions to control, perceive, and communicate with mobile and industrial robots — **Apply**

CO 2: Apply ROS2 to mobile robots to navigate, use SLAM, and control them effectively — **Apply**

CO 3: Apply ROS2 to industrial robots to control robotic arms and perform real world tasks within a simulation environment — **Apply**

CO - PO MAPPING:

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

SYLLABUS:

UNIT I: INTRODUCTION TO ROS2 — **5**

Overview of ROS2 architecture and communication protocols, Comparison with ROS1, setting up ROS2 environment and creating a ROS2 package, Introduction to ROS2 command-line tools, Basic ROS2 concepts such as nodes, topics, messages, and services, Introduction to Gazebo simulator.

UNIT II: ADVANCED ROS2 CONCEPTS — **5**

ROS2 middleware and communication mechanisms, ROS2 launch files and parameter management, ROS2 package dependencies and ROS2 ecosystem, Advanced ROS2 concepts such as actions and transformations

UNIT III: ROS2 APPLICATIONS IN MOBILE AND INDUSTRIAL ROBOTICS — **5**

Introduction to ROS2-based mobile robot navigation, Overview of ROS2-based industrial robot control, Integration of ROS2 with sensors and actuators for mobile and industrial robots, ROS2-based robot perception and manipulation

LEARN BEYOND CONTENT:

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- NA

CONTACT PERIODS:

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

TEXTBOOKS:

1. Lentin Joseph and Janathan Cacace, "Mastering ROS 2 for Robotics Programming: Design, build, simulate, and prototype complex robots using the Robot Operating System 2", 4th edition, Packt Publishers, 2025
2. Nils Holmgren, "ROS2 for Beginners: A Step-by-Step Guide to Building Real Robots with Ubuntu and Humble Hawksbill", Amazon Digital Services, 2025

REFERENCES:

1. Rico F M, "A Concise Introduction to Robot Programming with ROS2", CRC Press, 2023.
2. Nehmzow U, "Mobile robotics: a practical introduction", Springer Science & Business Media, 2012.
3. Corke, "Robotics, Vision, and Control", Springer, 2011
4. Ros2 Humble Tutorial: https://docs.ros.org/en/humble/Tutorials.html

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Table 2: Break-up of Assessment Mark components

<table>
<tr><th rowspan="4">S. No</th><th rowspan="4">Course Type</th><th colspan="7">Marks Breakup</th></tr>
<tr><th colspan="5">Continuous Assessments
(Figures inside the brackets indicate total marks)</th><th colspan="2">End Semester Examinations</th></tr>
<tr><th colspan="3">Theory</th><th colspan="2">Practical / Project</th><th>Theory</th><th colspan="2">Practical / Project</th></tr>
<tr><th>CIAT 1</th><th>CIAT 2</th><th>Activities</th><th>Evaluation of Student's work, Observation, Record, etc., / Review for Project presentation</th><th>Lab Test</th><th></th><th>Test / Report Evaluation</th><th>Presentation & Viva</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Theory Courses
L – T – P – J – C
2 – 0 – 0 – 0 – 2
3 – 0 – 0 – 0 – 3
3 – 1 – 0 – 0 – 4
4 – 0 – 0 – 0 – 4</td><td colspan="3">40%</td><td colspan="2"></td><td>60%</td><td></td><td></td></tr>
<tr><td>16(60)</td><td>16(60)</td><td>8(40)</td><td colspan="2"></td><td>60(100)</td><td></td><td></td></tr>
<tr><td>2.</td><td colspan="9">Theory with Laboratory / Theory with Project (L – T – P – J – C)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Type 1
1 – 0 – 2 – 0 – 2
1 – 0 – 0 – 2 – 2</td><td colspan="3">25%</td><td colspan="2">25 %</td><td></td><td colspan="2">50%</td></tr>
<tr><td>10(30)</td><td>10(30)</td><td>5(40)</td><td>15(75)</td><td>10(25)</td><td></td><td>40(80)</td><td>10(20)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Type 2
1 – 0 – 4 – 0 – 3
1 – 0 – 0 – 4 – 3</td><td colspan="3">15 %</td><td colspan="2">35 %</td><td rowspan="2"></td><td colspan="2">50%</td></tr>
<tr><td>5(30)</td><td>5(30)</td><td>5(40)</td><td>25(75)</td><td>10(25)</td><td>40(80)</td><td>10(20)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Type 3
2 – 0 – 2 – 0 – 3
2 – 0 – 0 – 2– 3</td><td colspan="3">35 %</td><td colspan="2">15 %</td><td>50%</td><td colspan="2"></td></tr>
<tr><td>15(60)</td><td>15(60)</td><td>5(40)</td><td>10(75)</td><td>5(25)</td><td>50(100)</td><td></td><td></td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Type 4
3 – 0 – 2 – 0 – 4
3 – 0 – 0 – 2 – 4</td><td colspan="3">35 %</td><td colspan="2">15 %</td><td>50%</td><td colspan="2"></td></tr>
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2 – 0 – 4 – 0 – 4
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<tr><td>10(60)</td><td>10(60)</td><td>5(40)</td><td>15(75)</td><td>10(25)</td><td>40(100)</td><td>7.5(80)</td><td>2.5(20)</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td rowspan="2">Type 6
3 – 0 – 4 – 0 – 5
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<tr><td>15(60)</td><td>15(60)</td><td>5(40)</td><td>10(75)</td><td>5(25)</td><td>40(100)</td><td>7.5(80)</td><td>2.5(20)</td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Laboratory Course
L – T – P – J – C
0 – 0 – 2 – 0 – 1
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<tr><td>45(100)</td><td>15(100)</td><td>30 (80)</td><td>10 (20)</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Project Work</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td colspan="2">60%</td><td rowspan="2"></td><td colspan="2">40 %</td></tr>
<tr><td colspan="2">Review 1 – 10 (100)
Review 2 – 20 (100)
Review 3 – 30 (100)</td><td>Report Evaluation Guide – 10(50)
External – 10(50)</td><td>Viva-Voce Internal – 10(50)
External – 10(50)</td></tr>
<tr><td rowspan="2">5.</td><td rowspan="2">Internship / Industrial Training
(2 Credits)</td><td colspan="5">100%</td><td></td><td colspan="2"></td></tr>
<tr><td></td><td></td><td></td><td colspan="2">Report 40 (100)
Presentation 30 (100)
Viva-Voce 30 (100)</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">6.</td><td rowspan="2">Tamil Courses
(1 Credit)</td><td colspan="5">100%</td><td></td><td></td><td></td></tr>
<tr><td>50(50)</td><td>50(50)</td><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">7.</td><td rowspan="2">Value Added Courses
(1 / 2 Credits)</td><td colspan="5">100%</td><td></td><td></td><td></td></tr>
<tr><td>50(50)</td><td>50(50)</td><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">8.</td><td rowspan="2">Industry Oriented Courses
(1 Credit)</td><td colspan="5">100%</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">An appropriate assessment style as decided by the Industry Expert shall be made with BoS Approval</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">Mandatory Credit Courses
(1/2/3 Credits)</td><td colspan="5">100%</td><td></td><td></td><td></td></tr>
<tr><td>50(50)</td><td>50(50)</td><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">10.</td><td rowspan="2">Mandatory Non-Credit Courses / Capsule Courses</td><td colspan="5">100%</td><td></td><td></td><td></td></tr>
<tr><td>100(100)</td><td></td><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
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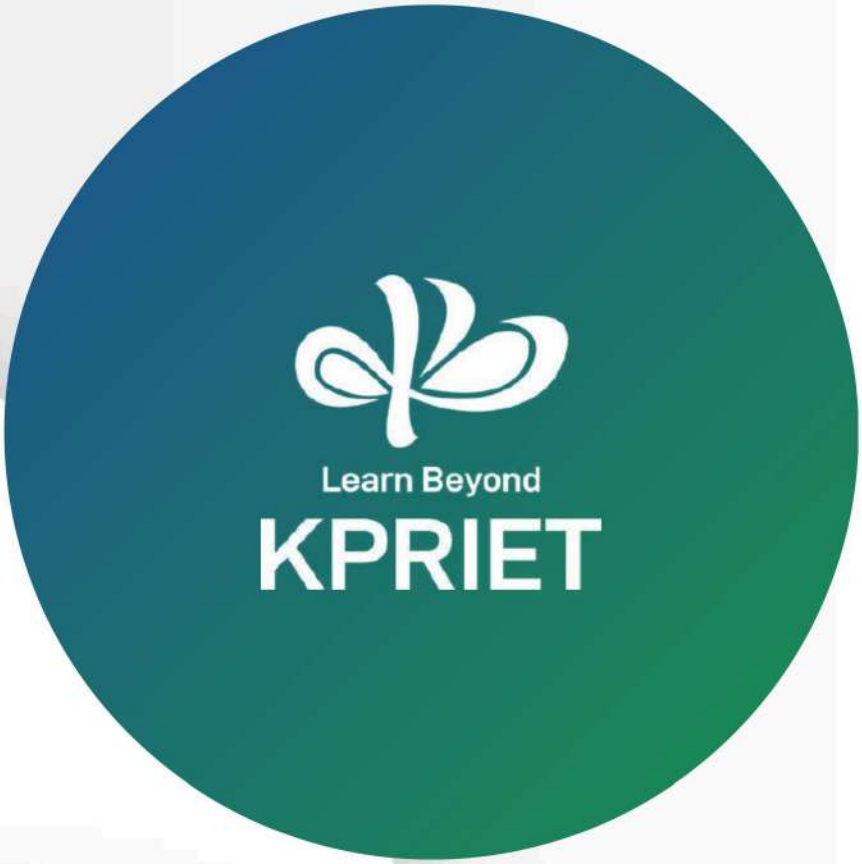
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