SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution | Approved by AICTE | Affiliated to Anna University
Accredited by NAAC with A++ Grade, Kuniamuthur, Coimbatore - 641008

83rd Rank

DEPARTMENT OF MECHATRONICS ENGINEERING

(Accredited by NBA)

AUTONOMOUS CURRICULUM AND SYLLABUS

REGULATIONS 2025

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution | Approved by AICTE | Affiliated to Anna University | Accredited by NAAC with A++ Grade
Kuniamuthur, Coimbatore – 641008
Phone : (0422)-2678001 (7 Lines) | Email : info@skcet.ac.in | Website : www.skcet.ac.in

Curriculum & Syllabi

Regulation 2025

for 2025-26 admitted Students

DEPARTMENT OF MECHATRONICS ENGINEERING

DEPARTMENT OF MECHATRONICS ENGINEERING

(Batch 2025-2029)

VISION OF THE INSTITUTION

- To Produce Globally Competitive Engineers with High Ethical Values and Social Responsibilities

MISSION OF THE INSTITUTION

- To impart the highest quality state-of-the-art technical education by providing impetus to innovation, research, and development and empowering students with entrepreneurship skills
- To instill ethical values, imbibe a sense of social responsibility, and strive for societal well-being
- To identify the needs of society and offer sustainable solutions through outreach programs

DEPARTMENT OF MECHATRONICS ENGINEERING

VISION OF THE DEPARTMENT

- To Provide world class education in the fields of Robotics and Automation to make Mechatronics Engineering the most preferred program among engineering aspirants

MISSION OF THE DEPARTMENT

To impart knowledge and skill to the students participating in the program by providing

M1: Expert Faculty to teach, inspire, mentor and motivate
M2: Excellent Infrastructure with facilities to learn Mechatronics, research and experiment
M3: Motivation towards self-learning, social responsibility and entrepreneurship
M4: Exposure to the latest technologies through industry-institute interaction.
M5: Environment to develop their innovative thoughts, moral values, communication and multidisciplinary skills

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	Apply knowledge of mathematics, science and engineering to solve contemporary engineering problems in the field of automation
PEO 2	Design, analyze, fabricate and test smart products
PEO 3	Exhibit the skills of simulation and experimentation using advanced engineering tools of industrial standards
PEO 4	Communicate and develop strong interpersonal abilities to prepare them for placement and higher studies
PEO 5	Be self-motivated towards lifelong learning and entrepreneurship

II. PROGRAMME OUTCOMES (POs)	
PO 1	**Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems
PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**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)
PO 4	**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)
PO 5	**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)
PO 6	**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)

PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams
PO 9	**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
PO 10	**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, to manage projects and in multidisciplinary environments
PO 11	**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

III. PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Graduates of B.E – MECHATRONICS programme will be able to:

PSO 1	Design, simulate and create automation systems for various applications
PSO 2	Apply the Knowledge of Robotics for addressing Societal, health and Safety Issues

IV. MAPPING OF PEOs WITH POs and PSOs

PEO	**POs**											**PSO**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	1	2
1	3	2	3	1	2	3	2	3	3	3	2	3	3
2	3	3	2	2	3	2	1	2	2	2	3	3	3
3	3	3	3	2	1	3	2	2	3	1	3	3	3
4	3	2	3	1	2	3	2	2	3	3	3	2	2
5	3	3	3	1	2	3	2	2	3	1	3	2	2
	1- low, 2 - medium, 3 - high, '-' - no correlation												

V. MAPPING OF PEOs WITH PSOs

	PSO 1	PSO 2
PEO 1	3	3
PEO 2	3	3
PEO 3	3	3
PEO 4	2	2
PEO 5	2	2

AUTONOMOUS CURRICULUM AND SYLLABI

Regulations 2025

B.E. Mechatronics Engineering Curriculum 2025-2029 Batch						
Semester - I						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						
1	25MA103	Foundational Mathematics for Engineers	3 / 1 / 0	4	4	4,8,9
2	25MT101	Elements of Mechatronics System	3 / 0 / 0	3	3	4,8,9
Theory with Practical (Internal 50 Marks & External 50 Marks)						
3	25MSC01	Materials Science	2 / 0 / 2	4	3	. 3, 4, 7, 9, 11, 12, 13, 16
4	25CS103	C Programming	1 / 0 / 4	5	3	4,9
5	25MT102	Product Assembly Visualization Lab	1 / 0 / 4	5	3	4,8,9
Indian Knowledge System - Blended Learning (Internal 100 Marks)						
6	25TA101	Heritage of Tamils	1 / 0 / 0	1	1	2, 7, 9, 12, 15, 16
7	25IKC01	Introduction to Indian Knowledge System	2 / 0 / 0	2	1	3,4,5,11,16
Mandatory Course						
8	25MC101	Induction Programme	3 WEEKS			4,8,9,10,11,16
			Total	**23**	**18**	
Certification/Online Course						
Certification/Spoken Tutorial/Coursera/NPTEL Courses- Minimum one Course						

Semester - II						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						

1	25MA203	Applied Mathematics	3 / 1 / 0	4	4	4,8,17
2	25MT201	Applied Mechanics	3 / 0 / 0	3	3	4,8,9
Theory with Practical (Internal 50 Marks & External 50 Marks)						
3	25MT202	Measurements and Instrumentation Systems	3 / 0 / 2	5	4	4,8,9
4	25MT203	Analog and Digital Electronics	3 / 0 / 2	5	4	4,8,9
5	25AD201	Python Programming	1 / 0 / 4	5	3	4,8,9,12
Practical (Internal 60 Marks & External 40 Marks)						
6	25MEC03	Design Thinking and Idea Lab	0 / 0 / 2	2	1	4, 9, 11, 12
Theory (Internal 100 Marks)						
7	25ENC01	Business Communication and Value Science	1 /2 / 0	3	3	4, 8, 9 ,16
Indian Knowledge System - Blended Learning (Internal 100 Marks)						
8	25TA201	Tamils and Technology	1 / 0 / 0	1	1	2,7,9,11,12,15,17
Mandatory Course (Internal 100 Marks)						
9	25MCC11	Disaster Management and Preparedness	2 / 0 / 0	2	0	4,8,9,11,13,14,15
			Total	**30**	**23**	
Certification/Online Course						
Certification/Spoken Tutorial/Coursera/NPTEL Courses- Minimum one Course						

Semester – III

S. No.	Course Code	Courses	L/T/P	Total Hours	Credits	SDG Mapping
Theory (Internal 40 Marks & External 60 Marks)						
1	25GE301	Universal Human Values	3 / 0 / 0	3	3	3, 4, 10, 16
2	25MT301	Signals and Systems	3 / 1 / 0	4	4	4,8,9
Theory with Practical (Internal 50 Marks & External 50 Marks)						
4	25MT302	Microcontrollers and Embedded systems	3 / 0 / 2	5	4	4,8,9
5	25MT303	Theory of Machines	3 / 0 / 2	5	4	4,8,9

6	25CSC01	Data Structures	3 / 0 / 2	5	4	4,8,9
7	25IT302	Database Systems	2 / 0 / 2	4	3	4,8,9
Indian Knowledge System - Blended Learning (Internal 100 Marks)						
8	25ME951	Metals and Metalworking Technology in Indian Tradition (Blended Learning)	2/0/0	2	2	4, 8, 9, 10, 12
Mandatory Course (Internal 100 Marks)						
9	25MCC01	Environmental Sciences	1 / 0 / 0	1	0	4,8,9,11,13,14,15
			Total	**29**	**24**	
Certification/Online Course						
Certification/Spoken Tutorial/Coursera/NPTEL Courses- Minimum one Course						

Semester - IV						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						
1	25MT401	Computer Networks and Cybersecurity	3 / 0 / 0	3	3	4,8,9,16
Theory with Practical (Internal 50 Marks & External 50 Marks)						
2	25MT402	Fluid and Thermal Engineering	3 / 0 /2	5	4	4,8,9
3	25MT403	Robotic Systems	3 / 0 /2	5	4	4,8,9
4	25MT404	Electrical Machines and Drives	3 / 0 / 2	5	4	4,8,9
5	25MT405	Control Systems	3 / 0 / 2	5	4	4,8,9
6	25CS302	Programming in Java	1 / 0 / 4	5	3	4,8,9
Indian Knowledge System - Blended Learning (Internal 100 Marks)						
7	25IKE02	Sustainable Energy Systems in IKS	2 / 0 / 0	2	2	7,11,12,13
			Total	**30**	**24**	
Certification/Online Course						
Certification/Spoken Tutorial/Coursera/NPTEL Courses- Minimum one Course						

Semester – V						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						
1	25MT501	Machine Design	3 / 0 / 0	3	3	4,8,9
2	25MT502	Autotronics and Vehicle Intelligence	3 / 0 / 0	3	3	4,8,9
3	25MT9XX	Professional Elective - I	3 / 0 / 0	3	3	-
Theory with Practical (Internal 50 Marks & External 50 Marks)						
4	25MT503	Programming in Embedded C++	3 / 0 / 2	5	4	4,8,9
5	25MT504	Hydraulics and Pneumatics Systems	3 / 0 / 2	5	4	4,8,9
6	25MT505	Smart Manufacturing	3 / 0 / 2	5	4	4,8,9
Project (Internal 100 Marks)						
7	25MT506	Prototype Lab	0/0/2	2	1	8, 9, 11, 12
Mandatory Course-Blended Learning (Internal 100 Marks)						
8	25MCC04	Soft Skills	1 / 0 / 0	1	0	4, 5, 10
9	25MCC02	Multilingual Practices	0 / 0 / 2	2	1	4,8,9
Total				**30**	**23**	
Foreign Language- Optional						

Semester – VI						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						
1	25MT601	Industrial Management and Professional Ethics	3 / 0 / 0	3	3	4,8,9
2	25MT9XX	Professional Elective - II	3 / 0 / 0	3	3	-
3	25MT0XX	Open / Emerging/ Industrial Elective- I	3 / 0 / 0	3	3	-
4	25MT0XX	Open / Emerging/ Industrial Elective- II	3 / 0 / 0	3	3	-
Theory with Practical (Internal 50 Marks & External 50 Marks)						
5	25MT602	Computer Integrated Manufacturing	3 / 0 / 2	5	4	4,8,9

6	25MT603	Artificial Intelligence for Robotics	3 / 0 / 2	5	4	4,8,9
7	25MT604	Industrial Automation	3 / 0 / 2	5	4	4,8,9
Mandatory Course-Blended Learning (Internal 100 Marks)						
8	25MCC02	Indian Constitution	1/0/0	1	0	16
Total				**28**	**24**	
Semester – VII						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Theory (Internal 40 Marks & External 60 Marks)						
1	25MT0XX	Open / Emerging / Industrial Elective- III	3 / 0 / 0	3	3	-
2	25MT9XX	Professional Elective - III	3 / 0 / 0	3	3	-
3	25MT9XX	Professional Elective - IV	3 / 0 / 0	3	3	-
4	25MT9XX	Professional Elective - V	3 / 0 / 0	3	3	-
Project (Internal 60 Marks & External 40 Marks)						
5	25MT701	Project - 1	0 / 0 / 6	6	3	4,8,9,17
Internship (Internal 100 Marks)						
6	25EES01	Employability Enhancement Skills (Internship)	28 Days		2	4,8,9,17
Total				**18**	**17**	
Semester – VIII						
S. No.	**Course Code**	**Courses**	**L/T/P**	**Total Hours**	**Credits**	**SDG Mapping**
Project (Internal 60 Marks & External 40 Marks)						
1	25MT801	Project - 2	0 / 0 / 24	24	12	4,8,9,17
Total Credits					**165**	

SCHEME OF CREDIT DISTRIBUTION – SUMMARY											
Sl. No.	Stream	Credits/Semester								C	%
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences Including Management (HSMC)	2	4	5	2		3			16	9.7
2	Basic Sciences (BSC)	7	4							11	6.7
3	Engineering Sciences (ESC)	6	7	11	7	1				32	19.4
4	Professional Core (PCC)	3	8	8	15	18	12			64	38.8
5	Professional Electives (PEC)					3	3	9		15	9.1
6	Open Electives (OEC) / Emerging Elective Courses (EEC)						6	3		9	5.5
7	Project Work (PROJ)							5	12	17	10.3
8	Mandatory Course (MC) / Spoken Hindi					1					0.0
Total		18	23	24	24	23	24	17	12	165	100.0

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM			
S. No.	Course Work - Subject Area	AICTE Suggested Credits	SKCET Credits (MCT)
1.	Humanities and Social Sciences (HS), including Management;	12*	16
2.	Basic Sciences (BS) including Mathematics, Physics, Chemistry, Biology;	21*	11
3.	Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, Instrumentation;	-	32
4.	Professional Subjects-Core (PC), relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required	101*	64
5.	Professional Subjects – Electives (PE), relevant to the chosen specialization/ branch;	6*	15
6.	Open Subjects- Electives (OE), from other technical and/or emerging subject areas;	6*	9
7.	Project Work, Seminar and/or Internship in Industry or elsewhere.	17*	17
8.	Mandatory Courses (MC)	Non-credit	1
Total		**163***	**165**
**Minor Variations is allowed as per need of the respective disciplines*			

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT (11 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./ Wk.**	**C**	**SDG Mapping**
1.	25TA101	Heritage of Tamils (Blended Learning)	1/0/0	1	1	2, 7, 9, 12, 15, 16
2.	25ENC01	Business Communication and Value Science	1/2/0	3	3	4, 8, 9, 16
3.	25TA201	Tamils and Technology (Blended Learning)	1/0/0	1	1	2, 7, 9, 11, 12, 15, 17
4.	25GE301	Universal Human Values (Blended Learning)	3/0/0	3	3	3, 4, 10, 16
5.	25MT601	Industrial Management and Professional Ethics	3 / 0 / 0	3	3	4,8,9

BASIC SCIENCE COURSES (11 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1.	25MA103	Foundational Mathematics for Engineers	3 / 1 / 0	4	4	4,8,9
2.	25MSC01	Materials Science	2 / 0 / 2	4	3	4,7,9,12,13,14
3.	25MA203	Applied Mathematics	3 / 1 / 0	4	4	4,8,17

ENGINEERING SCIENCE COURSES (32 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1.	25CS103	C Programming	1 / 0 / 4	5	3	4,9
2.	25MT102	Product Assembly Visualization Lab	1 / 0 / 4	5	3	4,8,9
3.	25MEC03	Design Thinking and Idea Lab	0 / 0 / 2	2	1	4, 9, 11, 12
4.	25MT201	Applied Mechanics	3 / 0 / 0	3	3	4,8,9
5.	25AD201	Python Programming	1 / 0 / 4	5	3	4,9
6.	25EC301	Signals and Systems	3 / 1 / 0	4	4	4,8,9

7.	25CSC01	Data Structures	3 / 0 / 2	5	4	4,8,9
8.	25CSIT302	Database Systems	2 / 0 / 2	4	3	4,8,9
9.	25CS302	Programming in Java	1 / 0 / 4	5	3	4,8,9
10.	25MT506	Prototype Lab	0/0/2	2	1	8, 9, 11, 12

PROFESSIONAL CORE COURSES (58 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1.	25MT101	Elements of Mechatronics System	3 / 0 / 0	3	3	4,8,9
2.	25MT202	Measurements and Instrumentation Systems	3 / 0 / 2	5	4	4,8,9
3.	25MT203	Analog and Digital Electronics	3 / 0 / 2	5	4	4,8,9
4.	25MT301	Microcontrollers and Embedded systems	3 / 0 / 2	5	4	4,8,9
5.	25MT302	Theory of Machines	3 / 0 / 2	5	4	4,8,9
6.	25MT401	Computer Networks and Cybersecurity	3 / 0 / 0	3	3	4,8,9,16
7.	25MT402	Fluid and Thermal Engineering	3 / 0 /2	5	4	4,8,9
8.	25MT403	Robotic Systems	3 / 0 /2	5	4	4,8,9
9.	25MT404	Electrical Machines and Drives	3 / 0 / 2	5	4	4,8,9
10.	25MT405	Control Systems	3 / 0 / 2	5	4	4,8,9
11.	25MT501	Machine Design	3 / 0 / 0	3	3	4,8,9
12.	25MT502	Autotronics and Vehicle Intelligence	3 / 0 / 0	3	3	4,8,9
13.	25MT503	Programming in Embedded C++	3 / 0 / 2	5	4	4,8,9
14.	25MT504	Hydraulics and Pneumatics Systems	3 / 0 / 2	5	4	4,8,9
15.	25MT505	Smart Manufacturing	3 / 0 / 2	5	4	4,8,9
16.	25MT602	Computer Integrated Manufacturing	3 / 0 / 2	5	4	4,8,9
17. .	25MT603	Artificial Intelligence for Robotics	3 / 0 / 2	5	4	4,8,9
18. .	25MT604	Industrial Automation	3 / 0 / 2	5	4	4,8,9

PROFESSIONAL ELECTIVE COURSES (15 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/ P**	**Contact hrs./Wk**	**C**	**SDG Mapping**
ELECTIVE STREAM I – APPLIED ROBOTICS						
1.	25MT901	Mobile Robotics	3/0/0	3	3	9,11
2.	25MT902	Agricultural Robotics and Automation	3/0/0	3	3	2,8,9,12,13
3.	25MT903	Bio-Mechatronics	3/0/0	3	3	3,9
4.	25MT904	Robot Operating System	3/0/0	3	3	4,9
5.	25MT905	Micro Robotics	3/0/0	3	3	3,6,9
6.	25MT906	Humanoids	3/0/0	3	3	4,8,10
7.	25MT907	Introduction to Marine and Aerial Robotics	3/0/0	3	3	9,13,14,15
8.	25MT908	Robot Motion Planning	3/0/0	3	3	9,11
9.	25MT909	Robot Control	3/0/0	3	3	9,4
ELECTIVE STREAM II - DESIGN AND MANUFACTURING						
1.	25MT910	Product Design and Manufacturing	3/0/0	3	3	9,12
2.	25MT911	Robots and System in Smart Manufacturing	3/0/0	3	3	9,8
3.	25MT912	CNC Machines and Part Programming	3/0/0	3	3	9,12
4.	25MT913	Additive Manufacturing Processes	3/0/0	3	3	9,12,13
5.	25MT914	Robotic Welding Technology	3/0/0	3	3	8,9
6.	25MT915	Digital Manufacturing	3/0/0	3	3	9,12
7.	25MT916	Micro and Nano Manufacturing	3/0/0	3	3	3,6,9
8.	25MT917	Industrial Metrology	3/0/0	3	3	9,12
9.	25MT918	Microelectromechanical Systems	3/0/0	3	3	3,9,13
ELECTIVE STREAM III - SMART MOBILITY SYSTEMS						
1.	25MT919	Advanced Driver Assistance Systems	3/0/0	3	3	3,9
2.	25MT920	Vehicle Ergonomics	3/0/0	3	3	3,10,12
3.	25MT921	Autonomous Underwater Vehicles	3/0/0	3	3	9,13,14
4.	25MT922	Electric and Hybrid Vehicles	3/0/0	3	3	7,9,11,13

5.	25MT923	Automobile Engineering	3/0/0	3	3	4,9,12
6.	25MT924	Battery Management System	3/0/0	3	3	7,12,13
7.	25MT925	Connected Vehicles	3/0/0	3	3	3,9,11
8.	25MT926	Safety, Ethics and Regulations for Driverless Cars	3/0/0	3	3	3,10,16
9.	25MT927	Foundations of Autonomous Vehicles	3/0/0	3	3	4,9,11
ELECTIVE STREAM IV – INTELLIGENCE SYSTEMS						
1.	25MT928	Introduction to Machine Learning	3/0/0	3	3	4,9,17
2.	25MT929	AI for Perception Planning and Control	3/0/0	3	3	3,9,11
3.	25MT930	Condition Monitoring and Fault Diagnostics	3/0/0	3	3	9,12,13
4.	25MT931	Intelligent Control System	3/0/0	3	3	7,9,12
5.	25MT932	Haptics	3/0/0	3	3	4,3,10
6.	25MT933	Computer Vision and Deep Learning	3/0/0	3	3	3,9,11
7.	25MT934	Reinforcement Learning for Robotics	3/0/0	3	3	4,9,13
8.	25MT935	Virtual Reality and its Applications	3/0/0	3	3	3,4,10
9.	25MT936	Augmented and Mixed Reality	3/0/0	3	3	4,9,11
ELECTIVE STREAM V –AUTOMATION						
1.	25MT937	Embedded System for Automation	3/0/0	3	3	9,7,12
2.	25MT938	Robotic Process Automation	3/0/0	3	3	8,9,12
3.	25MT939	Industrial Networking	3/0/0	3	3	9,11
4.	25MT940	Virtual Instrumentation and its Applications	3/0/0	3	3	4,9,12
5.	25MT941	Digital Twin and Industry 5.0	3/0/0	3	3	9,12,13,
6.	25MT942	Internet of Things for Mechatronics	3/0/0	3	3	6,9,11
7.	25MT943	AI and Machine Learning in Automation Testing	3/0/0	3	3	9,12
8.	25MT944	Planning and Decision Making in Robotics	3/0/0	3	3	3,9,11

9.	25MT945	Automation in Production Systems and Management	3/0/0	3	3	8,9,12
ELECTIVE STREAM VI – AVIONICS AND DRONE TECHNOLOGY						
1.	25MT946	Avionics	3/0/0	3	3	9,11,13
2.	25MT947	Drone Technologies	3/0/0	3	3	2,3,9,13
3.	25MT948	Navigation and Communication System	3/0/0	3	3	9,11,17
4.	25MT949	Unmanned Aerial Vehicles	3/0/0	3	3	9,11,13
5.	25MT950	Aircraft Stability and Control	3/0/0	3	3	4,9,11
6.	25MT951	Aircraft Mechatronics	3/0/0	3	3	7,9,12
7.	25MT952	Introduction to Aircraft Control System	3/0/0	3	3	3,9
8.	25MT953	Introduction to Airplane Performance	3/0/0	3	3	9,13
9.	25MT954	Introduction to Aircraft design	3/0/0	3	3	7,9,13

INDIAN KNOWLEDGE SYSTEM (08 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./ Wk.**	**C**	**SDG Mapping**
1.	25TA101	Heritage of Tamils (Blended Learning)	1 / 0 / 0	1	1	2,7,9,12,15,16
2.	25IK101	Introduction to Indian Knowledge System (Blended Learning)	2 / 0 / 0	2	2	3,5, 7,9,11,13,15,17
3.	25TA201	Tamils and Technology (Blended Learning)	1 / 0 / 0	1	1	2,7,9,11,12,15,17
4.	25ME951	Metals and Metalworking Technology in Indian Tradition (Blended Learning)	2 / 0 / 0	2	2	4,8,9
5.	25IKE02	Sustainable Energy Systems in IKS	2 / 0 / 0	2	2	4,8,9

OPEN / EMERGING/ INDUSTRIAL ELECTIVE (09 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
OPEN ELECTIVES (OE): Offered to other departments						
1.	25MT001	Basics of Robotics	3/0/0	3	3	2,3,9,13
2.	25MT002	Basics of Automation Systems	3/0/0	3	3	9,11,17
3.	25MT003	Smart Sensors for IoT	3/0/0	3	3	9,11,13
4.	25MT004	Basics of Unmanned Aerial Vehicles	3/0/0	3	3	4,9,11
5.	25MT005	Fundamentals of Arduino and Raspberry Pi	3/0/0	3	3	7,9,12
EMERGING ELECTIVES (EE): Offered to MCT						
1.	25MT006	Collaborative Robotics	3/0/0	3	3	9,11,17
1.	25MT007	Design Thinking and Entrepreneur Development	3/0/0	3	3	9,11,13
1.	25MT008	Brain Computer Interface	3/0/0	3	3	9,11,17
2.	25MT009	Social Robotics	3/0/0	3	3	9,11,13
3.	25MT010	Cognitive Robotics	3/0/0	3	3	4,9,11
4.	25MT011	Data Analytics for Robotics and Automation	3/0/0	3	3	9,11,17
5.	25MT012	Ethical Hacking	3/0/0	3	3	9,11,13
6.	25MT013	Entrepreneurship and Startups	3/0/0	3	3	4,9,11
7.	25MT014	Vision Guided Robots	3/0/0	3	3	9,11,17

PROJECT WORK (15 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1	25MT701	Project - I	0 / 0 / 6	6	3	4,8,9,17
2	25MT801	Project - II	0 / 0 / 24	24	12	4,8,9,17

PROFESSIONAL ELECTIVE COURSES: VERTICALS					
Vertical I	**Vertical II**	**Vertical III**	**Vertical IV**	**Vertical V**	**Vertical VI**
APPLIED ROBOTICS	**DESIGN AND MANUFACTURING**	**SMART MOBILITY SYSTEMS**	**INTELLIGENCE SYSTEMS**	**AUTOMATION**	**AVIONICS AND DRONE TECHNOLOGY**
25MT901- Mobile Robotics	25MT910- Product Design and Manufacturing	25MT919- Advanced Driver Assistance Systems	25MT928- Introduction to Machine Learning	25MT937- Embedded System for Automation	25MT946-Avionics
25MT902- Agricultural Robotics and Automation	25MT911- Robots and System in Smart Manufacturing	25MT920- Vehicle Ergonomics	25MT929- AI for Perception Planning and Control	25MT938- Robotic Process Automation	25MT947-Drone Technologies
25MT903- Bio-Mechatronics	25MT912- CNC Machines and Part Programming	25MT921- Autonomous Underwater Vehicles	25MT930- Condition Monitoring and Fault Diagnostics	25MT939- Industrial Networking	25MT948- Navigation and Communication System
25MT904- Robot Operating System	25MT913-Additive Manufacturing Processes	25MT922-Electric and Hybrid Vehicles	25MT931- Intelligent Control System	25MT940-Virtual Instrumentation and its Applications	25MT949- Unmanned Aerial Vehicles
25MT905- Micro Robotics	25MT914-Robotic Welding Technology	25MT923- Automobile Engineering	25MT932- Haptics	25MT941-Digital Twin and Industry 5.0	25MT950- Aircraft Stability and Control
25MT906- Humanoids	25MT915- Digital Manufacturing	25MT924-Battery Management System	25MT933- Computer Vision and Deep Learning	25MT942- Internet of Things for Mechatronics	25MT951-Aircraft Mechatronics

25MT907 - Introduction to Marine and Aerial Robotics	25MT916 - Micro and Nano Manufacturing	25MT925- Connected Vehicles	25MT934- Reinforcement Learning for Robotics	25MT943- AI and Machine Learning in Automation Testing	25MT952 - Introduction to Aircraft Control System
25MT908 - Robot Motion Planning	25MT917 - Industrial Metrology	25MT926- Safety, Ethics and Regulations for Driverless Cars	25MT935 - Virtual Reality and its Applications	25MT944 - Planning and Decision Making in Robotics	25MT953 - Introduction to Airplane Performance
25MT909 - Robot Control	25MT918 - Micro Electro Mechanical Systems	25MT927 - Foundations of Autonomous Vehicles	25MT936 - Augmented and Mixed Reality	25MT945 - Automation in Production Systems and Management	25MT954 - Introduction to Aircraft design

INTERNSHIP (02 Credits)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1.	25EES01	Employability Enhancement Skills (Internship)	28 Days		2	4,8,9,17

VALUE ADDED COURSES (Based on student's interest)							
S. No	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**	**Sem**
1.	25VA600	Real time data acquisition using LabVIEW- VI solutions, Bengaluru	0/0/2	2	1	9,4	III
2.	25VA601	CAD modeling and analysis software (CREO, catia, Fusion360, Ansys, NXCAD) - CAD Solutions, Coimbatore	0/0/2	2	1	9,12	IV
3.	25VA602	Autonomous Mobile Robots - Goat Robotics and Anya Robotics, Coimbatore	0/0/2	2	1	8,9	V
4.	25VA603	Industry 4.0 - Maxbyte Technologies, Coimbatore	0/0/2	2	2	9,11	VI
5.	25VA604	Embedded and Microcontroller Programming - RoboRam Education	0/0/2	2	2	4,9	VI
6.	25VA605	Fusion 360 - ICT Academy, Coimbatore	0/0/2	2	1	9,12	VII

VALUE ADDED COURSES (Based on student's interest)							
S. No	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**	**Sem**
7.	25VA606	Electric Vehicle, Industry 4.0, Data Analytics, Industrial Automation, Robotics and Automation, IOT using smart devices Lean Six Sigma – Yellow, Green and black) - TVS Training & Services Limited	0/0/2	2	2	7,9,11,12	VII
8.	25VA607	Mastering Embedded Systems: Unleash the Power of Controller Boards-IIIT BOMBAY e-YANTRA	0/0/2	2	1	4,9	VII
9.	25VA608	AI and Deep learning - DeepVision Tech Ai	0/0/2	2	1	3,4,9,13	VII

MANDATORY COURSES (Non-Credits) (Courses conducted either by internal faculty or through MOOCs)						
SL. No.	**Course Code**	**Course Title**	**L/T/P**	**Contact hrs./Wk.**	**C**	**SDG Mapping**
1.	25MC101	Induction Programme	0		-	3,4,10
2.	25MCC01	Environmental Sciences	1 / 0 / 0	1	0	4,8,9,11,13,14,15
3.	25MCC02	Multilingual Practices	1 / 0 / 0	1	1	4,8,9
4.	25MCC04	Soft Skills (Blended Learning)	1 / 0 / 0	1	0	4,5,10
5	25MCC11	Disaster Management and Preparedness	2/0/0	2	0	4,8,9,11,13,14,15

L: Lecture **T:** Tutorial **P:** Practical **C:** Credit **O:** Outside Class hours **Cat.:** Category

HSMC : Humanities and Social Sciences including Management
BSC : Basic Science Courses
OEC : Open and Emerging Elective Courses
PRJ : Project Work

ESC : Engineering Science Courses
PCC : Professional Core Courses
PEC : Professional Elective Courses
INT : Internship
MC : Mandatory Course

Definition of Credit:

L – Lecture	1 Hr. Lecture (L) per week	1 credit
T – Tutorial	1 Hr. Tutorial (T) per week	1 credit
P - Practical/Practice (Project and Industry based Courses)	1 Hr. Practical (P) per week	0.5 credit

SEMESTER – I

25MA103 SDG NO. 4,8,9	FOUNDATIONAL MATHEMATICS FOR ENGINEERS (Common to MECH, MCT, CIVIL)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

1. To understand and gain the knowledge of matrices, determinants and inverse of a matrix.
2. To reduce quadratic form to canonical form of a matrix and identify its nature.
3. To familiarize the concepts of differential calculus which are applicable in many branches of engineering.
4. To use derivatives to investigate the behaviour of functions, including identifying maxima, minima, and points of inflection.
5. To understand and evaluate definite integrals using different techniques.

MATRICES AND DETERMINANTS **12**

Introduction to Matrices - Types of matrices - Symmetric, skew symmetric, Hermitian and unitary matrices - Matrix operations - Rank of a matrix - Determinants - Properties - Solution of Linear Equations by Cramer's rule and Inverse of a Matrix. Case Study: Circuit Analysis by Mesh and Nodal methods.

EIGENVALUES AND EIGENVECTORS **12**

Characteristic equation - Eigenvalues and Eigenvectors of a real matrices and their properties - Cayley-Hamilton theorem - Orthogonal transformation of a real symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms. Case Study: Eigenvalues and Eigenvectors in vibration of a 2 Mass Spring System.

DIFFERENTIAL CALCULUS **12**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Curvature in Cartesian coordinates – Centre and Radius of curvature - Circle of curvature in Cartesian coordinates - Evolutes - Envelopes - Evolute as envelope of normals.
Case Study:Stress-Strain behaviour in materials.

MULTIVARIATE CALCULUS **12**

Partial derivative - Total derivative - Differentiation of implicit functions - Jacobian and its properties - Taylor’s series for functions of two variables - Maxima and minima of functions of two variables - Method of Lagrangian multipliers.Case Study:Kinematics of Particles.

DEFINITE INTEGRALS **12**

Evaluation of definite integrals using Bernoulli’s formula. Beta and Gamma functions: Relation between Beta and Gamma Functions-Evaluation of Integrals using Beta and Gamma Functions – Numerical Integration by using Trapezoidal and Simpson’s 1/3 rule. Case Study:Alternating Current Waveform Analysis.

TOTAL PERIODS: 60

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Solve the system of linear equations using Cramer's rule and matrix inversion methods.	[AP]
CO2	Compute the eigenvalues and eigenvectors to diagonalizable a given matrix and reduce quadratic form to canonical form by orthogonal transformation and identify the nature of the quadratic form.	[U]
CO3	Find the Curvature and Evolutes by applying the techniques of differentiation.	[U]
CO4	Utilize the Lagrange multiplier method to find extrema of functions with constraints.	[AP]
CO5	Solve definite integrals using integration techniques, Bernoulli's formula, Beta and Gamma functions.	[AP]

TEXTBOOKS

1. Kreyszig. E, "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Limited, Singapore, 2020.
2. Grewal. B.S, "Higher Engineering Mathematics", 42nd edition, Khanna Publishers, Delhi, 2021.
3. Burden R.L and Faires J.D, "Numerical Analysis", 9th edition, Cengage Learning, 2016.

REFERENCE BOOKS

1. Veerarajan .T, "Engineering Mathematics", McGraw-Hill, New Delhi, 2018.
2. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
3. Ramana. B. V, "Higher Engineering Mathematics", McGraw Hill, New Delhi, 2017..

WEB RESOURCES

1. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
2. https://nptel.ac.in/courses/111/107/111107105/
3. https://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/
4. https://www.coursera.org/learn/integration-calculus
5. https://www.khanacademy.org/math/linear-algebra/alternatebases/eigen-everything/v/linear algebra-introduction-to-eigenvaluesand-eigenvectors

25MT101 SDG No. 4,8,9	ELEMENTS OF MECHATRONICS SYSTEM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To introduce the fundamental concepts of mechanical systems
2. To familiarize students with various types of sensors, their working principles, applications in smart systems, and adherence to industry standards.
3. To develop understanding of actuators and drive systems.
4. To impart knowledge on embedded control systems.
5. To provide exposure to software stack and integration of systems

MECHANICAL SYSTEM **9**

Links, joints and constraints - Types of mechanism - Degrees of Freedom - Basics of transmission elements – Phases in mechanical engineering design – Sequential and Concurrent design.

SENSORS AND APPLICATIONS **9**

Basic specification and measurement – Types of sensors - Hall effect sensors, Tactile, Proximity, Capacitive, Inductive, Fiber optic, Thermal, Chemical, Inertial Rotary, Magnetic, Nano Sensor, Smart Sensors, Measurement of vehicle speed with radar sensors- Smart Sensor Systems – Role of sensors in IoT – Overview of IS/IEC 61757-1:1998 standard for fiber optic sensors.

ACTUATORS AND DRIVES **9**

Fluid power basics - types - linear and rotary actuators - Direction, pressure and flow control valves - Electrical Actuators (AC and DC) - Electrical drives – Fluid power drives. Case Study: Hydraulic Excavator

EMBEDDED CONTROL **9**

Open loop and closed loop systems – ON OFF control – proportional control – Basics and types of computing hardware - Real time behavior – Time Performance – Accuracy – parallelization – Concept of programming, Algorithm and coding.

SOFTWARE STACK AND INTEGRATION **9**

User Interface – Data acquisition and methods – Sampling and quantization – Data processing – Basic algorithm implementation – Motion control implementation – Development pipeline

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Infer the roles of links, joints, constraints, and design phases of mechanical systems	[U]
CO2	Identify appropriate sensors and its applications.	[AP]
CO3	Select suitable actuator and drive systems for mechatronic systems.	[AP]
CO4	Illustrate concepts of embedded control strategies	[U]
CO5	Outline the basics of software stack and integration.	[U]

TEXTBOOKS

1. Rattan S.S, “Theory of Machines”, 5th Edition, McGraw Hill Education (India) Private Limited, India, 2019
2. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI Learning Pvt. Ltd., India, 2022
3. Anthony Esposito and A P Harsha, “Fluid Power with Applications”, Revised 7th Edition, Pearson Education India, 2024

REFERENCE BOOKS

1. Raj Kamal, Embedded Systems, 4th Edition, McGraw Hill Education (India) Private Limited, India, 2020.
2. Banks J., Nelson B.L., Nichol D M, Carso J S, “Discrete – Event System Simulation”, 5th Edition, Pearson Education, 2014.
3. Alciatore D G, Histand M B, “Introduction to Mechatronics and Measurement Systems”, 4th Edition, McGraw-Hill Education, New York, 2011

WEB RESOURCES

1. https://onlinecourses.nptel.ac.in/noc25_me179/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee108/preview
3. http://engineering.nyu.edu/mechatronics/Description/elements.htm
4. https://www.coursera.org/learn/cps-design-for-mechatronics-healthcare-ev--robotics
5. https://www.coursera.org/learn/fluid-power

25MSC01 SDG NO. 3, 4, 7, 9, 11, 12, 13, 16	MATERIALS SCIENCE	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

1. To explore the basic concepts of physics in engineering.
2. To impart the physics concepts in solving real time engineering problems.
3. To explore and visualize theoretical concepts of physics by computational methods.
4. To enhance the ability to record, analyze and interpret experimental data.
5. To familiarize the basic concepts, synthesis and application of Nano materials.

WAVE OPTICS **6**

An introduction to Wave Optics, Interference - Principle of superposition - Michelson interferometer. Diffraction definition - Fresnel's diffraction and Fraunhofer's diffraction - Difference between interference and diffraction - Fraunhofer diffraction at Single slit-plane diffraction grating (Multi slit diffraction). Polarization definition – Brewsters law, Double refraction – Polarimeter – construction and working.

QUANTUM MECHANICS **6**

Quantum Mechanics Introduction – Planck's quantum theory - Matter waves, de-Broglie wavelength, Heisenberg's uncertainty principle , Time independent and Time – dependent Schodinger's wave equation, Physical significance of wave function, Particle in one dimensional potential box.

LASER AND FIBER OPTICS **6**

Characteristics of laser – Principle of spontaneous emission and stimulated emission – Einstein's theory of matter radiation interaction and A and B coefficients (derivation) – Population inversion – Pumping – CO2 laser, Fiber optics: principle and propagation of light in optical fibers – Numerical aperture and acceptance angle – Application of optical fiber in communication system.

ELECTRONICS AND OPTOELECTRONIC DEVICES **6**

Introduction to semiconductors –Basic concept of Band theory - Basic of Intrinsic and extrinsic semiconductors – PN Junction diode and its IV characteristics - Transistor – Bi-polar Junction Transistor (BJT). Optoelectronic devices: light detectors and solar cells – light emitting diode.

NANO MATERIALS **6**

Nanomaterials – Definition - Types - Comparison of nanomaterials with bulk materials. Nanoparticles, nanoclusters and nanorods - Preparation by sol-gel and solvo-thermal methods - Properties and applications. Carbon nanotubes – preparation by chemical vapor deposition -Properties and applications in electronics. Nanowires - Preparation by electrochemical deposition and electro-spinning - Properties and sensing applications.

TOTAL (THEORY): 30 PERIODS

LAB EXPERIMENTS

1. Calculate the Wavelength of mercury spectrum using Spectrometer and grating through V lab
   https://ov-amrt.vlabs.ac.in/exp/diffraction-grating/simulation.html
2. Determine the wavelength of given source of light using Newton's ring experiment through V – Lab.
   https://ep-iitb.vlabs.ac.in/exp/newtons-ring-experiment/simulation.html
3. Determination of Brewsters angle through V – Lab
   https://lo-amrt.vlabs.ac.in/exp/brewsters-angle-determination/simulation.html
4. Exploring light and energy: A practical Planck's constant experiment.
   https://ep-iitb.vlabs.ac.in/exp/plancks-constant-graph/simulation.html
5. Estimate the value of Stefan's constant using an incandescent Bulb.
   https://bop-iitk.vlabs.ac.in/exp/stefans-law/simulation.html
6. Analyze the refractive index of glass plate using different types of Laser source.
   https://lo-amrt.vlabs.ac.in/exp/michelsons-interferometer-refractive/simulation.html
7. Calculate the Numerical aperture and acceptance angle of the given optic fibre for data communication.
   https://lo-amrt.vlabs.ac.in/exp/numerical-aperture-optical-fiber/simulation.html
8. Estimate the Band gap of the given semiconductor.
   https://virtual-labs.github.io/exp-energy-band-gap-iitk/simulation.html
9. Calculate the efficiency of the given Solar panel.
   https://ep-iitb.vlabs.ac.in/exp/characteristics-solar-cell/simulation.html
10. Analyze the Characteristics of the Light emitting diode..
    https://oc-iitr.vlabs.ac.in/exp/characterization-led/simulation.html
11. Determination of stopping potential of different materials through V - lab.
    https://mp-amrt.vlabs.ac.in/exp/photoelectric-effect/simulation.html
12. Evaluate the electrochemical equivalent of Copper using electrochemical deposition.
    https://bop2-iitk.vlabs.ac.in/exp/electrochemical-equivalent-copper/simulation.html

LIFE SKILL EXPERIMENTS

1. Estimate the value of the given resistor, capacitor and voltage/Current using Multimeter.
2. Identify the earth, neutral and phase line in an AC circuit.

TOTAL (LAB): 30 PERIODS

TOTAL: 60 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to:

CO1	To apply the principles of wave optics in practical and theoretical contexts.	[AP]
CO2	Apply quantum principles to explain atomic and subatomic system behavior.	[AP]
CO3	Understand the principles of Lasers, Einstein's coefficients and the fundamentals of fiber optics along with their practical applications.	[U]
CO4	Apply the principles of semiconducting materials to analyze and design electronic circuits and systems.	[U]
CO5	Utilize the fundamental principles of nanomaterials to explore and implement their applications in Engineering.	[AP]

TEXT BOOKS

1. Bhattacharya,D.K. & Poonam,T. "Engineering Physics", Oxford University Press, 2015.
2. Malik,H.K. & Singh,A.K. "Engineering Physics", Tata McGraw-Hill Education, 2017.
3. Gary N. Felder & Kenny M. Felder, "Modern Physics", Cambridge University Press, 2022.
4. Sulabha K. Kulkarnl, Nanotechnology: principles and practices, Springer publications, , 3rd Edition, 2018.

REFERENCE BOOKS

1. Halliday, D., Resnick, R. & Walker, J., "Principles of Physics: Extended, International Adaptation", 12th Edition, Wiley, 2023.
2. Serway, R.A. & Jewett, J.W., "Physics for Scientists and Engineers", Cengage Learning, 2019.
3. Jenkins & White, "Fundamentals of Optics", 4th Edition, McGraw Hill Education, 2017.
4. B. Rogers, J Adams and S. Pennathur, Nanotechnology the whole story, CRC Press, 2013.

WEB RESOURCES

1. https://www.khanacademy.org/science/physics
2. http://www.feynmanlectures.caltech.edu/info/
3. https://physics.info/
4. http://hyperphysics.phy-astr.gsu.edu/hbase/index.html

25CS103 SDG NO. 4, 9	C PROGRAMMING	L	T	P	C
		1	0	4	3

COURSE OBJECTIVES:

1. To understand the basics of C language, including syntax, data types, variables, constants, operators, and control structures.
2. To familiarize the fundamental logic to write, debug, and optimize code using conditional statements, loops, and functions to solve real-life problems.
3. To acquire the skills to manipulate and store data using arrays, strings, pointers, and dynamic memory allocation.
4. To learn how to implement structures, unions, and file handling to create modular and scalable programs.
5. To familiarize the development of small projects to apply their learning in practical, real-world scenarios by adhering to best programming practices.

BASICS OF C PROGRAMMING AND CONTROL STRUCTURES **3**

Introduction to C Programming - Structure of a C Program, Keywords, Identifiers, Constants, Variables, Basic Data Types, Type Conversion, Input & Output Functions (printf(), scanf(), getchar(), putchar()). Operators in C - Arithmetic, Relational, Logical, Assignment, Bitwise Operators, Operator Precedence, Associativity, and Typecasting.

CONTROL FLOW AND LOOPING **3**

Control Structures - Decision-Making: if, if-else, nested if-else, switch-case, Looping: for, while, do-while, Loop Control Statements: break, continue, goto.

ARRAYS, STRINGS, AND POINTERS **3**

Arrays - Defining, Declaring, Initializing, Accessing Arrays, Multi-Dimensional Arrays (2D Arrays and Matrix Operations). Strings - Character Arrays, String Handling Functions (strlen(), strcpy(), strcmp(), strcat()), String Manipulation.

POINTERS, FUNCTIONS AND RECURSION **3**

Pointers and Dynamic Memory Allocation - Basics of Pointers, Pointer Arithmetic, Pointer to Functions, Dynamic Memory Allocation: malloc(), calloc(), free(), realloc(), Dangling Pointers, NULL Pointers. Functions - User-defined and Library Functions, Parameter Passing: Call by Value, Call by Reference, Recursion.

STRUCTURES AND FILE HANDLING **3**

Structures and Unions - Declaring and Accessing Structures, Array of Structures, Nested Structures, Structures vs Unions. File Handling and Command-Line Arguments - File I/O Functions: fopen(), fclose(), fread(), fwrite(), fprintf(), fscanf(), Text Files and Binary Files, Command-line Arguments. Bitwise Operators and Preprocessor Directives, Bit Manipulation,

Bitwise AND, OR, XOR, Left Shift, Right Shift. Preprocessor Directives: #define, #include, Macros, Conditional Compilation.

TOTAL (THEORY): 15 PERIODS

LAB EXPERIMENTS

1. Programs illustrating Input/output operations, arithmetic operators

Sample - Billing System for a Retail Store

Scenario: A retail store wants to automate its billing system. Write a C program that takes item names, quantities, and prices as input and calculates the total bill, including tax.
Concepts Used: Input/output operations, arithmetic operators, and control structures.

2. Programs illustrating Control Structures - Decision Making

Sample - Movie Ticket Booking System

Scenario: A multiplex offers discounts on movie tickets based on age. Write a program to accept the **age** of the user and display the ticket price using the following conditions:

- Children (below 12) - ₹100
- Seniors (above 60) - ₹150
- Others - ₹250

Concepts: if-else, Logical Operators

3. Programs illustrating Control Structures - Iteration

Sample - ATM PIN Validation

Scenario: A banking system allows users a maximum of three attempts to enter the correct PIN. Implement a program that asks the user for a 4-digit PIN. If the entered PIN is incorrect, the program should allow up to three attempts before locking the user out.

Concepts: while loop, Conditional statements

4. Programs illustrating Arrays

Sample - Smart Attendance Tracker

Scenario: A school wants to track student attendance. Develop a C program that allows input of student roll numbers and marks attendance. The program should display present and absent students.
Concepts Used: Arrays, loops, and conditional statements.

5. Programs illustrating String Manipulation

Sample - User Authentication System

Scenario: A company wants a basic user login system. Write a program that accepts a username and password from the user and checks if they match a pre-stored username and password. If they match, print "Login Successful"; otherwise, print "Invalid Credentials".

Concepts: strcmp(), gets(), puts(), Input Validation

6. Programs illustrating Functions

Sample - Banking Transaction System

Scenario: A bank needs an application to handle transactions. Write a program that allows users to deposit, withdraw, and check their account balance. Ensure that withdrawal doesn't exceed the account balance.
Concepts Used: Functions, conditional statements, and loops.

7. Programs illustrating Pointers and Dynamic Memory Allocation

Sample - Dynamic Array Allocation

Scenario: A **data-processing application** needs to store n numbers dynamically.
Task: Write a program that takes n as input, dynamically allocates memory for an array, accepts n numbers, and prints them.
Concepts: malloc(), free(), Pointer arithmetic

8. Programs illustrating Structures and Unions

Sample - Online Shopping Cart

Scenario: An e-commerce website wants a shopping cart system. Write a program that allows users to add products to the cart, calculate the total price, and apply discounts for orders above a certain amount.
Concepts Used: Arrays, structures, and conditional statements.

9. Programs illustrating File Handling

Sample - File Encryption & Decryption

Scenario: A company wants to protect sensitive data by encrypting text files. Write a program that reads a text file, encrypts the content using a simple character shift algorithm, and saves it to a new file.
Concepts Used: File handling, character manipulation, and loops.

TOTAL (LAB): 60 PERIODS

TOTAL: 75 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to:

CO1	Describe the C programming fundamental concepts and to select suitable keywords and data types for simple programs.	[U]
CO2	Choose appropriate control structures and looping techniques to design structured and efficient programs	[AN]
CO3	Apply arrays, strings, and pointers concepts to manipulate and process data for problem-solving in C programming	[AP]
CO4	Examine the effectiveness of functions and dynamic memory allocation in enhancing program modularity and efficiency	[AN]
CO5	Develop applications using structures, file handling and preprocessor directives to manage data and system interactions	[AP]

TEXT BOOKS

1. Jens Gustedt, "Modern C", 3rd Edition, Manning Publications, 2023.
2. Robert C. Seacord, "Effective C: An Introduction to Professional C Programming", 2nd Edition, No Starch Press, 2023.
3. Dan Gookin, "C Programming for Dummies", 2nd Edition, For Dummies Publication, 2020.

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Prentice Hall, 2015.
2. Stephen G. Kochan, "Programming in C", 4th Edition, Developer's Library, 2014.
3. King. K. N., "C Programming: A Modern Approach", 2nd Edition, W. W. Norton & Company, 2008.

WEB RESOURCES

1. https://cs50.harvard.edu/x/
2. https://www.learn-c.org/
3. https://www.geeksforgeeks.org/c-programming-language
4. https://www.programiz.com/python-programming
5. https://www.w3schools.com/c/
6. https://www.codechef.com/cpp-online-compiler

25MT102 SDG NO. 4,8,9	PRODUCT ASSEMBLY VISUALIZATION LAB	L	T	P	C
		1	0	4	3

COURSE OBJECTIVES

1. To develop the skill to draw components by free hand. sketching.
2. To apply the principles of orthographic projection of points and lines in 2D using manual techniques and CAD tools.
3. To construct isometric projections of solids using CAD software.
4. To represent 3D solids using projection techniques, sectioning, and development of surfaces.
5. To apply design and modelling principles to develop a complete engineering product using software.

FREE HAND SKETCHING **3**

Principles of Engineering Graphics and their significance, Drawing standards (BIS and ISO), elements of dimensioning. Free hand sketching- Pictorial representation of engineering objects – representation of three-dimensional objects in two dimensions– need for multiple views – developing visualization skills through free hand sketching of three-dimensional objects.

ORTHOGRAPHIC PROJECTIONS **3**

Introduction to projections: General principles of orthographic projection – first angle projection – layout of views - Projection of Points, Projection of lines. 2D drawing using CAD.

ISOMETRIC PROJECTIONS **3**

Isometric projections of simple and combination of solids. Conversion of pictorial view into orthographic Projection- 2D drawing from 3D drawing and missing views using CAD.

PROJECTIONS AND 3D MODELLING **3**

Projection of Solids: Classification of solids, Projection of solids in simple position-Solid Modelling. Sections of Solids: Right regular solids and auxiliary views for the true shape of the sections.

Development of Surfaces, Intersection of two simple solids.

PROJECT ON PRODUCT DEVELOPMENT **3**

Creation of any Engineering models and their presentation in standard 2D print form and as 3D wire-frame and shaded solids; Use of solid-modelling software for creating associative models at the component and assembly levels.

TOTAL (THEORY): 15 PERIODS

LIST OF EXERCISES:

1. Free Hand Sketching.
2. 2D drafting using CAD software.
3. Dimensioning of 2D views using ISO standard.
4. Projection of points and lines using software
5. Projection of solids in simple position- 3D modelling.
6. Section of solids- 3D Modelling.
7. Development of Surfaces - 3D Modelling
8. 3D Modelling of a basic mechanical part.
9. 3D Modelling of Flange Coupling assembly.
10. 3D Modelling of Spur gear with teeth and mounting holes

VIRTUAL LAB EXPERIMENTS

1. Projection of solids.
https://eg-nitk.vlabs.ac.in/exp/projections-of-solids/
2. Orthographic Projections from Isometric views.
https://kdmhttps://eg-nitk.vlabs.ac.in/exp/isometric-to-orthographic-view/

TOTAL PRACTICAL – 60 PERIODS

TOTAL – 75 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Develop freehand sketching and basic drafting skills	[AP]
CO2	Construct two-dimensional drawing for engineering applications.	[AP]
CO3	Build accurate 3D modelling of mechanical components and assemblies	[AP]
CO4	Interpret and convert engineering drawings into virtual 3D models.	[U]
CO5	Develop proficiency in modelling complex machine elements	[AP]

TEXT BOOKS:

1. Venugopal. K, Prabu Raja. V, “Engineering Graphics” New Age International Publishers, 15th Edition, 2021.
2. Shah. M. B and Rana. B. C, “Engineering Drawing”, Pearson Education, 6th edition, 2018.
3. Hamad M, “AutoCAD 2024 3D Modeling”, Mercury Learning & Information Publishers,1st edition,2023.

REFERENCE BOOKS:

1. Natarajan. K. V, “A textbook of Engineering Graphics”,Dhanalakshmi Publishers, 5th Edition, 2018.
2. Randy H. Shih, “SOLIDWORKS 2021 and Engineering Graphics - An Integrated Approach”, SDC Publications, 2021.
3. James D. Bethune, “Engineering Graphics with AUTOCAD 2015”, Pearson Education India, 2nd Edition, 2015.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_me128/preview
2. https://www.coursera.org/learn/3d-cad-fundamental
3. https://www.coursera.org/learn/introduction-to-3d-modeling
4. https://eg-nitk.vlabs.ac.in/Objective.html

25TA101 SDG : 4,11, 16	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES

1. To know various concepts of Tamil Language families.
2. To know about the essentialities of Heritage.
3. To understand the Aram concepts of Tamils and the cultural influence.

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.

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.

FOLK AND MARTIAL ARTS **3**

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

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.

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.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students shall have ability to,

C101.1	Know about the language families in India, impact of religions and the contribution of Bharathiyar and Bharathidhasan.	[U]
C101.2	Observe the growth of sculpture, making of musical instruments and the role of temples in socio and economic lives.	[U]
C101.3	Understand the significance of folklore and martial arts.	[U]
C101.4	Learn the sangam literature, sangam age and overseas conquest of Cholas.	[U]
C101.5	Understand the contribution of Tamils to Indian Freedom Struggle, role of Siddha medicine and print history of Tamil Books.	[U]

TEXT-CUM-REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

25IKC01 SDG No: 3,4,5,11,16	INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

1. Identify key aspects of Indian knowledge systems, including philosophy, science, mathematics, medicine (Ayurveda), astronomy, and architecture.
2. Highlight the contributions of Indian philosophy and spirituality to global thought and ethics.
3. Illustrate the cultural diversity of India through its languages, festivals, arts, and traditions
4. Implement practices from Indian knowledge systems such as yoga, meditation, and sustainable living in daily routines.
5. Compare ancient Indian scientific theories with contemporary scientific principles.

INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS (IKS) 6

About Indian Knowledge System; Definition of Indigenous/ Traditional Knowledge; Scope, and Importance of Traditional Knowledge Ancient India - Bharat Varsha: People of Ancient Bharat Varsha; Our great natural heritage: The great Himalayas and the rivers; The civilizations of the Sindhu -Ganga valley, Ancient Indian Traditional Knowledge and Wisdom about nature and climate.

INDIAN HERITAGE OF KNOWLEDGE 6

Ancient Indian Knowledge: The Vedas and its components - the Vedangas Ancient Indian books and treaties: The Sastras.; The Great Indian Epics: The Ramayana and The Mahabharata Epics.
Languages and language studies in India :What is linguistics. Script and Language; Alphabet of the Indian; languages Varnamala: Origin, Evolution, and phonetic features; Languages of India; Important texts of Indian languages: Skills Siksha, Expression/Prounciation- Nirukta.

INTRODUCTION TO FINE ARTS AND PERFORMING ARTS OF INDIA 6

Ancient Indian classical music and dance forms: The Science of Dramas- Natyasastra and the Science of Music-Gandharva-Veda; Aesthetics in Indian Art and Culture; Folk music and traditional dance forms of the Northeast.
Indian Science & Technology:Ancient India's contribution to Mathematics - Number System. Algebra and Arithmetic, Geometry and Trigonometry; Origin of Decimal system in India; nomenclature of numbers in the Vedas. Zero and Infinity Sulba-sutras.

INDIAN ASTRONOMY 6

Planetary System. Motion of the Planets; Velocity of Light; Eclipse. Astronomy. Navagrahas. Important works in Indian Astronomy. Aryabhata and Nilakantha: Contribution to Astronomical Studies Indian Metal Works: Mining Techniques. Types of Metals. Tools & Techniques for Metal Smelting with examples.

CONTRIBUTION OF ANCIENT INDIA TO HEALTH SCIENCES: 6

Traditional Indigenous systems of medicines in India:- Ayurveda and Yoga; Elements of Ayurveda: Gunas and Doshas, Pancha Mahabhuta and Sapta-dhatu; Concept of disease in Ayurveda; Ayurvedic lifestyle practices: Dinacharya and Ritucharya; Important Ayurvedic Texts; Hospitals in Ancient India; Ayurveda: Gift of India to the modern world.

THE EXPERIENTIAL LEARNING SESSIONS MAY INCLUDE:

- Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.
- Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.
- Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.
- Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.
- Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students.

TOTAL: 30 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Recall the rich heritage of Indian knowledge systems	[U]
CO2	Describe the contribution of Indian knowledge systems to the world.	[R]
CO3	Demonstrate knowledge of sociocultural and ethnolinguistic diversity that constitutes the soul of Bharatvarsha.	[R]
CO4	Apply traditional knowledge and techniques in day-to-day life.	[AP]
CO5	Distinguish knowledge traditions that originated in the Indian subcontinent.	[AP]

TEXT BOOKS

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.2022.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing, 2023.

REFERENCE BOOKS:

1. Dharampal, The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century, Dharampal Classics Series, Rashtrotthana Sahitya, Bengaluru, 2021
2. Baladev Upadhyaya, Samskrta Śāstrom ka Itihās, Chowkhambha, Varanasi, 2010.
3. Bose,D.M.,Sen, S.N. and Subbarayappa,B.V., Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.

4. Astāngahrdaya, Vol. I, Sūtrasthāna and Śarīrasthāna, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
5. Bajaj,J.K. and Srinivas,M.D., Indian Economy, and Polity in Eighteenth-century Chengalpattu, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995.

SEMESTER - II

25MA203	APPLIED MATHEMATICS	L	T	P	C
SDG NO. 4,8,17	(Common to MECH, MCT, CIVIL)	3	1	0	4

COURSE OBJECTIVES

1. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
2. To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
3. To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
4. To explore the solutions of linear partial differential equations of second and higher order with constant coefficients.
5. To equip students with the knowledge and skills to solve differential equations using numerical methods.

MULTIPLE INTEGRALS (12)

Double integrals – Double integration in Cartesian coordinates – Area as double integral – Change the order of integration-Triple integrals – Triple integration in Cartesian coordinates – Volume as triple integral. Case study: Properties of surfaces and solids.

VECTOR CALCULUS (12)

Gradient - Divergence and Curl- Irrotational and Solenoidal vector fields – Vector Integration - Green's theorem in a plane - Gauss divergence theorem and Stoke's theorems - Problems involving Cubes and rectangular parallelepipeds. Case study: Failure analysis of structures.

ORDINARY DIFFERENTIAL EQUATIONS (12)

Homogeneous linear ordinary differential equations of second order – Solution by variation of parameters – Homogenous equations of Euler – Cauchy and Legendre's type – System of simultaneous linear differential equations with constant coefficients. Case study: Ordinary Differential Equations in Free fall of an object with Air Resistance.

PARTIAL DIFFERENTIAL EQUATIONS (12)

Formation of partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous type. Case study: Polar system for curvilinear motion.

NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS (12)

Taylor series method – Euler's method – Modified Euler's method – Improved Euler's method – Fourth order Runge – Kutta method for solving first order equation – Solution of one – dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes. Case study: Numerical analysis of stress and deflection in a cantilever beam.

TOTAL PERIODS: 60

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Apply multiple integral ideas in solving areas, volumes and other practical problems.	[AP]
CO2	Use the vector point function to establish the relation between line, surface and volume integrals.	[U]
CO3	Compute the solution of second order and simultaneous linear differential equations in engineering applications.	[AP]
CO4	Solve higher-order partial differential equations using differential operators.	[AP]
CO5	Find solutions of differential equations. To apply various techniques of numerical methods.	[U]

TEXTBOOKS

1. Kreyszig. E, "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Limited, Singapore 2020.
2. Grewal. B.S, "Higher Engineering Mathematics", 44th edition, Khanna Publications, Delhi, 2021.
3. Grewal, B.S., "Numerical Methods in Engineering and Science with Programs in C, C++ & MATLAB ", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCE BOOKS

1. Veerarajan. T, "Transforms and Partial differential equations", 3rd edition, Tata McGraw-Hill Publishing Company Ltd., reprint, 2016
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th edition, 2016.
3. Kandasamy P, Thilagavathy K, Gunavathi K,"Numerical Methods", S.Chand and Company, 2018.

WEB RESOURCES

1. https://archive.nptel.ac.in/courses/111/107/111107108/
2. https://archive.nptel.ac.in/courses/111/108/111108081/
3. https://archive.nptel.ac.in/courses/111/105/111105122/
4. https://archive.nptel.ac.in/courses/111/101/111101153/

5. https://archive.nptel.ac.in/courses/111/107/111107105/

25MT201 SDG NO. 4,8,9	APPLIED MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To learn the fundamental concepts of force systems, free body diagrams and equilibrium.
2. To compute the centroid and moment of inertia for different geometric sections
3. To impart the effect of friction and dynamic behaviour of particles using principles of kinetics and work–energy methods.
4. To enable knowledge on shear force, bending moment, and bending stress in beams.
5. To familiarize students with torsional behaviour of shafts, deflection of beams, and the stability analysis of columns using Euler's formula

STATICS OF PARTICLES **9**

System of forces- Resolution and resultant of coplanar concurrent forces, Equilibrium of a particle in two dimensions- Lami's Theorem-Free body diagram, Statics of rigid bodies in two dimensions- Varignon's theorem, Moment of a force – couple, Case Study: Static equilibrium analysis of robot links using Lami's theorem and Varignon's theorem.

CENTROID AND MOMENT OF INERTIA OF SECTIONS **9**

Centroid of common shapes: Rectangle, triangle, circle, and semicircle by using standard formula - Parallel axis and perpendicular axis theorems - Area moment of inertia: T section, I section, Angle Section - Polar moment of Inertia. Case study: Centroid and inertia analysis in robot arm structures.

FRICTION AND KINEMATICS OF PARTICLES **9**

Laws of friction, Coefficients of Friction - Ladder Friction. Kinetics of particles, D'Alembert's principle and its applications, work-kinetic energy, impulse momentum.

SHEAR FORCE, BENDING MOMENT AND BENDING STRESS IN BEAMS **9**

Types of loads and support - Shear force and bending moment diagrams for cantilever, simply supported and overhanging beam with point and uniformly distributed loads- Theory of simple bending and its equation – Bending stress in symmetrical sections. Case study: Bending analysis in robotic arm structures.

TORSION, DEFLECTION OF BEAMS AND COLUMNS **9**

Torsion equation - Torsion in solid and hollow circular shafts - Evaluation of slope and deflection by Double integration method for cantilever and simply supported beams with point and uniformly distributed loads – Column - Application of Euler Equation for building columns.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Apply principles of statics to determine resultants, moments, and equilibrium conditions for particles and rigid bodies.	[AP]
CO2	Compute centroid and moments of inertia for standard and composite sections.	[AP]

CO3	Apply laws of friction and basic kinetics principles to solve friction and particle motion problems.	[AP]
CO4	Apply shear force, bending moment, and simple bending theories to analyse loading effects in beams.	[AP]
CO5	Apply torsion, beam deflection methods, and Euler's column theory to determine stresses and deformations.	[AP]

TEXTBOOKS:

1. N. Kottiswaran, "Engineering Mechanics Statics and Dynamics", Sri Balaji Publications, 2017.
2. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
3. Guruprasad, K. R., "Robotics: Mechanics and Control", PHI learning (P) Ltd., 2019.

REFERENCE BOOKS:

1. F.P. Beer and Jr.E. Johnston, "Vector Mechanics for Engineers statics and Dynamics", 11th edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. Ferdinand P Beer, Russell Johnston, "Mechanics of Materials", 8th Edition, McGraw Hill Education, 2020
3. K.M.Lynch and F.C. Park, "Modern Robotics: Mechanics, Planning, and Control", Cambridge University Press, 2017

WEB RESOURCES:

1. https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/pages/lecture notes/
2. https://www.coursera.org/learn/engineering-mechanics-statics
3. https://onlinecourses.nptel.ac.in/noc21_me70/preview
4. https://archive.nptel.ac.in/courses/105/104/105104160/

25MT202 SDG NO. 4,8,9	MEASUREMENTS AND INSTRUMENTATION SYSTEMS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

1. To introduce the fundamental concepts of instrumentation systems
2. To familiarize students with various data transmission methods and indicating devices used in modern systems.
3. To impart knowledge on mechanical measurement techniques and instruments used for linear, angular, and geometric property evaluation.
4. To discover vision-based measurement techniques.
5. To provide adequate knowledge of virtual instrumentation systems using LabVIEW .

MEASUREMENTS SYSTEM **9**

Basic elements of measurement systems – Errors – Calibration – standards - static and dynamic characteristics of instruments.

DATA TRANSMISSION AND INDICATING DEVICES **9**

Transmission and Storage: Cables, Buses, Fibre-optic, Radio-telemetry, storage and retrieval systems. Indicating Devices: Analog meters – Voltmeter and Ammeter, Digital meters – Multimeter, Oscilloscopes, Digital Displays.

MECHANICAL MEASUREMENTS **9**

Standards of measurement, Geometric Dimensioning and Tolerances - Limits, fits and gauges - Linear and Angular measuring instruments - Measurement of straightness, flatness, squareness, parallelism, roundness and cylindricity, profile measurements - Coordinating measuring machine

VISION BASED MEASUREMENT **9**

Image Formation -Geometric Camera Models - Camera Parameters - Calibration - Perspective Projection - Color Spaces - 1D, 2D measurements - Halcon measurement- Case Study: Reference guide pitch measurement.

VIRTUAL INSTRUMENTATION **9**

Fundamentals - Comparison with traditional Instrument - Text based vs Graphical programming - Data flow programming - Components of DAQ - IMAQ tool box – Case studies: Interfacing temperature sensor with data acquisition system-Interfacing ultrasonic sensor with data acquisition system.

TOTAL: 45 PERIODS

List of Experiments

1. Displacement measurement using capacitive sensor and weight using load cell
2. Measurement of pressure using Bourdon Gauge
3. Measurement of temperature using Thermistor/RTD and Thermocouple sensor
4. Measure and control the speed of motor using stroboscope
5. Water level measurement using ultrasonic sensor
6. Measure the strain applied in the cantilever beam using strain sensor
7. Measure the torque developed using torque sensor
8. Programming for measurement of displacement using LVDT sensor using DAQ.
9. Programming for measurement of real time temperature using LM35 sensor using DAQ
10. Develop a prototype model for any engineering applications using sensors and interface using VI software.

Virtual Lab Experiments:

1.Identifying building blocks of signal conditioning technique of a sensor

https://ic-coep.vlabs.ac.in/exp/building-blocks-of-signal-conditioning/

2.Configuration of proximity sensors and its application

https://sil-coep.vlabs.ac.in/exp/proximity-sensors-applications/

TOTAL(PRACTICAL): 30 PERIODS
TOTAL: 75 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Illustrate the basics of the measurement system.	[U]
CO2	Infer the various data transmission techniques and indicating devices for measurement applications.	[U]
CO3	Make use of mechanical measurement instruments and methods to evaluate dimensional and geometric tolerances of engineering components.	[AP]
CO4	Outline vision-based measurement techniques and image processing tools	[U]
CO5	Utilize the virtual instrumentation concepts for real-time data acquisition and sensor integration using LabVIEW	[AP]

TEXT BOOKS

1. John P. Bentley, “Principles of Measurement Systems”, Pearson Education, 6th Edition, 2018.
2. Samir Mekid, “Metrology and Instrumentation Practical Applications for Engineering and Manufacturing”, 1st Edition 2022.
3. A K.Sawhney, “A course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat rai & co, 2015.

REFERENCE BOOKS

1. Murthy D. V. S, “Transducers and Instrumentation”, Prentice Hall, 2nd Edition, 2018.
2. S. Sumathi and P. Surekha, “LabVIEW based Advanced Instrumentation Systems” Springer-Verlag Berlin Heidelberg, 2015.
3. Kirianaki N.V., Yurish S.Y., Shpak N.O., Deynega V.P., Data Acquisition and Signal Processing for Smart Sensors, John Wiley & Sons, Chichester, UK, 2021

WEB RESOURCES

1. https://www.sciencedirect.com/science/article/pii/B9780123819604000127
2. https://www.coursera.org/learn/measurement-and-analysis
3. https://onlinecourses.nptel.ac.in/noc24_me12/preview
4. https://ifsolutions.com/what-is-instrumentation-and-control-engineering-systems-equipment/

25MT203 SDG NO. 4,8,9	ANALOG AND DIGITAL ELECTRONICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

1. To introduce the fundamental principles and characteristics of analog electronic devices
2. To provide knowledge of operational amplifiers.
3. To apply Boolean algebra and Karnaugh Map techniques.
4. To enable students to design and analyze combinational logic circuits .
5. To impart knowledge on the design and application of sequential logic circuits

ANALOG ELECTRONICS **9**

Operation and VI Characteristics: Varactor Diode, Photo Diode, Light Emitting Diode and Laser Diode – Bipolar Junction Transistor, SCR, MOSFET- Half wave and Full wave Rectifier.

LINEAR INTEGRATED CIRCUITS **9**

Ideal OP-AMP characteristics – Inverting and Non-inverting Amplifiers, -S/H circuit, Instrumentation amplifier Comparators, Zero Crossing Detector, Schmitt Trigger, Clipper and Clamper - D/A converter (R- 2R ladder), A/D converters(Successive Approximation Converter)-Operation of 555 timer

MINIMIZATION TECHNIQUES AND LOGIC GATES **9**

Boolean postulates and laws – Minimization of Boolean expressions - Minterm - Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization - Implementations of Logic Functions using gates up to four variables.

COMBINATIONAL LOGIC CIRCUITS **9**

Adders and Subtractors, Multiplexer, Demultiplexer, Encoders, Decoders, Programmable Logic Devices - Introduction to PLA, PAL and FPGA - Two Bit Magnitude comparator-Basic safety interlocks using combinational logic circuits.

SEQUENTIAL LOGIC CIRCUITS **9**

Latches and flip flops:SR,JK,D,T and Master slave - Characterization and excitation tables of flip flops-Asynchronous Up counter and Synchronous counters using T flip flops-Monitor and control of production cycles using counters.

TOTAL:45 PERIODS

LAB COMPONENTS

1. Analyze the VI characteristics of SCR and MOSFET.
2. Obtain the characteristics of half wave and full wave rectifier with and without filter.
3. Generate Pulse Width Modulation (PWM) Signal using 555 Timer IC
4. Design of Instrumentation amplifier using Op-amp.
5. Construct Voltage to Current and Current to Voltage converters using Op-Amp.
6. Construct the differentiator and integrator using OP-amp
7. Design of 8:1 multiplexer and 1:8 demultiplexer using logic gates.
8. Realize basic flip-flops R-S ,J-K,J-K Master slave flip-flops using gates and verify their truth tables
9. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on a 7-segment display (using IC-7447)
10. Design a full adder and full subtractor circuit.
11. Develop a prototype model for any engineering applications using analog and digital electronics

VIRTUAL LAB EXPERIMENTS:

1. Analysis and Synthesis of Logic Functions using Decoders & Encoders https://de-iitr.vlabs.ac.in/exp/decoder-demultiplexer-encoder/procedure.html
2. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA https://ae-iitr.vlabs.ac.in/exp/voltage-regulator/

TOTAL(PRACTICAL): 30 PERIODS

TOTAL: 75 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Illustrate the operation and characteristics of analog electronic devices	[U]
CO2	Identify the functions of Operational Amplifier and its applications.	[AP]
CO3	Demonstrate knowledge on minimization techniques and implementation using logic gates	[U]
CO4	Model basic combinational logic circuits	[AP]
CO5	Explain the operation of latches, flip-flops and counters	[AP]

TEXT BOOKS:

1. Morris Mano M., Michael D.Ciletti, "Digital Design",6th Edition, Pearson education, 2018.
2. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
3. Roy Choudhary D., Shail B Jain, "Linear Integrated Circuits", 3rd edition, New Age International Books, 2021

REFERENCE BOOKS:

1. Roger Tokheim and Patrick Hoppe, "Digital Electronics Principles and Applications", 9th Edition, McGraw Hill, 2022.
2. Anil K. Maini, "Digital Electronics: Principles and Integrated Circuits", Wiley, 2019
3. William Jeremiah Coughlin, Robert F. Coughlin, Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", 3rd edition, Prentice Hall, 2018

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ee32/preview
2. https://onlinecourses.nptel.ac.in/noc21_ee75/preview
3. https://onlinecourses.nptel.ac.in/noc21_ee75/preview
4. https://onlinecourses.nptel.ac.in/noc24_ee140/preview
5. https://nptel.ac.in/courses/108105066
6. https://onlinecourses.nptel.ac.in/noc20_ee13/preview

25ENC01	BUSINESS COMMUNICATION AND VALUE	L	T	P	C
SDG NO. 4,8,9,16	SCIENCE	1	2	0	3

Course Objectives:

1. Develop active listening abilities and comprehend technical content through audio/video resources.
2. Communicate effectively in business contexts using appropriate verbal and non-verbal skills.
3. Apply skimming, scanning, and analytical reading strategies to interpret technical articles.
4. Apply clarity, conciseness and coherence in workplace communication to ensure effective message delivery.
5. Introduce the key concepts of values, life skills and business communication.

LISTENING **3**

Listening skills (Hearing Vs Listening) - Principles of listening -The Process of listening-Types of listening-- Pronunciation and enunciation.

Assessment: Listening Skills- British Council B2&C1

SPEAKING **3**

Oral communication in business contexts - Business etiquette - Presentation skills (basic introduction)-Storytelling in presentations-Group discussion - Immersion activity.

Assessment: Speaking Skills- Topic Presentation

READING **3**

Skimming and scanning-Story Reading- Newspaper reading-Reading and understanding technical articles.

A**ssessment: Reading Comprehension**

WRITING **3**

Email writing - Story writing - Resume creation - Collaborative Report writing and Proposal writing - Parts of speech (Drills and exercises) - Tenses - Subject-verb agreement - Voice-If Conditional Clause- Error Correction.

Assessment: Writing skills- Email etiquette, Resume writing, Report and Proposal writing and Spot the error.

LIFE SKILLS **3**

Introduction to values-Its importance and necessity–SATORI (sharing personal experience)-Analyzing personality traits- Dr.Meredith Belbin's 9 Team Roles and Lindgren's Big 5 personality traits - Diversity & Inclusion.

Assessment: Active Learning Method

TOTAL HOURS: 15

Activities:

1. **Listening skills – British Council B2 & C1 -** Practice listening comprehension with British Council audio /video clips.
   Outcome: To improve the understanding of accents and business contexts.

2. **Listening to technical lectures (audio/video) -** Exposure to academic and professional talks from **TEDX videos** to enhance focused listening and note-taking abilities.
   Outcome: To take clear, structured, and relevant notes for future reference.

3. **Linguaphone English -**Listen to short conversations and repeat sentence-by-sentence to practice pronunciation and rhythm.
   Outcome: To improve pronunciation and fluency in both academic and professional communication contexts.

4. **Immersion activity** – Team members interview a person from different background and the recorded video along with the PPT should be projected in the class.
   Outcome: To know about different kinds of people and personality of different strata.

5. **Group Discussion –** Group Discussion is conducted as per the norms to measure their thinking ability to evaluate their skills.
   Outcome: To express ideas clearly, listen actively and to build their confidence level.

6. **Story telling in presentation –** Students present their technical topics through their own narration, blending them with relevant stories**.** (Video Presentation)
   Outcome: To simplify concepts and connect with listeners on a deeper level.

7. **British Council B2&C1 reading skills-** Practice reading comprehension with British Council B2&C1 hand-outs.

Outcome: To achieve good reading ability.

8. **Email writing:** Learners compose clear, concise and professionally formatted emails.
   Outcome: To draft and structure emails effectively, using correct tone and grammar.

9. **Story writing**: Students create coherent and engaging stories.

Outcome: To create well-structured stories that effectively uses plot, character development, and descriptive language.

10. **Resume Writing –** Learners are trained to tailor their resumes appropriately.

Outcome: To craft well-structured, industry-specific resumes to meet employer's expectations.

11. **Report and Proposal Writing -** Learners practice writing skills to write reports and proposals.

Outcome: To produce well-organized and persuasive reports and proposals.

12. **Error Correction –** Learners identity and correct language errors using guided hand-outs.

Outcome: To identify and correct grammatical and semantic errors.

TOTAL HOURS: 30

Continuous Internal Assessment:

1. Listening Skills - British Council B2&C1
2. Speaking Skills - Topic Presentation
3. Reading Skills - Reading Articles
4. Writing Skills - Email etiquette, Resume writing, Report writing and Proposal writing.
5. Spot the error

TOTAL:45 HOURS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to:

CO1	Comprehend professional listening conversations for academic and workplace contexts and speak English confidently.	[U]
CO2	Articulate ideas clearly to enhance overall written and spoken communication.	[R]
CO3	Apply the basic tenets of communication in workplace.	[AP]
CO4	Analyze the LSRW skills in different fields.	[A]
CO5	Understand the importance of life skills and values.	[U]

TEXTBOOKS

1. King, Patrick. *How to Speak Effectively: A Guide to Engaging Conversations, Presentations, and Making an Impact on People.* Penguin India*, 2024.*
2. Bharadwaj Apoorva, *"*Leadership Communication Skills for Intercultural Management*:* Strategies for Effective Intercultural Management (Contemporary Themes in Business and Management)", Routledge India; 1st edition, 2024.
3. Bovee, Courtland L., John V. Thill, and Barbara E. Schatzman. *Business Communication Today.* 15th ed., Pearson, 2021.

REFERENCE BOOKS

1. Helen Spencer-Oatey and DomnaLazidou**, "**Making Working Relationships Work: The TRIPS Toolkit for Handling Relationship Challenges and Promoting Rapport",Castledown Publishers,2023.
2. Dr.Praveen Sam and K N Shoba - A Course in Technical English by Cambridge University press, 2020.
3. C. Gangalakshmi, B. Rathika, L. Saranraj, "Professional English for Engineers", Cengage India, 2023 (2nd Edition).

WEB RESOURCES

1. Train your mind to perform under pressure- Simon Sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2. Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0
3. https://www.coursera.org/specializations/business-english
4. https://www.coursera.org/specializations/effective-business-communication

25AD201 SDG NO. 4,8,9,12	PYTHON PROGRAMMING	L	T	P	C
		1	0	4	3

COURSE OBJECTIVES

1. To familiarize on Python's core data types and concepts.
2. To understand the python modules, string operations, and data structures for managing and processing data efficiently.
3. To acquire knowledge in object-oriented programming concepts and file-handling techniques.
4. To gain proficiency in using NumPy for array manipulation and performing essential mathematical operations.
5. To analyze data using Pandas library for creating and manipulating DataFrames.

INTRODUCTION TO PYTHON **3**

Python Basics: Python syntax, Variables, Data Types (int, float, string, boolean), Type Casting, Arithmetic & Logical Operators. Conditional Branching Statements: if, if-else, if-elif-else, nested conditions. Iterative Statements: for loop, while loop, Loop Control Statements (break, continue, pass). Functions and Lambda Functions: Defining functions, Function arguments (positional, keyword, default), Return values, Anonymous (Lambda) Functions.

PYTHON MODULES, STRINGS, AND DATA STRUCTURES **3**

Importing built-in and user-defined modules. String Handling: String slicing, concatenation, formatting, and methods like strip(), split(), replace(). List: Creating lists, List indexing, List methods (append(), remove(), sort(), reverse()), List comprehension. Tuple: Characteristics of tuples, Tuple indexing, Tuple methods (count(), index()). Dictionary: Key-value pairs, Dictionary methods (get(), keys(), values(), items(), update(), pop()).

OBJECT-ORIENTED PROGRAMMING AND FILE HANDLING **3**

Classes and Objects: OOP concepts, Creating classes and objects, Self parameter, init method. Inheritance & Polymorphism: Types of inheritance (Single, Multiple, Multilevel), Method Overriding, Method Overloading in Python. File Handling: Reading and writing files, File modes (r, w, a), Working with text and CSV files

EXCEPTION HANDLING AND PYTHON LIBRARIES (NUMPY) **3**

Exception Handling: Understanding exceptions, Handling exceptions using try-except-finally, Raising custom exceptions. NumPy Library: Introduction to NumPy, Arrays, Array creation and manipulation, Array operations (arithmetic, indexing, slicing).

PYTHON LIBRARIES (PANDAS) **3**

Pandas Library: Series: Creating Series, Indexing, Operations on Series, DataFrames: Creating DataFrames, Data Manipulation (filtering, sorting, merging, concatenating). Handling Missing Data: dropna(), fillna(), isnull() functions.

TOTAL PERIODS: 15

List of Experiments

1. Implement basic Python programs to demonstrate data types, operators, and I/O.
2. Develop programs using conditional statements (if, if-else, nested conditions).
3. Write Python scripts using loops to generate patterns and series.
4. Create Python scripts to demonstrate string manipulation techniques.
5. Perform operations on lists, tuples, and dictionaries using various methods.
6. Develop a simple OOP-based application to demonstrate classes, objects, inheritance, and polymorphism.
7. Read and write text and CSV files using Python file handling methods.
8. Perform basic operations on NumPy arrays (creation, slicing, and arithmetic).
9. Solve a system of linear equations related to force and motion.
10. Compute the velocity and displacement of an object under uniform acceleration.
11. Simulate projectile motion to demonstrate the equations of motion and visualize the projectile trajectory using matplotlib.
12. Simulate and visualize the application of Newton's laws of motion in mechanical systems.

TOTAL PERIODS: 60

TOTAL PERIODS: 75

COURSE OUTCOMES

Upon completion of the course, students shall have the ability to

CO1	Develop Python scripts by utilizing operators and control flow statements to solve problems.	[AP]
CO2	Apply list, tuple, and dictionary data structures to solve computational problems.	[AP]
CO3	Analyze object-oriented program structure to identify relationships and interactions between classes.	[AN]
CO4	Apply exception handling constructs to manage runtime errors and improve program stability	[AP]
CO5	Analyze the data frames using Pandas through data manipulating techniques	[AN]

TEXTBOOKS

1. Eric Matthes “Python Crash Course,: A Hands-On, Project-Based Introduction to Programming” 3rd Edition, No StarchPublisher 2023
2. Jake VanderPlas, " Python Data Science Handbook ", 2nd Edition, O'Reilly Media, 2022.
3. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.

REFERENCE BOOKS

1. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
2. Charles Severance, "Python for Everybody", 1st Edition, University of Michigan, 2016.

3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, O'Reilly Media, 2015.

WEB RESOURCES

5. https://www.coursera.org/learn/python-for-applied-data-science-ai
6. https://www.udacity.com/course/ai-programming-python-nanodegree--nd089
7. https://www.edx.org/course/introduction-to-python-for-data-science
8. https://www.kaggle.com/learn/python

25MEC03 SDG No: 4, 9, 11, 12	DESIGN THINKING AND IDEA LAB (Common to All Branches)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

1. To accelerate development of indigenous products in line with the “Make in India” campaign.
2. To encourage aspiring engineers to actualize their ideas under one roof.
3. To impart multidisciplinary education to all students to promote innovation and product development.
4. To initiate new ways of creative thinking and enable the students to learn the cycle of Design Thinking process for developing innovative products.
5. To promote experiential learning and entrepreneurial skills among the students.

DESIGN THINKING

Design Thinking: Definition, Need and Objective, Concepts and Brainstorming, Stages: Empathize, Define, Ideate, Prototype, Test. Practical Examples of Customer Challenges, Alignment of Customer Expectations with Product Design - Feedback, Re-Design and Re-Create.

INTRODUCTION TO TOOLS AND EQUIPMENT

Introduction to Hand Tools and Power Tools - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc.

Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace and OpenBSP - 2D and 3D structures for prototype building using CNC machine - Basic welding and other joining techniques for assembly - Basics of 3D scanning, Point cloud data generation for reverse engineering.

Exposure to PCB prototype fabrication - Familiarity and use of soldering and de-soldering equipment - Usage of Arduino, Raspberry Pi and Beagle Bone.
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EXPERIMENTAL LEARNING

1. 2D profile cutting of press fit box / casing in acrylic (3 or 6 mm thickness) / polymer / cardboard / MDF (2 mm thickness) board using laser cutter and engraver.
2. Machine 3D geometry on soft material such as soft wood using CNC router.
3. Fabricate products like trusses using cutting and welding tools.
4. 3D printing of scanned geometry using FDM or SLA printer.
5. Designing a suitable PCB layout, fabrication and testing of the circuit.
6. Assemble and disassemble electronic components on a PCB using soldering and de-soldering equipment.
7. Embedded programming using Arduino, Raspberry Pi and Beagle Bone.

DESIGN THINKING PROJECT

1. Design and implementation of a capstone project.

TOTAL: 30 PERIODS

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Recall the basic concepts of Design Thinking.	[U]
CO2	Utilize the equipment, tools and inventories associated with Design Thinking Laboratory.	[AP]
CO3	Perform fundamental fabrication operation using hand tools, power tools, welding equipment, laser cutter and engraver	[AP]
CO4	Perform fundamental electrical and electronic circuit design using PCB machine.	[AP]
CO5	Develop innovative products by implementing the design thinking approach.	[C]

TEXT BOOKS

1. Veeranna D.K, “Workshop / Manufacturing Practices (with Lab Manual)”, AICTE’s Prescribed Textbook, Khanna Book Publishing, 1st edition, 2022.
2. E. Balaguruswamy, “Design Thinking: A Beginner's Perspective”, McGraw-Hill Education, 1st edition, 2024.
3. Anuja Agarwal, “Design Thinking: A Framework for Applying Design Thinking in Problem Solving”, Cengage India, 1st edition, 2024.

REFERENCE BOOKS

1. Lal, D. M., “Design Thinking- Beyond the Sticky Notes”, Sage Publications India Pvt. Ltd., 1st edition, 2021.
2. Kaushik Kumar and Muralidhar Kurni, “Design Thinking: A Forefront Insight”, CRC Press, 1st edition, 2023.
3. Shalini Rahul Tiwari, “Design Thinking: A Comprehensive Textbook”, Wiley India, 1st edition, 2024.

WEB RESOURCES

1. https://fab-coep.vlabs.ac.in/List%20of%20experiments.html
2. https://www.innovationtraining.org/how-to-use-design-thinking-to-design-an-innovation-lab/
3. https://www.erdster.co.in/design-thinking-lab.html
4. https://www.coursera.org/learn/uva-darden-design-thinking-innovation

25TA201 SDG: 4,11,16	TAMILS AND TECHNOLOGY / தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES

1. To know about weaving, ceramic, design and construction technologies in sangam age.
2. To know the significance of technologies such as manufacturing, agriculture and irrigation.
3. To be aware of the development of Scientific Tamils and Tamil Computing.

WEAVING AND CERAMIC TECHNOLOGY **3**

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

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.

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.

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.

SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL PERIODS: 15

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Describe about the weaving industry in sangam age and ceramic technology.	[U]
CO2	Observe the design of houses, sculptures and construction of temples.	[U]
CO3	Relate the various manufacturing materials and stone types in Silappathikaram.	[U]
CO4	Understand the significance of agriculture and irrigation technology in ancient period.	[U]
CO5	Explain the growth of scientific Tamil, Tamil computing and digitization of Tamil books.	[U]

TEXTBOOKS

1. "தமிழக வரலாறு – மக்களும் பண்பாடும்" – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. "Social Life of Tamils" (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. "Social Life of the Tamils - The Classical Period" (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

WEB RESOURCES

1. https://archive.org/details/keeladibookenglish18092019/page/n13/mode/2up
2. https://www.tamildigitallibrary.in/admin/assets/book/TVA_BOK_0005812_Language_and_Literature.pdf
3. https://archive.org/details/lLXZ_historical-heritage-of-the-tamils-edited-by-s-v-subrahmanian-and-k-d-thirunavukk

25MCC11	DISASTER MANAGEMENT AND PREPAREDNESS	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES

1. To learn the basic concepts, types, and features of disasters and hazards.
2. To know the effects of disasters on the environment and society.
3. To become familiar with disaster preparedness, early warning systems, and stakeholder roles.
4. To follow measures for disaster risk reduction and safety.

MODULE I Introduction to Disaster Management 6

Disaster, hazard, vulnerability, resilience, risk – Definitions and key concepts – Disaster characteristics – Disaster classification: natural and man-made disasters – Emerging hazards and urban risks – Overview of Indian and global disaster scenarios.

MODULE II Natural and Human-Induced Disasters 6

Types and causes of natural disasters: floods, droughts, cyclones, earthquakes, tsunamis, landslides, forest fires, volcanic activities, coastal and soil erosion. Human-induced disasters: industrial accidents, chemical and nuclear hazards, transportation accidents, terrorism, infrastructure failures, environmental pollution.

MODULE III Disaster Impacts and Risk Assessment 6

Environmental, physical, social, economic and political impacts of disasters – Health and psycho-social issues – Demographic considerations (gender, age, special needs) – Climate change impacts – Hazard mapping and zoning – Vulnerability and capacity assessment principles – Tools for risk assessment.

MODULE IV Disaster Preparedness and Early Warning Systems 6

Disaster management cycle: prevention, mitigation, preparedness, response, recovery, and reconstruction – Early warning systems: communication and dissemination – Structural and non-structural measures – Community-based preparedness approaches – Roles and responsibilities of Government agencies, NGOs, local institutions and public participation.

MODULE V Response, Rehabilitation and Disaster Governance 6

Response strategies, temporary sheltering, emergency logistics management – Rehabilitation, reconstruction, and long-term recovery planning – Post-disaster environmental response – Institutional frameworks for disaster governance (NDMA, SDMA, NDRF, etc.) – Policies, legal frameworks, national & international initiatives (Sendai Framework).

TOTAL PERIODS: 30

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1	Comprehend the key concepts, causes, and categories of disasters.	U
CO2	Discuss the environmental, social, and economic impacts of various disasters.	U
CO3	Interpret hazard, vulnerability, and risk assessment approaches in disaster contexts.	U
CO4	Describe the elements of preparedness, early warning, and stakeholder roles in disaster management.	U
CO5	Adopt preparedness and mitigation strategies to achieve effective disaster risk reduction.	AP

TEXTBOOKS

1. Sharma, S. C. Disaster Management, Khanna Publishing House, 2025.
2. **Palanivel, K.** *Disaster Management,* Allied Publishers, 2015.
3. **Sulphey, M. M.** *Disaster Management,* PHI Learning Publications, 2017.

REFERENCE BOOKS

1. Shrivastava, A.K., Text book of Disaster Management, Scientific Publications, 2021.
2. Rajendra Kumar Pandey., Disaster Management in India, SAGE Publications Pvt. Ltd., 2020.
3. Arulsamy S., and Jeyadevi J., Disaster Management, Neelkamal Publications, 2016.

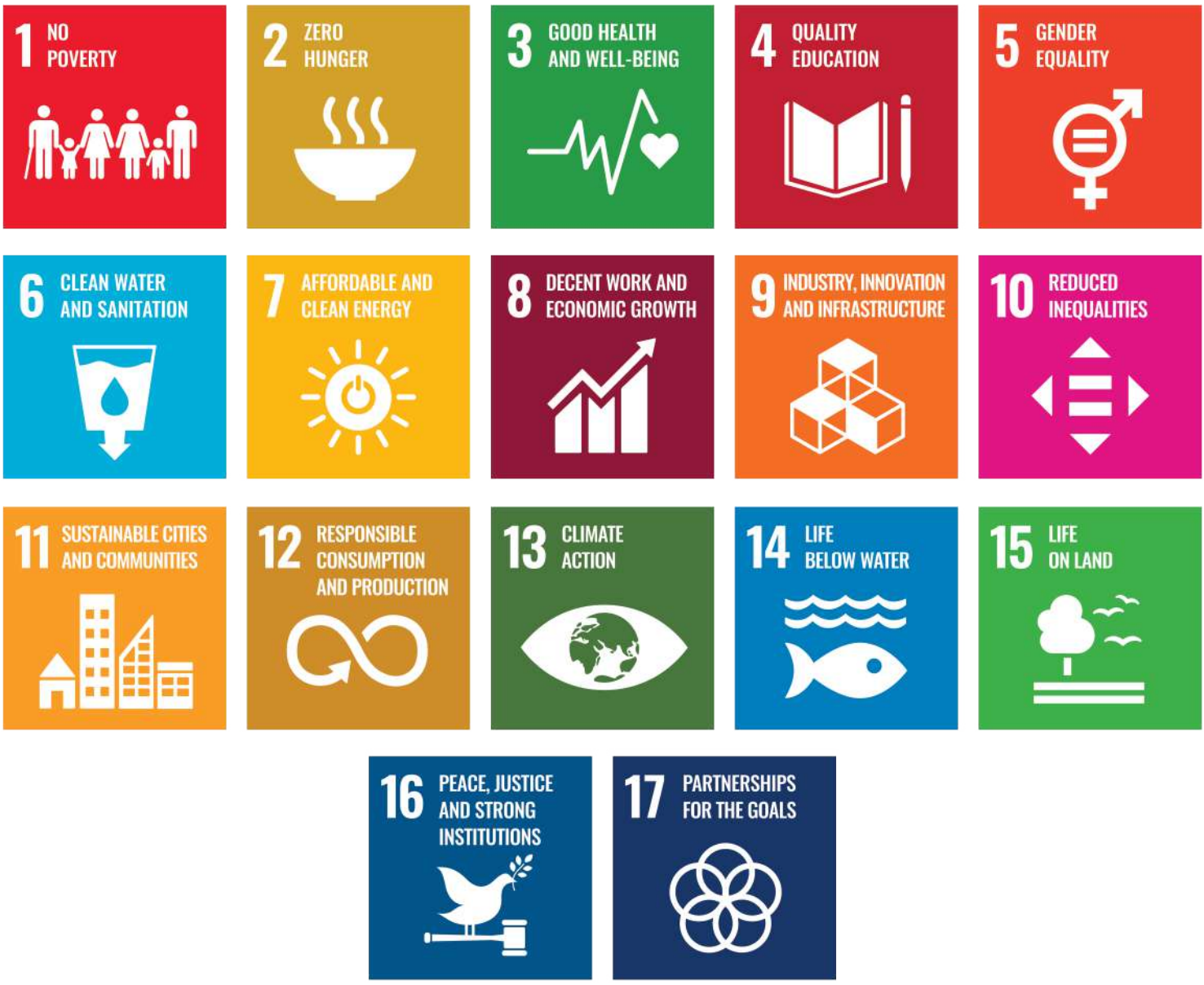
INDIAN STANDARDS (IS) and ASTM CODE OF PRACTICE

1. IS 15498: 2023 – Guidelines for Improving the Cyclonic Resistance of Low-Rise Houses and Other Buildings, BIS, New Delhi.
2. IS 17163: 2020 – Site-Specific Investigation and Stability Analysis of Landslides — Guidelines, BIS, New Delhi.
3. IS 1893 (Part 1): 2016 – Criteria for Earthquake Resistant Design of Structures, BIS, New Delhi.

WEB RESOURCES

1. https://ndma.gov.in/
2. https://www.ndrf.gov.in/
3. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview
4. https://www.coursera.org/learn/disaster-preparedness

SUSTAINABLE DEVELOPMENT GOALS



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