

**B.E-MECHATRONICS ENGINEERING**  
**Regulation 2024**  
**CURRICULUM & SYLLABI**

**DEPARTMENT VISION**

To be a global leader in Mechatronics Engineering education by fostering innovation, interdisciplinary collaboration, and entrepreneurship, equipping students with the technical expertise and empowering them to excel in both industry and academia as forward-thinking professionals and communicators.

**DEPARTMENT MISSION**

As a department, we are committed

- ❖ To impart quality education in the field of Mechatronics Engineering and to build analytical and creative skills through research and development.
- ❖ To enable the students to apply technical knowledge for finding optimal solutions to real-life problems using an interdisciplinary approach.
- ❖ To produce graduates in the field of Mechatronics Engineering who have outstanding technical excellence to work in the industry.
- ❖ To facilitate young minds to pursue higher education with strong communication skills.
- ❖ To develop entrepreneurial skills in our students to make them competent and smart in the global arena.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

**PEO 1:** To work or pursue higher education in multicultural, multilingual and multinational environment with competent oral and written communication.

**PEO 2:** To lead and contribute in a team entrusted with professional, social and ethical responsibilities

**PEO 3:** To solve complex engineering problems and engage in lifelong learning in their profession.

**PEO 4:** To develop innovative and sustainable products with multidisciplinary expertise.

**PEO 5:** To develop entrepreneurial skills for self-support and sustainability.

**PROGRAMME OUTCOMES (POs)**

**Engineering Graduates will be able to:**

- PO 1:** Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2:** Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3:** Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4:** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO 5:** Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO 6:** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7:** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8:** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9:** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10:** Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11:** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 12:** Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

**Graduates will be able to:**

**PSO 1:** Analyze, design and develop mechatronics system to solve complex engineering problems

**PSO 2:** Adopt a multidisciplinary approach to solve real world industrial problems

**PSO 3:** Innovate and implement smart technology and industry 4.0 in mechatronics system

**B.E-MECHATRONICS ENGINEERING**  
**CURRICULUM AND SYLLABI (Regulation 2024)**  
**(Applicable for students admitted from the Academic Year 2024-2025)**  
**Minimum Credits to be Earned: 165**

SEMESTER I											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC	
2	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC	
3	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC	
4	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC	
5	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC	
6	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC	
7	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC	
8	24MC111	Induction Program	3 Weeks							MC	MC
<b>TOTAL</b>							22	28			

SEMESTER II											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MA201	Transforms and Partial Differential Equations	3	1	0	4	4	40/60	T	BSC	
2	24EE204	Basic Electrical and Electronics Engineering	3	0	0	3	3	40/60	T	ESC	
3	24ME201	Material Science and Metallurgy	3	0	0	3	3	40/60	T	ESC	
4	24ME202	Engineering Mechanics	3	0	0	3	3	40/60	T	ESC	
5	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC	
6	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC	
7	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC	
		Work Integrated Learning (Industrial Practice)	Regulation 2024, Clause 4.4								AP
<b>TOTAL</b>							18	21			

SEMESTER III										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
2	24MA301	Statistics and Numerical Methods	3	1	0	4	4	40/60	T	BSC
3	24MH301	Fluid Mechanics and Thermal Systems	3	1	0	4	4	40/60	T	ESC
4	24MH302	Digital Electronics and Microprocessor	3	0	2	4	5	50/50	TP	PCC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
5	24MH303	Electrical Drives and Actuators	3	0	2	4	5	50/50	TP	PCC	
6	24MH304	Mechanics of Materials	3	0	0	3	3	40/60	T	ESC	
7	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC	
8	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC	
		Work Integrated Learning (Industrial Training-I)	Regulation 2024, Clause 4.4								AP
<b>TOTAL</b>							23	27			

SEMESTER IV											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MH401	Sensors and Instrumentation	3	0	2	4	5	50/50	TP	PCC	
2	24MH402	Embedded Systems and Programming	3	0	2	4	5	50/50	TP	PCC	
3	24MH403	Theory of Machines	3	1	0	4	4	40/60	T	PCC	
4	24MH404	Manufacturing Technology	3	0	2	4	5	50/50	TP	PCC	
5	24CS202	C Programming and Data Structures	3	0	2	4	5	50/50	TP	ESC	
6	24MH411	Theory of Machines Laboratory	0	0	4	2	4	60/40	P	PCC	
7	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC	
8	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC	
9		Mandatory Course- 3 (Choose from list)	2	0	0	0	2	100/0	MC	MC	
		Work Integrated Learning (Industrial Training-II)	Regulation 2024, Clause 4.4								AP
<b>TOTAL</b>							24	34			

SEMESTER V										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MG601	Economics, Finance & Accounting	3	0	0	3	3	40/60	T	HSMC
2	24MH501	Fluid Power Systems and Industrial Automation	3	0	0	3	3	40/60	T	PCC
3	24EC401	Control Systems Engineering	3	0	2	4	5	50/50	TP	PCC
		PEC-1	3	0	0	3	3	40/60	T	PEC
5		OEC-1	3	0	0	3	3	40/60	T	OEC
6	24MH511	Industrial Automation Laboratory	0	0	4	2	4	60/40	P	PCC
7	24MH512	Design and Modelling Laboratory	0	0	4	2	4	60/40	P	PCC
8	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
9	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC	
10		Mandatory Course- 4 (Choose from list)	2	0	0	0	2	100/0	MC	MC	
		Work Integrated Learning (Industrial Problem Solving-I)	Regulation 2024, Clause 4.4								AP
<b>TOTAL</b>							22	31			

SEMESTER VI											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MH601	Drone Technologies	3	0	0	3	3	40/60	T	PCC	
2	24MH602	Robotics	3	0	0	3	3	40/60	T	PCC	
3	24MH603	Design of Mechatronics System	3	0	2	4	5	50/50	TP	PCC	
4		PEC-2	3	0	0	3	3	40/60	T	PEC	
5		PEC-3	3	0	0	3	3	40/60	T	PEC	
6		OEC-2	3	0	0	3	3	40/60	T	OEC	
	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC	
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC	
9	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC	
10	24EL611	Innovation and Product Development-4 (Patent Filing / Startup Registration)	0	0	2	1	2	100/0	EL	EEC	
		Work Integrated Learning (Industrial Problem Solving-II)	Regulation 2024, Clause 4.4								AP
<b>TOTAL</b>							24	30			

SEMESTER VII											
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MH701	Machine Vision Systems	3	0	0	3	3	40/60	T	PCC	
2		PEC-4	3	0	0	3	3	40/60	T	PEC	
3		PEC-5	3	0	0	3	3	40/60	T	PEC	
4		PEC-6	3	0	0	3	3	40/60	T	PEC	
5		OEC-3	3	0	0	3	3	40/60	T	OEC	
6		OEC-4	3	0	0	3	3	40/60	T	OEC	
7	24MH711	Design and Fabrication Project	0	0	2	1	2	60/40	P	EEC	
8	24MH712	Robotics and Machine Vision Laboratory	0	0	4	2	4	60/40	P	PCC	
9	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC	
<b>TOTAL</b>							22	26			

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
<b>SEMESTER VIII</b>										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MH811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC
2	Personality and Character Development Activity Points (Refer Regulation 2024, Clause 4.2)									AP
3	Work Integrated Learning Activity Points (Refer Regulation 2024, Clause 4.4)									AP
<b>TOTAL</b>						10	20			

<b>Humanities, Social Science and Management Courses (12 Credits)</b>										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24HS101	Technical English	2	0	2	3	4	50/50	TP	HSMC
2	24GE102	தமிழர்மரபு / Heritage of Tamils	1	0	0	1	1	40/60	T	HSMC
3	24GE202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	1	40/60	T	HSMC
4	24HS301	Universal Human Values	2	0	0	2	2	100/0	T	HSMC
5	24MG601	Economics, Finance & Accounting	3	0	0	3	3	40/60	T	HSMC
6	24SD613	Corporate Communication Skills	0	0	4	2	4	100/0	P	HSMC

<b>Basic Science Courses (20 Credits)</b>										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MA101	Matrices and Calculus	3	1	0	4	4	40/60	T	BSC
2	24PH101	Engineering Physics	3	0	2	4	5	50/50	TP	BSC
3	24CY101	Engineering Chemistry	3	0	2	4	5	50/50	TP	BSC
4	24MA201	Transforms and Partial Differential Equations	3	1	0	4	4	40/60	T	BSC
5	24MA301	Statistics and Numerical Methods	3	1	0	4	4	40/60	T	BSC

<b>Engineering Science Courses (29 Credits)</b>										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24GE201	Computer Aided Engineering Graphics	3	0	2	4	5	50/50	TP	ESC
2	24GE111	Engineering Practices Laboratory	0	0	4	2	4	60/40	P	ESC
3	24EE204	Basic Electrical and Electronics Engineering	3	0	0	3	3	40/60	T	ESC
4	24ME201	Material Science and Metallurgy	3	0	0	3	3	40/60	T	ESC
5	24ME202	Engineering Mechanics	3	0	0	3	3	40/60	T	ESC
6	24GE101	Problem Solving using Python Programming	3	0	2	4	5	50/50	TP	ESC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
7	24MH301	Fluid Mechanics and Thermal Systems	3	1	0	4	4	40/60	T	ESC
8	24MH304	Mechanics of Materials	3	0	0	3	3	40/60	T	ESC
9	24CS202	C Programming and Data Structures	3	0	2	4	5	50/50	TP	ESC

Professional Core Courses (52 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MH302	Digital Electronics and Microprocessor	3	0	2	4	5	50/50	TP	PCC
2	24MH303	Electrical Drives and Actuators	3	0	2	4	5	50/50	TP	PCC
3	24MH401	Sensors and Instrumentation	3	0	2	4	5	50/50	TP	PCC
4	24MH402	Embedded Systems and Programming	3	0	2	4	5	50/50	TP	PCC
5	24MH403	Theory of Machines	3	1	0	4	4	40/60	T	PCC
6	24MH404	Manufacturing Technology	3	0	2	4	5	50/50	TP	PCC
7	24MH411	Theory of Machines Laboratory	0	0	4	2	4	60/40	P	PCC
8	24MH501	Fluid Power Systems and Industrial Automation	3	0	0	3	3	40/60	T	PCC
9	24EC401	Control Systems Engineering	3	0	2	4	5	50/50	TP	PCC
10	24MH511	Industrial Automation Laboratory	0	0	4	2	4	60/40	P	PCC
11	24MH512	Design and Modelling Laboratory	0	0	4	2	4	60/40	P	PCC
12	24MH601	Drone Technologies	3	0	0	3	3	40/60	T	PCC
13	24MH602	Robotics	3	0	0	3	3	40/60	T	PCC
14	24MH603	Design of Mechatronics System	3	0	2	4	5	50/50	TP	PCC
15	24MH701	Machine Vision Systems	3	0	0	3	3	40/60	T	PCC
16	24MH712	Robotics and Machine Vision Laboratory	0	0	4	2	4	60/40	P	PCC

Professional Elective Courses - Vertical-1 (Applied Robotics)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE01	Medical Robotics	3	0	0	3	3	40/60	T	PEC
2	24MHE02	Micro robotics	3	0	0	3	3	40/60	T	PEC
3	24MHE03	Collaborative robotics	3	0	0	3	3	40/60	T	PEC
4	24MHE04	Robots and Systems in Smart Manufacturing	3	0	0	3	3	40/60	T	PEC
5	24MHE05	Agriculture Robotics and Automation	3	0	0	3	3	40/60	T	PEC
6	24MHE06	Humanoid Robotics	3	0	0	3	3	40/60	T	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
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**Professional Elective Courses - Vertical-2 (Smart Mobility Systems)**

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE07	Smart mobility and intelligent vehicles	3	0	0	3	3	40/60	T	PEC
2	24MHE08	Automotive Mechatronics	3	0	0	3	3	40/60	T	PEC
3	24MHE09	Electric and Hybrid Vehicles	3	0	0	3	3	40/60	T	PEC
4	24MHE10	Aircraft Mechatronics	3	0	0	3	3	40/60	T	PEC
5	24MHE11	Advanced Driver Assistance Systems	3	0	0	3	3	40/60	T	PEC
6	24MHE12	Automotive System Modelling and Simulation	3	0	0	3	3	40/60	T	PEC

**Professional Elective Courses - Vertical-3 (Avionics And Drone Technology)**

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE13	Design of UAV system	3	0	0	3	3	40/60	T	PEC
2	24MHE14	Aerodynamics of drones	3	0	0	3	3	40/60	T	PEC
3	24MHE15	Avionics	3	0	0	3	3	40/60	T	PEC
4	24MHE16	Navigation and Communication Systems	3	0	0	3	3	40/60	T	PEC
5	24MHE17	Guidance and control	3	0	0	3	3	40/60	T	PEC
6	24MHE18	Control Engineering	3	0	0	3	3	40/60	T	PEC

**Professional Elective Courses - Vertical-4 (Automation)**

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE19	Total Integrated Automation	3	0	0	3	3	40/60	T	PEC
2	24MHE20	Computer Architecture and organization	3	0	0	3	3	40/60	T	PEC
3	24MHE21	Power Electronics	3	0	0	3	3	40/60	T	PEC
4	24MHE22	Virtual instrumentation	3	0	0	3	3	40/60	T	PEC
5	24MHE23	Digital Twin and Industry 5.0	3	0	0	3	3	40/60	T	PEC
6	24MHE24	Motion Control system	3	0	0	3	3	40/60	T	PEC

**Professional Elective Courses - Vertical-5 (Intelligent Systems)**

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE25	Machine Learning for Intelligent Systems	3	0	0	3	3	40/60	T	PEC
2	24MHE26	Engineering Optimization Techniques	3	0	0	3	3	40/60	T	PEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
3	24MHE27	Condition Monitoring and Fault Diagnostics	3	0	0	3	3	40/60	T	PEC
4	24MHE28	Computer Vision and Deep Learning	3	0	0	3	3	40/60	T	PEC
5	24MHE29	Applied image Processing	3	0	0	3	3	40/60	T	PEC
6	24MHE30	Micro Electro Mechanical Systems (MEMS)	3	0	0	3	3	40/60	T	PEC

Professional Elective Courses - Vertical-6 (Diversified Group 1)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MHE31	Rapid Prototyping	3	0	0	3	3	40/60	T	PEC
2	24MHE32	Introduction to Non-destructive testing	3	0	0	3	3	40/60	T	PEC
3	24MHE33	Computer Integrated Manufacturing	3	0	0	3	3	40/60	T	PEC
4	24MHE34	CNC Machine Tools and Programming	3	0	0	3	3	40/60	T	PEC
5	24MEE11	Product Life cycle Management	3	0	0	3	3	40/60	T	PEC
6	24MHE35	Process Planning and Cost Estimation	3	0	0	3	3	40/60	T	PEC

Open Elective Courses (12 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24CEO01	Environmental Science and Sustainability	3	0	0	3	3	40/60	T	OEC
2	24CEO02	Green Building Design	3	0	0	3	3	40/60	T	OEC
3	24CEO03	Municipal Solid Waste Management	3	0	0	3	3	40/60	T	OEC
4	24CEO04	Sustainable Infrastructure	3	0	0	3	3	40/60	T	OEC
5	24CEO05	Disaster Management	3	0	0	3	3	40/60	T	OEC
6	24CEO06	Geographical Information System	3	0	0	3	3	40/60	T	OEC
7	24CEO07	Environment and Agriculture	3	0	0	3	3	40/60	T	OEC
8	24CEO08	Earthquake Engineering	3	0	0	3	3	40/60	T	OEC
9	24CSO01	Introduction to Algorithms	3	0	0	3	3	40/60	T	OEC
10	24CSO02	Fundamentals of Software Engineering	3	0	0	3	3	40/60	T	OEC
11	24CSO03	Introduction to Cloud Computing	3	0	0	3	3	40/60	T	OEC
12	24CSO04	Principles of Blockchain Technology	3	0	0	3	3	40/60	T	OEC
13	24CSO05	Machine Learning using Python for Beginner	3	0	0	3	3	40/60	T	OEC
14	24CSO06	Multimedia and Computer Graphics	3	0	0	3	3	40/60	T	OEC
15	24CSO07	Introduction to App Development	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
16	24CSO08	Data Analytics	3	0	0	3	3	40/60	T	OEC
17	24EEO01	Electrical Safety	3	0	0	3	3	40/60	T	OEC
18	24EEO02	Introduction to E-Vehicle	3	0	0	3	3	40/60	T	OEC
19	24EEO03	Hybrid Energy Technology	3	0	0	3	3	40/60	T	OEC
20	24EEO04	Solar Photovoltaic System	3	0	0	3	3	40/60	T	OEC
21	24EEO05	Energy Forecasting, Modeling, and Project Management	3	0	0	3	3	40/60	T	OEC
22	24EEO06	Energy Efficient Buildings Design	3	0	0	3	3	40/60	T	OEC
23	24EEO07	Government Rules, Opportunities, Testing, and Certification of EV	3	0	0	3	3	40/60	T	OEC
24	24EEO08	PLC and Automation	3	0	0	3	3	40/60	T	OEC
25	24ECO01	Micro Sensors and Nano Sensors	3	0	0	3	3	40/60	T	OEC
26	24ECO02	Fundamentals of VLSI	3	0	0	3	3	40/60	T	OEC
27	24ECO03	Mass Communication	3	0	0	3	3	40/60	T	OEC
28	24ECO04	Sensor Technology	3	0	0	3	3	40/60	T	OEC
29	24ECO05	Nanomaterials and Devices	3	0	0	3	3	40/60	T	OEC
30	24ECO06	ML for Electronic Systems	3	0	0	3	3	40/60	T	OEC
31	24ECO07	Wireless and Mobile Communication	3	0	0	3	3	40/60	T	OEC
32	24ECO08	Internet of Things and Applications	3	0	0	3	3	40/60	T	OEC
33	24MEO01	Introduction to MEMS and NEMS	3	0	0	3	3	40/60	T	OEC
34	24MEO02	Energy Conservation and Management	3	0	0	3	3	40/60	T	OEC
35	24MEO03	Fundamentals of Additive Manufacturing	3	0	0	3	3	40/60	T	OEC
36	24MEO04	Lean Six Sigma	3	0	0	3	3	40/60	T	OEC
37	24MEO05	Agriculture Technology	3	0	0	3	3	40/60	T	OEC
38	24BMO01	Fundamentals of Radiological Equipment's	3	0	0	3	3	40/60	T	OEC
39	24BMO02	Basics of Biomedical Instrumentation	3	0	0	3	3	40/60	T	OEC
40	24BMO03	Introduction to Robotics in Medicine	3	0	0	3	3	40/60	T	OEC
41	24BMO04	Principles of Telemedicine	3	0	0	3	3	40/60	T	OEC
42	24BMO05	Hospital Management	3	0	0	3	3	40/60	T	OEC
43	24BMO06	Bio MEMS and Applications	3	0	0	3	3	40/60	T	OEC
44	24BMO07	Fundamentals of Brain Computer Interface	3	0	0	3	3	40/60	T	OEC
45	24BMO08	Principles of Rehabilitation Engineering	3	0	0	3	3	40/60	T	OEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
46	24CHO01	Industrial pollution prevention and control	3	0	0	3	3	40/60	T	OEC
47	24CHO02	Petroleum Technology	3	0	0	3	3	40/60	T	OEC
48	24CHO03	Green Chemistry and Engineering	3	0	0	3	3	40/60	T	OEC
49	24CHO04	Bio-Energy Technology	3	0	0	3	3	40/60	T	OEC
50	24CHO05	Carbon capture utilization and storage	3	0	0	3	3	40/60	T	OEC
51	24CHO06	Battery Technology	3	0	0	3	3	40/60	T	OEC
52	24CHO07	Energy Management	3	0	0	3	3	40/60	T	OEC
53	24CHO08	Environmental Audit	3	0	0	3	3	40/60	T	OEC
54	24ITO01	Introductions to Full Stack Web Development	3	0	0	3	3	40/60	T	OEC
55	24ITO02	Introduction to Digital Marketing	3	0	0	3	3	40/60	T	OEC
56	24ITO03	Social Media Marketing	3	0	0	3	3	40/60	T	OEC
57	24ITO04	Ethical Hacking	3	0	0	3	3	40/60	T	OEC
58	24ITO05	Information Storage Management	3	0	0	3	3	40/60	T	OEC
59	24ITO06	Introductions to Cyber Security	3	0	0	3	3	40/60	T	OEC
60	24ITO07	Software Testing Essentials	3	0	0	3	3	40/60	T	OEC
61	24ITO08	Introductions to UI and UX Design	3	0	0	3	3	40/60	T	OEC
62	24ADO01	Introduction to Machine Learning	3	0	0	3	3	40/60	T	OEC
63	24ADO02	Introduction to Artificial Intelligence	3	0	0	3	3	40/60	T	OEC
64	24ADO03	Introduction to Big Data	3	0	0	3	3	40/60	T	OEC
65	24ADO04	Basics of Data Science	3	0	0	3	3	40/60	T	OEC
66	24ADO05	R Programming	3	0	0	3	3	40/60	T	OEC
67	24ADO06	Fundamentals of Deep Learning	3	0	0	3	3	40/60	T	OEC
68	24ADO07	AI in Healthcare Applications	3	0	0	3	3	40/60	T	OEC

Employability Enhancement Courses (22 Credits)										
S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24SD311	Aptitude and Coding Skills -1	0	0	2	1	2	100/0	P	EEC
2	24EL311	Innovation and Product Development -1 (Idea Generation)	0	0	2	1	2	100/0	EL	EEC
3	24SD411	Aptitude and Coding Skills -2	0	0	2	1	2	100/0	P	EEC
4	24EL411	Innovation and Product Development -2 (Conceptualization)	0	0	2	1	2	100/0	EL	EEC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
5	24SD511	Advanced Aptitude and Coding Skills 1	0	0	2	1	2	100/0	P	EEC
6	24EL511	Innovation and Product Development-3 (Prototype Development and Testing)	0	0	2	1	2	100/0	EL	EEC
7	24SD611	Technical Proficiency-1	0	0	2	1	2	100/0	P	EEC
8	24SD612	Advanced Aptitude and Coding Skills 2	0	0	2	1	2	100/0	P	EEC
9	24EL611	Innovation and Product Development-4 (Patent Filing / Startup Registration)	0	0	2	1	2	100/0	EL	EEC
10	24MH711	Design and Fabrication Project	0	0	2	1	2	60/40	P	EEC
11	24SD711	Technical Proficiency-2	0	0	2	1	2	100/0	P	EEC
12	24MH811	Project Work / Semester Internship	0	0	20	10	20	60/40	P	EEC

#### MANDATORY COURSES -1 & 2

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category	
1	24MC111	Induction Program	3 Weeks							MC	MC
2	24MC201	Environmental Science	2	0	0	0	2	100/0	MC	MC	

#### MANDATORY COURSES - 3

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MC301	Introduction to Women and Gender Studies	2	0	0	0	2	100/0	MC	MC
2	24MC302	Elements of Literature	2	0	0	0	2	100/0	MC	MC
3	24MC303	Film Appreciation	2	0	0	0	2	100/0	MC	MC
4	24MC304	Well, Being with Traditional Practices Yoga, Ayurveda and Siddha	2	0	0	0	2	100/0	MC	MC
5	24MC305	History of Science and Technology in India	2	0	0	0	2	100/0	MC	MC
6	24MC306	Political and Economic Thought for a Humane Society	2	0	0	0	2	100/0	MC	MC
7	24MC307	Indian Constitution	2	0	0	0	2	100/0	MC	MC
8	24MC308	Bureau of Indian Standards (BIS)	2	0	0	0	2	100/0	MC	MC

#### MANDATORY COURSES - 4

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
1	24MC401	Japanese Language	2	0	0	0	2	100/0	MC	MC
2	24MC402	German Language	2	0	0	0	2	100/0	MC	MC
3	24MC403	Korean Language	2	0	0	0	2	100/0	MC	MC
4	24MC404	French Language	2	0	0	0	2	100/0	MC	MC

S.No.	Course Code	Course	L	T	P	C	Prds. /wk.	CA / ES	Course Type	Category
5	24MC405	Hindi Language	2	0	0	0	2	100/0	MC	MC
6	24MC406	Industrial Safety	2	0	0	0	2	100/0	MC	MC
7	24MC407	Disaster Risk Reduction and Management	2	0	0	0	2	100/0	MC	MC
8	24MC408	State, Nation Building and Politics in India	2	0	0	0	2	100/0	MC	MC

**B.E-MECHATRONICS ENGINEERING**  
**CURRICULUM AND SYLLABI (Regulation 2024)**

<b>SEMESTERWISE CREDITS DISTRIBUTION</b>									
<b>Category</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>VII</b>	<b>VIII</b>	<b>Credits</b>
<b>HSMC</b>	4	1	2		3	2			12
<b>BSC</b>	12	4	4						20
<b>ESC</b>	6	13	7	4					29
<b>PCC</b>			8	18	11	10	5		52
<b>PEC</b>					3	6	9		18
<b>OEC</b>					3	3	6		12
<b>EEC</b>			2	2	2	3	2	10	22
<b>MC</b>									
<b>Total</b>	<b>22</b>	<b>18</b>	<b>23</b>	<b>24</b>	<b>22</b>	<b>24</b>	<b>22</b>	<b>10</b>	<b>165</b>

# **Semester-I**

<b>Course Code</b>	24HS101	<b>Course Name</b>	TECHNICAL ENGLISH	<b>Course Category</b>	TP	Humanities, Social Science and Management Courses	L	T	P	C
							2	0	2	3

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Science and Humanities		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is:***

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Employ grammar and appropriate terminologies for day-to-day situations	U								2	2	3		2			
<b>CO-2:</b>	Understand the nuances within both spoken and written interactions	U								3	2	3		2			
<b>CO-3:</b>	Utilize vivid and analytical vocabulary, expressions, and sentence structures	R								2	2	3		2			
<b>CO-4:</b>	Read various forms of writing and grasp both their literal and implied interpretations	E								2	2	3		2			
<b>CO-5:</b>	Compose various kinds of writing employing suitable structures	AP								2	2	3		2			

<b>Unit-1</b>	<b>BASICS OF COMMUNICATION</b>	<b>6 Periods</b>
Grammar – Simple present tense, Present continuous tense, Asking questions (Wh-questions); Vocabulary: One-word substitutions, Synonyms; Writing: Personal profile		
<b>Unit-2</b>	<b>NARRATION</b>	<b>6 Periods</b>
Grammar – Subject – verb agreement, Simple past, Past continuous tense; Vocabulary – Antonyms, Word formation (Prefixes and Suffixes). Writing – Narrative (Event: Festivals, Birthday, personal experience)		
<b>Unit-3</b>	<b>DESCRIPTION</b>	<b>6 Periods</b>
Writing – Definitions, Descriptive writing, Checklists; Grammar: Future tense, Perfect tense, Preposition; Vocabulary: Adjectives and Adverbs		
<b>Unit-4</b>	<b>CLASSIFICATION</b>	<b>6 Periods</b>
Writing – Note-making, Note-taking; Grammar: Connectives, Transition words (linkers); Vocabulary: Contextual vocabulary, Words used Both as Noun and Verb, Classification-related words		
<b>Unit-5</b>	<b>EXPRESSION OF VIEWS</b>	<b>6 Periods</b>
Writing – Letter writing / Email writing (Enquiry / Permission, Letter to Editor); Grammar: Question tags, Indirect questions, Yes / No questions; Vocabulary: Compound words, Phrasal verbs.		
<b>Total Theory: 30 Periods</b>		

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Listening – Telephone conversation &amp; Writing message, gap filling</li> <li>2. Reading – Telephone message, bio-note; Writing – Personal profile</li> <li>3. Listening – Travel podcast / Watching a travel documentary</li> <li>4. Reading – An excerpt from a travelogue, Newspaper Report</li> <li>5. Writing – Narrative (Event: Festivals, Birthday, and personal experience: Excursion, Sports, Conference, etc.)</li> <li>6. Listening – Conversation, Radio/TV advertisement, Commentary</li> <li>7. Reading – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature</li> <li>8. Listening – Announcements and filling a table, Catalogue, List of Equipment</li> <li>9. Reading – An article, social media posts and classifying (channel conversion – text to table)</li> <li>10. Listening – Debate / Discussion; Reading – Formal letters, Letters to the Editor, Opinion articles / Blogs</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Using English: A Course book for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.</li> <li>2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.</li> </ol>	<ol style="list-style-type: none"> <li>1. Anderson, Paul V. Technical Communication: A Reader–Centered Approach. Cengage, New Delhi, 2008.</li> <li>2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

Course Code	24MA101	Course Name	MATRICES AND CALCULUS	Course Category	T	Basic Science Courses	L	T	P	C
							3	1	0	4

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	NIL	

**Course Objective: The purpose of learning this course is:**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Use the matrix algebra methods for solving practical problems.	U	3	2	2	2									2			
<b>CO-2:</b>	Use differential calculus ideas on several variable functions.	R	3	2	2	2									2			
<b>CO-3:</b>	Apply different methods of integration in solving practical problems by using Beta and Gamma functions.	AP	3	2	2	2									2			
<b>CO-4:</b>	Apply multiple integral ideas in solving areas and volumes problems.	AP	3	2	2	2									2			
<b>CO-5:</b>	Apply the concept of vectors in solving practical problems.	AN	3	2	2	2									2			

<b>Unit-1</b>	<b>MATRICES</b>	<b>12 Periods</b>
Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form - Applications: Stretching of an elastic membrane.		
<b>Unit-2</b>	<b>FUNCTIONS OF SEVERAL VARIABLES</b>	<b>12 Periods</b>
Limit, continuity, partial derivatives – Homogeneous functions and Euler's theorem - Total derivative – Differentiation of implicit functions - Taylor's formula for two variables - Errors and approximations – Lagrange's method of undetermined multipliers - Applications of Maxima and Minima in Temperature problems.		
<b>Unit-3</b>	<b>INTEGRAL CALCULUS</b>	<b>12 Periods</b>
Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule –Beta and Gamma functions - Properties – Evaluation of integrals by using Beta and Gamma functions – Error functions.		
<b>Unit-4</b>	<b>MULTIPLE INTEGRALS</b>	<b>12 Periods</b>
Double integrals – Change of order of integration – Double integrals in polar coordinates – Triple integrals – Volume of Solids –Change of variables in double and triple integrals-Area enclosed by plane curves using MATLAB.		
<b>Unit-5</b>	<b>VECTOR CALCULUS</b>	<b>12 Periods</b>
Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green's theorem, Stoke's and Gauss divergence theorems – Applications and Verification in evaluating line, surface and volume integrals.		
<b>Total:</b>		<b>60 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. Joel Hass, Christopher Heil, Maurice D. Weir "Thomas' Calculus", Pearson Education., New Delhi, 2018. 2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017. 3. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009. 4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012. 5. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010	1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015. 2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education 2nd Edition, 5th Reprint, Delhi, 2009. 3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

Course Code	24PH101	Course Name	ENGINEERING PHYSICS	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities		Data Book / Codes Standards	NIL	

**Course Objective: *The purpose of learning this course is to:***

- Make the students effectively to achieve an understanding of mechanical properties of materials.
- Enable the students to gain knowledge of oscillations, sounds and applications of thermal physics.
- Introduce the basics of optics and lasers and its applications.
- Equipping the students to successfully understand the importance of quantum physics.
- Introduce the significance and structure of crystal physics.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		Program Outcomes (PO)												Program Specific Outcome (PSO)			
		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand the important mechanical properties of materials.	U	3	2	2		2					1		2			
<b>CO-2:</b>	Analyze and apply the principles of oscillations, sound, and thermal physics to solve real-world problems.	AN	3	2	2		2					1		2			
<b>CO-3:</b>	Applying the principles of optics and lasers to analyze and design optical systems and devices.	AP	3	2	2		2					1		2			
<b>CO-4:</b>	Apply quantum mechanical principles to analyze and predict the behavior of particles and systems at the atomic and subatomic levels.	AP	3	2		2								2			
<b>CO-5:</b>	Understanding and predicting material properties based on crystal structure and symmetry principles.	U	3	2			2							2			

**Unit-1 MECHANICS OF MATERIALS**

**9 Periods**

Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke's law - Poisson's ratio -stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination- I shaped girders and application in Engineering field –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

**Unit-2 OSCILLATIONS, SOUND AND THERMAL PHYSICS**

**9 Periods**

Simple harmonic motion - Torsional pendulum -- Damped oscillations –Shock Absorber –Forced oscillations and Resonance –Applications of resonance.- Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion– Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

**Unit-3 OPTICS AND LASERS**

**9 Periods**

Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer -- Diffraction - CD as diffraction grating – Diffraction by crystals - Polarization -polarizers -- Laser – characteristics – Spontaneous and Stimulated emission- population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO2 laser, Semiconductor laser -Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers

<b>Unit-4</b>	<b>QUANTUM MECHANICS</b>	<b>9 Periods</b>
Black body radiation (Qualitative) – Planck’s hypothesis – Einstein’s theory of Radiation - Matter waves–de Broglie hypothesis - Electron microscope – Uncertainty Principle – The Schrodinger Wave equation (time-independent and time-dependent) – Meaning and Physical significance of wave function - Normalization -Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope and its application in nano field.		
<b>Unit-5</b>	<b>CRYSTAL PHYSICS</b>	<b>9 Periods</b>
Crystal Bonding – Ionic – covalent – metallic and vander Walls’s/ molecular bonding. Crystal systems -unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures – crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czocharalski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.		
<b>Total Theory: 45 Periods</b>		

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.</li> <li>2. Non-uniform bending - Determination of Young’s modulus</li> <li>3. Uniform bending – Determination of Young’s modulus</li> <li>4. Simple harmonic oscillations of cantilever.</li> <li>5. Laser- Determination of the wavelength of the laser using grating</li> <li>6. Air wedge - Determination of thickness of a thin sheet/wire</li> <li>7. Optical fibre -Determination of Numerical Aperture and acceptance angle</li> <li>8. Compact disc- Determination of width of the groove using laser.</li> <li>9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.</li> <li>10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids</li> <li>11. Post office box -Determination of Band gap of a semiconductor.</li> <li>12. Photoelectric effect</li> <li>13. Michelson Interferometer.</li> <li>14. Melde’s string experiment</li> <li>15. Experiment with lattice dynamics kit.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013.</li> <li>2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley &amp; Sons, 2011.</li> <li>3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer Verlag, 2012.</li> <li>4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.</li> </ol>	<ol style="list-style-type: none"> <li>1. R. Wolfson, Essential University Physics. Volume 1 &amp; 2. Pearson, 2016.</li> <li>2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017.</li> <li>3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

Course Code	24CY101	Course Name	ENGINEERING CHEMISTRY	Course Category	TP	Basic Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities		Data Book / Codes Standards	NIL	

**Course Objective: *The purpose of learning this course is:***

- To inculcate knowledge on different types of polymers, their properties and preparation techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of different types of corrosion and its control methods.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand and apply basic knowledge on different types of polymeric materials, their properties and various techniques of their fabrication.	U	3	2	1		2			1				2			
<b>CO-2:</b>	Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technological applications.	AP	3	3	3		3							2			
<b>CO-3:</b>	Proficiently identify corrosion mechanisms, select control methods, and apply protective coatings.	AP	3	3	2	2		2			1			1			
<b>CO-4:</b>	Analyze and compare energy sources, discerning characteristics and applications.	AN	3	2	2		3					1					
<b>CO-5:</b>	Develop competence in assessing water quality, applying treatment methods, and implementing conditioning techniques.	AP	3	2	2		1		3	2	1			2			

**Unit-1 POLYMER CHEMISTRY**

**9 Periods**

Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: T<sub>g</sub>, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

**Unit-2 NANOCHEMISTRY**

**9 Periods**

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, chemical vapour deposition and electrospinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

**Unit-3 CORROSION AND ITS CONTROL**

**9 Periods**

Introduction to corrosion - chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-differential aeration corrosion-pitting, water line corrosions, factors influencing corrosion. Corrosion control-material selection and design- - sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions

<b>Unit-4 ENERGY SOURCES</b>	<b>9 Periods</b>
Batteries - Characteristics - types of batteries – primary battery (dry cell), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H <sub>2</sub> -O <sub>2</sub> fuel cell - Supercapacitors-Types and Applications, Renewable Energy:Solar- solar cells, DSSC	
<b>Unit-5 WATER TECHNOLOGY</b>	<b>9 Periods</b>
Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD and heavy metals. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis.	
<b>Total Theory: 45 Periods</b>	

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Estimation of HCl using Na<sub>2</sub>CO<sub>3</sub> as primary standards</li> <li>2. Determination of alkalinity in water sample.</li> <li>3. Determination of hardness of water by EDTA method.</li> <li>4. Determination of DO content of water sample by Winkler's method</li> <li>5. Determination of chloride content of water sample by Argentometric method.</li> <li>6. Determination of strength of given hydrochloric acid using pH meter.</li> <li>7. Determination of strength of acids in a mixture of acids using conductivity meter</li> <li>8. Estimation of iron content of the given solution using potentiometer.</li> <li>9. Estimation of iron content of the water sample using spectrophotometer (1, 10 - Phenanthroline/thiocyanate method).</li> <li>10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer</li> <li>11. Determination of strength of an acid using conductivity meter.</li> <li>12. Estimation of nickel content of the given solution by EDTA method</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	1. Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015. 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012. 3. Dara S.S., "A Textbook of Engineering Chemistry", Chand Publications, 2004.	1. Sachdeva M.V., "Basics of Nano Chemistry", Anmol Publications Pvt Ltd, 2011. 2. Friedrich Emich, "Engineering Chemistry", Medtech, 2014. 3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24GE201	Course Name	COMPUTER AIDED ENGINEERING GRAPHICS	Course Category	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Mechanical Engineering		Databook/Codes/Standards	NIL	

**Course Objective: *The purpose of learning this course is to:***

- Understand universal technical drawing standards
- Provide training on drafting software to draw simple sketches
- Demonstrate the concepts of orthographic and isometric projections
- Use drawing skills for communicating concepts, ideas for engineering product design
- Use pictorial views to visualize and draw the isometric view of the objects

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Perform freehand sketching of basic geometrical constructions and multiple views of objects	R	3	2	2								2		2	3		
<b>CO-2:</b>	Understand the concept of orthographic projections of lines and plane surfaces.	U	3	2	2								2		2	3		
<b>CO-3:</b>	Apply the Projection concepts and drafting software to draw projection of solids.	AP	3	2	2		3						2		2	3		
<b>CO-4:</b>	Draw projections of the section of solids and development of surfaces using CAD software and basic manual tools.	AP	3	2	2		3						2		2	3		
<b>CO-5:</b>	Utilize modern drafting tools and software to visualize and project isometric and perspective sections of simple solids.	AP	3	2	2		3						2		2	3		

**Unit-1 CONCEPTS, CONVENTIONS, PLANE CURVES AND FREEHAND SKETCHING 9 Periods**

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning. Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method - Visualization concepts and Free Hand sketching: Visualization principles -Representation of Three-Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects (Draw without using drawing instruments)

**Unit-2 PROJECTION OF POINTS, LINES AND PLANE SURFACE 9 Periods**

Orthographic projection - principles-Principal planes - First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**Unit-3 PROJECTION OF SOLIDS 9 Periods**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes

**Unit-4 PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9 Periods**

Sectioning of simple solids like prisms, pyramids, cylinder, and cone in a simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones

<b>Unit-5</b>	<b>ISOMETRIC AND PERSPECTIVE PROJECTIONS</b>	<b>9 Periods</b>
Principles of isometric projection - isometric scale -Isometric projections and isometric views of simple solids and truncated solids - Prisms, pyramids, cylinders, cones-combination of two solid objects in simple vertical positions. Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method		
<b>Total Theory: 45 Periods</b>		

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Drawing of a Title Block with necessary text and projection symbol.</li> <li>2. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning</li> <li>3. Drawing front view, top view and side view of objects from the given pictorial views (eg. V- block, Base of a mixie, Simple stool, Objects with hole and curves)</li> <li>4. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)</li> <li>5. Drawing of a simple steel truss.</li> <li>6. Drawing sectional views of prism, pyramid, cylinder, cone, etc,</li> <li>7. Drawing isometric projection of simple objects.</li> <li>8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, Twenty ninth edition 2017</li> <li>2. Dr. M.H Annaiah, Dr. B Sudheer Prem Kumar &amp; Dr. C N Chandrappa, Computer Aided Engineering Drawing, New Age International (P) Limited, 7th Edition, 2023.</li> <li>3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.</li> </ol>	<ol style="list-style-type: none"> <li>1. S. Ramachandran and K. Pandian, "Engineering Graphics" Airwalk Publications; 8th edition 2014.</li> <li>2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2018.</li> <li>3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&amp;II combined), Subhas Stores, Bangalore, 2018.</li> <li>4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
* The expected levels for Bloom's Taxonomy should be:				
<ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

<b>Course Code</b>	24GE102	<b>Course Name</b>	தமிழர் மரபு /HERITAGE OF TAMILS	<b>Course Category</b>	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Science and Humanities		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- Explore the history, significance, and classical status of the Tamil language and analyze the timeless management principles found in Thiruvalluvar's Thirukural.
- Learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.
- Familiarize the students with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.
- Get the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.
- Explore the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Gain comprehensive knowledge about the linguistic diversity in India and the Dravidian language family and appreciate the classical status of Tamil and its rich literary heritage.	U																
<b>CO-2:</b>	Students will learn about the development of Tamil art and sculpture over time, including temple arts, traditional crafts, and musical instruments.	U																
<b>CO-3:</b>	Students will become familiar with various Tamil folk dances, performances, and martial arts, and their significance in Tamil culture.	U																
<b>CO-4:</b>	Students will understand the ancient Tamil way of classifying landscapes and life, their connection to nature, and the trade and conquests of the Chola dynasty.	U																
<b>CO-5:</b>	Students will learn about the role of Tamils in India's freedom movement, their cultural influence across India, the Self-Respect Movement, and contributions to traditional medicine and literature.	U																

**Unit-1 மொழி மற்றும் இலக்கியம் /LANGUAGE AND LITERATURE**

**3 Periods**

இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - சங்க இலக்கியத்தின் மதச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல்அறம் - திருக்குறளில் மேலாண்மைக் கோட்பாடுகள் - தமிழ் இதிகாசங்கள் மற்றும் தமிழ் நிலத்தில் பௌத்தம் மற்றும் சமணத்தின் தாக்கம் - பக்தி இலக்கியம் ஆழ்வார்களும் நாயன்மார்களும் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கிய வளர்ச்சி - பாரதியார் மற்றும் பாரதிதாசன் பங்களிப்பு

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

<b>Unit-2</b>	<b>மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை/ HERITAGE - ROCK ART PAINTINGS TO MODERN ART - SCULPTURE</b>	<b>3 Periods</b>
<p>நடுகல் முதல் நவீன சிற்பம் - ஐம்பொன்சிற்பங்கள் - பழங்குடியினர் மற்றும் அவர்களின் கைவினைப்பொருட்கள் - கோவில் தேர் செய்யும் கலை - - சுடுமண் சிற்பங்கள், கிராம சிறுதெய்வங்கள், கன்னியாகுமரியில் திருவள்ளுவர் சிலை, இசைக்கருவிகள் தயாரித்தல் - மிருதங்கம், பறை, வீணை, யாழ் மற்றும் நாதஸ்வரம். தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் கோவில்களின் பங்களிப்பு.</p> <p>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.</p>		
<b>Unit-3</b>	<b>நாட்டுப்புற மற்றும் தற்காப்பு கலைகள்/ FOLK AND MARTIAL ARTS</b>	<b>3 Periods</b>
<p>தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியன் கூத்து, ஓயிலாட்டம், தோல் பொம்மலாட்டம், சிலம்பாட்டம், வளரி, புலி நடனம் - தமிழர்களின் தனி மற்றும் குழு விளையாட்டுகள்.</p> <p>Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.</p>		
<b>Unit-4</b>	<b>தமிழர்களின் திணைக் கோட்பாடுகள்/THINAI CONCEPT OF TAMILS</b>	<b>3 Periods</b>
<p>தமிழக தாவரங்கள் மற்றும் விலங்கினங்கள் &amp; தொல்காப்பியம் மற்றும் சங்க இலக்கியம் குறிப்பிடும் அகம் மற்றும் புறம் பற்றியக் கோட்பாடுகள் - தமிழர்களின் அறக் கோட்பாடுகள் - சங்க காலத்தில் கல்வி மற்றும் எழுத்தறிவு - பண்டைய நகரங்கள் மற்றும் சங்க காலத்தில் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - சோழர்களின் வெளிநாட்டு வெற்றி.</p> <p>Flora and Fauna of Tamils &amp; 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.</p>		
<b>Unit-5</b>	<b>இந்திய தேசிய இயக்கத்திற்கும் இந்திய கலாச்சாரத்திற்கும் தமிழர்களின் பங்களிப்பு/CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE</b>	<b>3 Periods</b>
<p>இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு - இந்தியாவின் பிற பகுதிகளில் தமிழர்களின் கலாச்சார தாக்கம் - சுயமரியாதை இயக்கம் - சுதேச மருத்துவ முறைகளில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள் மற்றும் கையெழுத்துப் பிரதிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு.</p> <p>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 &amp; Manuscripts – Print History of Tamil Books.</p>		
<b>Total:</b>		<b>15 Periods</b>

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

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b><i>Average of Internal Test (20%)</i></b>	<b><i>Critical Thinking Assessment (20%)</i></b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

Course Code	24GE111	Course Name	ENGINEERING PRACTICES LABORATORY	Course Category	P	Engineering Science Courses	L	T	P	C
							0	0	4	2

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Mechanical Engineering		Data Book / Codes /Standards	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To identify tools, work material and measuring instruments useful for welding, Machining, Plumbing and carpentry
- To provide exposure to the students with hands on experience on various wiring system
- To provide exposure to the students with hands on experience on various Electronic Components

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Understand the concepts of welding safety protocols, equipment operation essential for successful welding practices in engineering applications.	U	3	2				1	1						2			
<b>CO-2:</b>	Make simple metal joints using welding equipment and wooden joints using carpentry tools	AP	3	2				1	1						2			
<b>CO-3:</b>	Apply the knowledge of pipeline connections to household fittings.	AP	3	2				1	1						2			
<b>CO-4:</b>	Demonstration on centrifugal pump and air conditioning working principles	U	3	2				1	1						2			
<b>CO-5:</b>	Apply the skills of basic electrical engineering for house wiring practice	AP	3	2				1	1						2			

**List of Experiments**

**60 Periods**

1. PLUMBING WORK:
  - a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
  - b) Preparing plumbing line sketches.
  - c) Laying pipe connection to the suction & delivery side of a pump
  - d) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.
2. WOOD WORK:
  - a) Sawing, b) Planing and c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.
3. Wood Work Study:
  - a) Studying joints in door panels and wooden furniture b) Studying common industrial trusses using models.
4. WELDING WORK:
  - a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. b) Practicing gas welding
5. BASIC MACHINING WORK:
  - a) (simple)Turning. b) (simple)Drilling. c) (simple)Tapping.
6. ASSEMBLY WORK:
  - a) Assembling a centrifugal pump. b) Assembling an air conditioner
7. SHEET METAL WORK:

- a) Making of a square tray
8. FOUNDRY WORK:  
a) Demonstrating basic foundry operations.
9. ELECTRICAL ENGINEERING PRACTICES  
a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket  
b) Staircase wiring  
c) Fluorescent Lamp wiring with introduction to CFL and LED types.  
d) Energy meter wiring and related calculations/ calibration  
e) Study of Iron Box wiring and assembly  
f) Study of Fan Regulator (Resistor type and electronic type using DIAC/TRIAC/QUADRAC)  
g) Study of emergency lamp wiring/Water heater
10. ELECTRONIC ENGINEERING PRACTICES- SOLDERING WORK:  
a) Soldering simple electronic circuits and checking continuity.
11. ELECTRONIC ASSEMBLY AND TESTING WORK:  
a) Assembling and testing electronic components on a small PCB.
12. ELECTRONIC EQUIPMENT STUDY:  
a) Study elements of smart phone.  
b) Assembly and dismantle of LED TV.  
c) Assembly and dismantle of computer/ laptop

Learning Assessment		
Continuous Learning Assessment (CLA) (60% weightage)		End Semester Examination (40% weightage)
Evaluation of Laboratory Observation, Record (45%)	Model Lab Exam (15%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

<b>Course Code</b>	24MC111	<b>Course Name</b>	INDUCTION PROGRAMME	<b>Course Category</b>	P	Humanities and Management Courses	L	T	P	C
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<b>Pre-requisite Courses</b>		<b>Co-requisite Courses</b>		<b>Progressive Courses</b>		
<b>Course Offering Department</b>	Science and Humanities (First year)		<b>Data Book / Codes / Standards</b>			

This is a mandatory 2-week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfil his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don't's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real-life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering /Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity-based programme and therefore there shall be no tests / assessments during this programme.

References:

Guide to Induction program from AICTE

# **Semester-II**

<b>Course Code</b>	24MA201	<b>Course Name</b>	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	<b>Course Category</b>	T	Basic Science Courses	L	T	P	C
							3	1	0	4

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Science and Humanities		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is:***

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in a wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

			Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>			BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand how to solve the given standard partial differential equations.	U	3	3	2													
<b>CO-2:</b>	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	AP	3	3	2	2	1											
<b>CO-3:</b>	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations	AP	3	3	2	2												
<b>CO-4:</b>	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	U	3	3		3	2								1			
<b>CO-5:</b>	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.	AN	3	3		2	3								2			

**Unit-1 PARTIAL DIFFERENTIAL EQUATIONS**

**12 Periods**

Formation of partial differential equations–Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange’s linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous using MATLAB.

**Unit-2 FOURIER SERIES**

**12 Periods**

Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series–Root mean square value–Parseval’s identity–Practical Harmonic analysis in signal processing and Quantum mechanics.

**Unit-3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**

**12 Periods**

Classification of PDE – Method of separation of variables - Fourier series solutions of one-dimensional wave equation – One dimensional equation of heat conduction– Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

<b>Unit-4</b>	<b>FOURIER TRANSFORMS</b>	<b>12 Periods</b>
Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity- Application of Transform to boundary value Problems in Digital signals.		
<b>Unit-5</b>	<b>Z-TRANSFORMS AND DIFFERENCE EQUATIONS</b>	<b>12 Periods</b>
Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Applications: Formation of difference equations–Solution of difference equations using Z-transforms.		
		<b>Total: 60 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1.Grewal B.S., "Higher Engineering Mathematics" 44 <sup>th</sup> Edition, Khanna Publishers, NewDelhi,2018. 2.Kreyszig E, "Advanced Engineering Mathematics", 10 <sup>th</sup> Edition, John Wiley, New Delhi, India, 2016 3.Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G" Advanced Mathematics for Engineering Students", Vol.II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai,1998. 4.Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,NewDelhi,2018.	1.Andrews. L.C and Shivamoggi.B, "Integral Transforms for Engineers" SPIE Press,1999. 2.Bali.N. P and Manish Goyal, "A Textbook of Engineering Mathematics",10th Edition, Laxmi Publications Pvt .Ltd,2015. 3.James.G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, NewDelhi,2016. 4.Wylie.R.C.and Barrett.L.C., "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6th Edition, NewDelhi,2012

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

<b>Course Code</b>	24EE204	<b>Course Name</b>	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	<b>Course Category</b>	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

<b>Pre-requisite Courses</b>	NIL	<b>Co- requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Electrical And Electronics Engineering		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- Understand the principles of DC and AC circuits, including circuit components, Ohm's Law, Kirchhoff's Laws, and analysis techniques such as nodal and mesh analysis
- Learn about the construction, working principles, and applications of various electrical machines, including generators, motors, transformers, and special machines
- Comprehend semiconductor materials and electronic devices such as diodes, transistors, SCR, and MOSFET, along with their characteristics, biasing, and applications in communication engineering
- Review and understand the fundamentals of digital electronics, including number systems, binary codes, logic functions, and minimization techniques using Karnaugh maps
- Gain knowledge of measurement principles and instrumentation techniques, including instrument components, standards, calibration, and various types of meters and instruments used in electrical engineering

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Analyse the electric circuit parameters for solving engineering problems. Also understand basic electrical safety concepts.	AP	3	2	1			3						2	2			
<b>CO-2:</b>	Explain the working principle and applications of AC/DC machines	U	2	2	1					1				2	2			
<b>CO-3:</b>	Analyse the characteristics of analog electronic devices to develop projects in multidisciplinary environment.	AN	2	1	1					1				2	2			
<b>CO-4:</b>	Explain the basic concepts of digital electronics and analyse complex engineering problems.	E	2	2	1					1				2	2			
<b>CO-5:</b>	Explain the operating principles of measuring instruments.	U	2	2	1					1				2	2			

<b>Unit-1 ELECTRICAL CIRCUITS</b>	<b>9 Periods</b>
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws– Nodal Analysis, Mesh analysis Introduction to alternating voltage and currents: Waveforms, Average value, RMS Value, Powers in AC circuits, power factor – Star and Delta connection - Electrical safety- Fuses and Earthing.	
<b>Unit-2 ELECTRICAL MACHINES</b>	<b>9 Periods</b>
DC Machine: Construction, Working principle, EMF equation, Types and Applications. Transformers: Construction, Working principle, EMF Equation and Applications. Three Phase Induction Motors: Construction, Working principle, and Applications. Special Machines: Stepper motor, Servo Motor and BLDC Motor - Construction, Working and Applications	
<b>Unit-3 ANALOG ELECTRONICS</b>	<b>9 Periods</b>
Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications – Bipolar Junction Transistor-Biasing, SCR, GTO, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.	

<b>Unit-4</b>	<b>DIGITAL ELECTRONICS</b>	<b>9 Periods</b>
Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps.		
<b>Unit-5</b>	<b>MEASUREMENTS AND INSTRUMENTATION</b>	<b>9 Periods</b>
Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.		
<b>Total:</b>		<b>45 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020 2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017. 3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008	1. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018. 2. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015. 3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017. 4. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2022

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

Course Code	24ME201	Course Name	Material Science and Metallurgy	Course Category	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	
Course Offering Department	Mechanical Engineering		Data Book / Codes / Standards	NIL		

**Course Objective: *The purpose of learning this course is to:***

- To impart the knowledge on the fundamental principles of constitution of alloys and phase diagrams
- To Interpret isothermal transformation diagrams and cooling curves to predict phase transformations during heat treatment.
- To identify about structure, properties and applications of ferrous and non-ferrous metals
- To give insight into advanced materials such as polymers, ceramics and composites and their applications.
- To provide knowledge on mechanical properties of materials and strengthening mechanisms

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Examine various phases of metals and alloys using phase diagrams.	U	3			2									2	2		
<b>CO-2:</b>	Apply the heat treatment process for the metals to improve the properties of materials.	AP	3	2	3	2									2	2		
<b>CO-3:</b>	Compare different types of steels and cast irons in terms of their microstructures, mechanical properties, and applications.	U	3	2	3	2									2	2		
<b>CO-4:</b>	Apply the gained understanding of non-metallic materials to select appropriate materials for specific engineering applications	AP	3	2	3	2									2	2		
<b>CO-5:</b>	Analyze fracture mechanisms and failure modes in materials subjected to different loading conditions.	AN	3	2	3	2									2	2		

**Unit-1 ALLOYS AND PHASE DIAGRAMS**

**9 Periods**

Constitution of alloys - Solid solutions, substitutional and interstitial - phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron - carbon equilibrium diagram. Diffusion: Introduction – Fick's Law of Diffusion - Diffusion Mechanisms, Steady state and non-steady state diffusion

**Unit-2 HEAT TREATMENT**

**9 Periods**

Definition - Full annealing, stress relief, recrystallisation and spheroidising - normalising, hardening and Tempering of steel. Isothermal transformation diagrams - cooling curves superimposed I.T. diagram CCR - Hardenability, Jominy end quench test - Austempering, martempering - case hardening, carburizing, Nitriding, cyaniding, carbonitriding - Flame and Induction hardening - Vacuum and Plasma hardening-Types of Furnaces used for Heat treatment and its Applications Merits and demerits.

**Unit-3 FERROUS AND NON-FERROUS METALS**

**9 Periods**

Effect of alloying additions on steel-  $\alpha$  and  $\beta$  stabilisers- stainless and tool steels - HSLA, Maraging steels - Cast Iron - Grey, white, malleable, spheroidal - alloy cast irons, Copper and copper alloys Brass, Bronze and Cupronickel - Aluminium and Al-Cu - precipitation strengthening treatment - Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

<b>Unit-4</b>	<b>NON-METALLIC MATERIALS</b>	<b>9 Periods</b>
Polymers - types of polymer, commodity and engineering polymers - Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers - Urea and Phenol formaldehydes)- Engineering Ceramics - Properties and applications of Al <sub>2</sub> O <sub>3</sub> , SiC, Si <sub>3</sub> N <sub>4</sub> , PSZ and SIALON -Composites- Classifications- Metal Matrix and FRP - Applications of Composites		
<b>Unit-5</b>	<b>MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS</b>	<b>9 Periods</b>
Mechanisms of plastic deformation, slip and twinning - Types of fracture - Testing of materials under tension, compression and shear loads - Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test- izod and charpy, fatigue and creep failure mechanisms- ASTM/ISO Standards for Material testing- Introduction to Metallography		
<b>Total</b>		<b>45 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill Education; 2nd edition July 2017. 2. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian Edition 2014. 3. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd., 2015.	1. U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012 2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 2010. 3. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd., New Delhi, 2006.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

<b>Course Code</b>	24ME202	<b>Course Name</b>	ENGINEERING MECHANICS	<b>Course Category</b>	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechanical Engineering		<b>Data Book/Codes/Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is:***

- To Learn the use scalar and vector analytical techniques for analyzing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Illustrate vector and scalar representations of forces and moments, and their applications in mechanics.	AP	3	2	2	2									2			
<b>CO-2:</b>	Analyze equilibrium conditions of rigid bodies under applied forces and moments.	AN	3	2	2	2									2			
<b>CO-3:</b>	Evaluate the properties of distributed forces in symmetrical and unsymmetrical shapes	AN	3	2	2	2									2			
<b>CO-4:</b>	Determine the friction and the effects by the laws of friction	AN	3	2	2	2									2			
<b>CO-5:</b>	Calculate dynamic forces exerted in rigid body	AP	3	2	2	2									2			

**Unit-1 STATICS OF PARTICLES**

**9 Periods**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

**Unit-2 EQUILIBRIUM OF RIGID BODIES**

**9 Periods**

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections

**Unit-3 DISTRIBUTED FORCES**

**9 Periods**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

**Unit-4 FRICTION**

**9 Periods**

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction

<b>Unit-5</b>	<b>DYNAMICS OF PARTICLES</b>	<b>9 Periods</b>
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.		
		<b>Total 45 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 12th Edition, Tata McGraw-Hill Publishing company, 2019. 2. Vela Murali, "Engineering Mechanics", Oxford University Press 2018. 3. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2018.	1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 2017. 2. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010. 3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics - Statics and Dynamics", 4th Edition, Pearson Education 2006. 4. Meriam J.L. and Kraige L.G., "Engineering Mechanics - Statics" - John Wiley&Sons,2017.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

<b>Course Code</b>	24GE101	<b>Course Name</b>	PROBLEM SOLVING USING PYTHON PROGRAMMING	<b>Course Category</b>	TP	Engineering Science Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Computer Science and Engineering		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- Understand the basics of algorithmic problem solving.
- Learn to solve problems using Python conditionals and loops
- Define Python functions and use function calls to solve problems
- Use Python data structures – lists, tuples, and dictionaries to represent complex data.
- Perform input/output operations with files in Python

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Develop algorithmic solutions to simple computational problems	AP	3	2	2	2	3											
<b>CO-2:</b>	Develop and execute simple Python programs	AP	3	2	2	2	3											
<b>CO-3:</b>	Develop Python programs using conditionals and loops for solving problems and decompose a Python program into functions.	AN	3	2	2	2	3											
<b>CO-4:</b>	Represent compound data using Python lists, tuples, dictionaries etc.	AP	3	2	2	2	3											
<b>CO-5:</b>	Read and write data from/to files in Python programs	AP	3	2	2	2	3											

**Unit-1 COMPUTATIONAL THINKING AND PROBLEM SOLVING**

**9 Periods**

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

**Unit-2 DATA TYPES, EXPRESSIONS, STATEMENTS**

**9 Periods**

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments.

**Unit-3 CONTROL FLOW, FUNCTIONS, STRINGS**

**9 Periods**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

**Unit-4 LISTS, TUPLES, DICTIONARIES**

**9 Periods**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

**Unit-5 FILES, MODULES, PACKAGES**

**9 Periods**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages;

**Total Theory: 45 Periods**

<b>Suggested List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.</li> <li>2. Python programming using simple statements and expressions.</li> <li>3. Scientific problems using Conditionals and Iterative loops.</li> <li>4. Implementing real-time/technical applications using Lists, Tuples.</li> <li>5. Implementing real-time/technical applications using Dictionaries.</li> <li>6. Implementing programs using Functions.</li> <li>7. Implementing programs using Strings.</li> <li>8. Implementing programs using written modules and Python Standard Libraries</li> <li>9. Implementing real-time/technical applications using File handling.</li> <li>10. Implementing real-time/technical applications using Exception handling.</li> <li>11. Exploring Pygame tool.</li> <li>12. Developing a game activity using Pygame.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.</li> <li>2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning &amp; Development Limited, 2017</li> </ol>	<ol style="list-style-type: none"> <li>1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.</li> <li>2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.</li> <li>3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021</li> <li>4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.</li> <li>5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

<b>Course Code</b>	24GE202	<b>Course Name</b>	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	<b>Course Category</b>	T	Humanities, Social Science and Management Courses	L	T	P	C
							1	0	0	1

<b>Pre-requisite Courses</b>	NIL	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Science and Humanities		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: The purpose of learning this course is to:**

- Provide a comprehensive understanding of the weaving industry and ceramic technology during the Sangam Age, with a particular focus on Black and Red Ware (BRW) Potteries and the graffiti found on these artifacts.
- Students will gain insight into the cultural, technological, and socio-political contexts that shaped temple constructions..
- Study of the iron and steel industries, coin minting, and bead making, alongside archaeological evidence and literary references Silappathikaram.
- Understand the ancient agricultural practices and irrigation technologies, focusing on various water management systems, animal husbandry, and agro-processing. It also explores ancient knowledge of the sea, including fisheries, pearl and conch diving, and oceanic knowledge.
- Learn the knowledge and skills to engage with modern technologies for the preservation and advancement of the Tamil language.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Understand the technological and cultural developments of the Sangam Age, particularly in the areas of weaving and ceramics	U																
<b>CO-2:</b>	Appreciate the cultural and technological advancements reflected in the structural designs and materials used.	U																
<b>CO-3:</b>	Understand the technological and industrial advancements in ancient societies, particularly in the areas of metallurgy, shipbuilding, coin minting, and bead making.	U																
<b>CO-4:</b>	Gain the knowledge about the agricultural and irrigation technologies of ancient societies, as well as their maritime knowledge and practices,	U																
<b>CO-5:</b>	Understand the development and application of Scientific Tamil and Tamil computing.	U																

<b>Unit-1 நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் / WEAVING AND CERAMIC TECHNOLOGY</b>	<b>3 Periods</b>
சங்க காலத்தில் நெசவுத் தொழில் - பீங்கான் தொழில்நுட்பம் - கருப்பு மற்றும் சிவப்பு பாத்திரங்கள் (BRW) - மட்பாண்டங்கள் மீது கீறல் குறியீடுகள். Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	
<b>Unit-2 வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம்/ DESIGN AND CONSTRUCTION TECHNOLOGY</b>	<b>3 Periods</b>
சங்க காலத்தில் வீடு வடிவமைத்தல், கட்டுமானம் மற்றும் வீட்டு உபயோகப் பொருட்களின் வடிவமைப்புகள் - சங்க காலத்தில்கட்டுமானப் பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை பற்றிய பற்றிய விவரங்கள்-மாமல்லபுரத்தின் சிற்பங்கள் மற்றும் கோவில்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் -நாயக்கர் கால கோவில்கள் -மாதிரி கட்டமைப்புகள் பற்றி அறிதல்-	

<p>மதுரை மீனாட்சி கோயில்- திருமலை நாயக்கர் மஹால் - செட்டி நாடு வீடுகள், இந்தோ - பிரிட்டிஷ் காலத்தில் மதராஸில் உள்ள சரசனிக் கட்டிடக்கலை.</p> <p>Designing and Structural construction House &amp; 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.</p>	
<b>Unit-3</b>	<b>உற்பத்தி தொழில்நுட்பம் /MANUFACTURING TECHNOLOGY</b>
<b>3 Periods</b>	
<p>கப்பல் கட்டும் கலை - உலோகவியல் ஆய்வுகள் - இரும்புத் தொழில் - இரும்பு உருக்குதல், எஃகு - தாமிரம் மற்றும் தங்கம் - வரலாற்றின் ஆதாரமாக நாணயங்கள் - நாணயங்கள் - மணிகள் செய்யும் தொழில்கள் கல் மணிகள் - கண்ணாடி மணிகள் - டெரகோட்டா மணிகள் - ஷெல் மணிகள் / எலும்பு துடிப்புகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் விவரிக்கப்பட்டுள்ள ரத்தினக் கற்கள்.</p> <p>Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.</p>	
<b>Unit-4</b>	<b>வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்/AGRICULTURE AND IRRIGATION TECHNOLOGY</b>
<b>3 Periods</b>	
<p>அணை, ஏரி, குளங்கள், மதகு-சோழர் கால குமிழித் தூம்பு முக்கியத்துவம், கால்நடை பராமரிப்பு - கால்நடை பயன்பாட்டுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் அறிவு - மீன்வளம் - முத்து - முத்துக்குளித்தல் - கடல் பற்றிய பண்டைய அறிவு - அறிவு சார்ந்த சமூகம்.</p> <p>Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoombu 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.</p>	
<b>Unit-5</b>	<b>அறிவியல் தமிழ் &amp; கணினித்தமிழ்/ SCIENTIFIC TAMIL &amp; TAMIL COMPUTING</b>
<b>3 Periods</b>	
<p>அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி- தமிழ் நூல்கள் மின்பதிப்பு செய்தல்- தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணைய தமிழ் அகராதி - சொற்குவைத்திட்டம்.</p> <p>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.</p>	
<b>Total: 15 Periods</b>	

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

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b><i>Average of Internal Test (20%)</i></b>	<b><i>Critical Thinking Assessment (20%)</i></b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

Course Code	24MC201	Course Name	ENVIRONMENTAL SCIENCE	Course Category	T	Mandatory Course	L	T	P	C
							2	0	0	0

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Science and Humanities		Data Book / Codes / Standards	NIL	

**Course Objective: *The purpose of learning this course is :***

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of the global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human rights, value education and role of technology in monitoring human and environmental issues.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand the functions of the environment, ecosystems and biodiversity and their conservation.	U						3	3					2			
<b>CO-2:</b>	Analyze the causes and effects of environmental pollution and contribute to the preventive measures in the immediate society.	AN						3	3	1							
<b>CO-3:</b>	Identify various natural resources and their contribution to mankind and apply sustainable measures to preserve them for future generations.	AP						3	3		2			2			
<b>CO-4:</b>	Identify the various sustainable measures for environmental protection against climatic changes and apply them for sustainable and societal development.	AP	3		2			3	3								
<b>CO-5:</b>	Demonstrate the knowledge of environmental issues and analyse the effect of population dynamics and role of technology in environmental issues.	U						3	3	2			2				

**Unit-1 ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**

**6 Periods**

Definition, scope and importance of environment -concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem– Introduction to biodiversity definition: genetic, species and ecosystem diversity –value of biodiversity-hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

**Unit-2 ENVIRONMENTAL POLLUTION**

**6 Periods**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies.

<b>Unit-3 NATURAL RESOURCES</b>	<b>6 Periods</b>
Forest resources: Use and over-exploitation, deforestation, Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.	
<b>Unit-4 SOCIAL ISSUES AND THE ENVIRONMENT</b>	<b>6 Periods</b>
From unsustainable to sustainable development, rain water harvesting, Environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products.	
<b>Unit-5 HUMAN POPULATION AND THE ENVIRONMENT</b>	<b>6 Periods</b>
Population growth, variation among nations – population explosion – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.	
<b>Total: 30 Periods</b>	

Learning Resources	Text Books	References
	1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers (2018). 2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2016). 3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).	1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001. 3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007. 4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005). 5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013).

Learning Assessment		
Continuous Learning Assessment (CLA) (100% weightage)		End Semester Examination (0% weightage)
Average of Internal Test (50%)	Critical Thinking Assessment (50%)	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

# Semester III

<b>Course Code</b>	24HS301	<b>Course Name</b>	UNIVERSAL HUMAN VALUES	<b>Course Category</b>	T	Humanities, Social Sciences and Management Courses	L	T	P	C
							2	0	0	2

<b>Pre-requisite Courses</b>	Nil	<b>Co-requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil
<b>Course Offering Department</b>	Science & Humanities (First year)		<b>Data Book / Codes / Standards</b>	Nil	

**Course Objective: *The purpose of learning this course is to:***

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

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>		
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO-1:</b>	Become more aware of themselves, and their surroundings (family, society, nature)	U						1	1	1	3			3			
<b>CO-2:</b>	Have more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	U						1	1	1	3			3			
<b>CO-3:</b>	Have better critical ability.	AN						3	3	2	3		1	3			
<b>CO-4:</b>	Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	U						3	3	2	3		1	3			
<b>CO-5:</b>	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	U						3	3	2	3		2	3			

**Unit-1 INTRODUCTION**

**6 Periods**

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self- Exploration– Its content and process; „Natural acceptance“ and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Practical Session: Include sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

**Unit-2 HARMONY IN THE HUMAN BEING**

**6 Periods**

Understanding human being as a co-existence of the sentient „I“ and the material „Body“, Understanding the needs of Self („I“) and „Body“ - happiness and physical facility, Understanding the Body as an instrument of „I“ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of „I“ and harmony in „I“, Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. Practical Session: Include sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

<b>Unit-3 HARMONY IN THE FAMILY AND SOCIETY</b>	<b>6 Periods</b>
Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co- existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Practical Session: Include sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students" lives	
<b>Unit-4 HARMONY IN THE NATURE AND EXISTENCE</b>	<b>6 Periods</b>
Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co- existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence. Practical Session: Include sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.	
<b>Unit-5 IMPLICATIONS OF HARMONY ON PROFESSIONAL ETHICS</b>	<b>6 Periods</b>
Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up. Practical Session: Include Exercises and Case Studies will be taken up in Sessions E.g. To discuss the conduct as an engineer or scientist etc.	
<b>Total: 30 Periods</b>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 3rd revised edition, 2023.</li> <li>2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.</li> <li>3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.</li> <li>4. The Story of Stuff (Book).</li> <li>5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi</li> <li>6. Small is Beautiful - E. F Schumacher.</li> <li>7. Slow is Beautiful - Cecile Andrews.</li> <li>8. Economy of Permanence - J C Kumarappa</li> <li>9. Bharat Mein Angreji Raj - PanditSunderlal</li> <li>10. Rediscovering India - by Dharampal</li> <li>11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi</li> <li>12. India Wins Freedom - Maulana Abdul Kalam Azad</li> <li>13. Vivekananda - Romain Rolland (English)</li> </ol>	<ol style="list-style-type: none"> <li>1. Class preparations: <a href="https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php">https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php</a></li> <li>2. Lecture presentations: <a href="https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php">https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php</a></li> <li>3. Practice and Tutorial Sessions: <a href="https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php">https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php</a></li> </ol>

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<b>Average of Internal Test (0%)</b>	<b>Critical Thinking Assessment (100%)</b>	

<b>Course Code</b>	24MA301	<b>Course Name</b>	STATISTICS AND NUMERICAL METHODS	<b>Course Category</b>	T	Basic Science Courses	L	T	P	C
							3	1	0	4

<b>Pre-requisite Courses</b>	Mathematics knowledge in Higher secondary level	<b>Co-requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil
<b>Course Offering Department</b>	Mechanical Engineering	<b>Data Book / Codes / Standards</b>	Statistical Table		

**Course Objective: *The purpose of learning this course is to:***

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquire the knowledge of testing hypotheses for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Apply the concept of testing of hypothesis for small and large samples in real life problems.	AP	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
<b>CO-2:</b>	Apply the basic concepts of classifications of design of experiments in the field of agriculture.	AP	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
<b>CO-3:</b>	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	AN	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
<b>CO-4:</b>	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	U	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
<b>CO-5:</b>	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	E	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-

**Unit-1 TESTING OF HYPOTHESIS**

**9+3 Periods**

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

**Unit-2 DESIGN OF EXPERIMENTS**

**9+3 Periods**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – 22 factorial design.

**Unit-3 SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**

**9+3 Periods**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

**Unit-4 INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3 Periods**

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

**Unit-5 NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3 Periods**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

**Total 60 Periods**

Learning Resources	Text Book	Reference
		1.Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015. 2.Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015. 44.

Learning Assessment				
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (40% weightage)		End Semester Examination (60% weightage)
		<i>CLA-1 Average of Internal Test (20%)</i>	<i>Critical Thinking Assessment (20%)</i>	
		<b>Theory</b>	<b>Theory</b>	<b>Theory</b>
Level 1	Remember	15%	15%	15%
Level 2	Understand	25%	20%	25%
Level 3	Apply	30%	25%	30%
Level 4	Analyze	30%	25%	30%
Level 5	Evaluate	-	10%	-
Level 6	Create	-	5%	-
	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Course Designers**

<p><b>Experts from Industry</b></p>	<p><b>Experts from Higher Technical Institutions</b> <b>Dr.D.Yokesh,</b> <i>Assistant Professor/ Mathematics,</i> Department of Science and Humanities, <i>Anand Institute of Heigher Technology,</i> Kalasalingam Nagar, Old Mahablipuram Road,Kazhipattur, Chennai-603103.</p>	<p><b>Internal Experts</b> <b>1. Dr.A.SWAMINATHAN,</b> <i>Assistant Professor/Mathematics,</i> <i>Department of Science and Humanities,</i> <i>Agni College of Technology,</i> <i>Thalambur, Chennai-126.</i> <b>2. Dr.Sivakama Sundari,</b> Assistant Professor/Mathematics, Department of Science and Humanities, Agni College of Technology, Thalambur, Chennai-126.</p>
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<b>Course Code</b>	24MH301	<b>Course Name</b>	FLUID MECHANICS AND THERMAL SYSTEMS	<b>Course Category</b>	T	Engineering Science Courses	L	T	P	C
							3	1	0	4

<b>Pre-requisite Courses</b>	Engineering Mechanics, Engineering Physics	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To knowledge in Fluid Properties and Statics
- To understand the concept of fluid kinematics and Dynamics.
- To learn about the flows in fluid, Viscous flows and flow through pipes
- To understand the basics laws of thermodynamics
- To understand the second law of thermodynamics and entropy

														Program Outcomes (PO)				Program Specific Outcome (PSO)												
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>														BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Recognize and Understand the Fluid properties and Fluid statics													U	3	3	1											3	2	1
<b>CO-2:</b>	Interpret the problems related to Kinematics and Dynamics of fluid flow.													AP	3	3	1	1								1		3	2	1
<b>CO-3:</b>	Analyze the viscous flow and estimate the energy losses in flow through pipes.													AP	3	3	2	1	2							1		3	2	1
<b>CO-4:</b>	Recognize the basics of thermodynamics and analyze the first law of thermodynamics and its applications.													AP	3	3	2	2	1							1		3	2	1
<b>CO-5:</b>	Apply the second law of thermodynamics, entropy principle and solve the problems related to thermal systems.													AP	3	3	2	2	1							1		3	2	1

**Unit-1 FLUID PROPERTIES AND FLUID STATICS**

**12 Periods**

Fluid Definition and Classification – Properties of fluids: Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Bulk Modulus, Capillary and Surface Tension – Fluid statics: Concept of fluid static pressure – Pascal 's law –Absolute and Gauge pressures – Manometers: Types and Pressure measurement – Concept of Buoyancy and Floatation.

**Unit-2 FLUID KINEMATICS AND FLUID DYNAMICS**

**12 Periods**

Fluid Kinematics: Types of fluid flow – Continuity equation in two and three dimensions – Velocity and Acceleration of fluid particle. Fluid dynamics: Euler's equation along a streamline –Bernoulli's equation and applications – Venturi meter, Orifice meter and Pitot tube.

**Unit-3 VISCIOUS FLOW, FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS**

**12 Periods**

Viscous flow: Shear stress, pressure gradient relationship – Flow of viscous fluid through circular pipe – Flow through pipes: Loss of head due to friction – Minor head losses – Flow through pipes in series and in parallel – Power transmission through pipes. Dimensional analysis: Buckingham's theorem.

**Unit-4 BASICS OF THERMODYNAMICS AND FIRST LAW OF THERMODYNAMICS**

**12 Periods**

Thermodynamics – Microscopic and macroscopic point of view – Systems, properties, process, path, cycle. Thermodynamic equilibrium – Zeroth law of Thermodynamics – internal energy, enthalpy, specific heat capacities CV and CP, Relationship between CV and CP. First law of Thermodynamics – Application to closed and open systems – Steady Flow Energy Equation (SFEE) – Simple problems.

<b>Unit-5</b>	<b>SECOND LAW OF THERMODYNAMICS AND ENTROPY</b>	<b>12 Periods</b>
Second Law of thermodynamics – Kelvin Planck and Clausius Statements – Equivalents of Kelvin Planck and Clausius statements. Reversibility – Irreversibility, reversible cycle – Heat engine, heat pump and refrigerator. Carnot cycle and Clausius theorem, the property of entropy, the inequality of Clausius – Entropy principle – General expression for entropy – Simple problems in entropy – Third law of thermodynamics.		
		<b>Total: 60 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	<ol style="list-style-type: none"> <li>1. Yunus A. Cengel and John M. Cimbala., - Fluid Mechanics, 4<sup>th</sup> Edition, McGraw Hill Higher Education, 2019 ISBN: 9781264858422, 1264858426.</li> <li>2. Bansal R.K., Fluid Mechanics and Hydraulic Machines, 11<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2024 ISBN: 9788131808153, 8131808153.</li> <li>3. R.K. Rajput., Engineering Thermodynamics, 5<sup>th</sup> edition Laxmi Publications, New Delhi, 2015 ISBN: 9788131800584.</li> </ol>	<ol style="list-style-type: none"> <li>1. Cengel Yunus A. and Boles Michael A., Thermodynamics: An Engineering Approach, 10<sup>th</sup> Edition, McGraw-Hill Education, 2023. ISBN: 978-1266152115.</li> <li>2. Frank M. White, Henry Xue., Fluid Mechanics, 9<sup>th</sup> Edition, McGraw Hill India 2022. ISBN: 9789355322043.</li> <li>3. Nag P.K., Engineering Thermodynamics, 6<sup>th</sup> Edition, McGraw Hill India 2017. ISBN: 9352606426, 9789352606429.</li> </ol>

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	<b>End Semester Examination (60% weightage)</b>
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

<b>Course Code</b>	24MH302	<b>Course Name</b>	DIGITAL ELECTRONICS AND MICROPROCESSOR	<b>Course Category</b>	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>	Basic Electrical and Electronics Engineering	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic gate

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	State the fundamental operating concepts behind digital logic circuits and microprocessors.	U	3	3	1									1	3	2	2
<b>CO-2:</b>	Recognize the use of various digital logic circuits and sub units in microprocessors.	U	3	3	1									1	3	2	2
<b>CO-3:</b>	Summarize the digital logic circuits and the architectures of microprocessors	U	3	3	1									1	3	2	2
<b>CO-4:</b>	Design the DLC and Microprocessor for the stated applications.	AP	3	3	3	2	2						2	1	3	2	2
<b>CO-5:</b>	Develop the circuits using DLC and Microprocessor for given applications	AP	3	3	3	2	2						2	1	3	2	2

**Unit-1 DIGITAL FUNDAMENTALS**

**9 Periods**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Min terms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

**Unit-2 COMBINATIONAL & SYNCHRONOUS SEQUENTIAL CIRCUITS**

**9 Periods**

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder -Multiplexer, Demultiplexer, Decoder, Priority Encoder. Flip flops – SR, JK, T, D, design of clocked sequential circuits – Design of Counters- Shift registers, Universal Shift Register.

**Unit-3 ASYNCHRONOUS SEQUENTIAL CIRCUITS AND MEMORY DEVICES**

**9 Periods**

Stable and Unstable states, output specifications, cycles and races, Pulse mode sequential circuits, Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA).

**Unit-4 8085 PROCESSOR**

**9 Periods**

Hardware Architecture, pin diagram – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

**Unit-5 PROGRAMMING PROCESSOR**

**9 Periods**

Instruction - format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions – stack -8255 architecture and operating modes – Interfacing stepper motor – ADC-Traffic light Controller.

**Total Theory: 45 Periods**

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
1. Verify the logic gates. 2. Verify the truth table of multiplexer and demultiplexer 3. Construct the half adder and full adder using logic gates and verify its truth table. 4. Simple arithmetic operations addition/subtraction/multiplication/division using 8085 5. Program for Ascending and descending order, Maximum and Minimum number using 8085. 6. Interface the A/D converter using 8085. 7. Interface the traffic light controller using 8085. 8. Programming practices with Simulator /Emulator/Open source.	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 6th Edition, Pearson, 2018, ISBN: 9789353062019. 2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013, ISBN: 8187972092.	1. Charles Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013, ISBN: 9780495667766. 2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011, ISBN: 813173448X. 3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R. D. Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003, ISBN: 817808574574-7. 4. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007, ISBN: 9788120348530. 5. N.K. Karthik, 8085 Microprocessor: Programming and Interface, 2005, ISBN: 9788120327856.

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

<b>Course Code</b>	24MH303	<b>Course Name</b>	ELECTRICAL DRIVES AND ACTUATORS	<b>Course Category</b>	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>	Basic Electrical and Electronics Engineering	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To familiarize a relay and power semiconductor devices
- To get a knowledge on drive characteristics
- To obtain the knowledge on DC motors and drives
- To obtain the knowledge on AC motors and drives
- To obtain the knowledge on Stepper and Servo motor

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Recognize the principles and working of relays, drives and motors	U	3	3	2	2	1						1	2	3	2	2
<b>CO-2:</b>	Explain the working and characteristics of various drives and motors	U	3	3	2									2	3	2	2
<b>CO-3:</b>	Apply the solid-state switching circuits to operate various types of Motors and Drivers	AP	3	3	1	2	1						1	2	3	2	2
<b>CO-4:</b>	Interpret the performance of Motors and Drives	AP	3	3	1	2	1						1	2	3	2	2
<b>CO-5:</b>	Select the Motors and Drivers for given applications.	AP	3	3	2	2	1						2	2	3	2	2

**Unit-1 RELAY AND POWER SEMI-CONDUCTOR DEVICES 9 Periods**

Study of Switching Devices – Relay and Types, Switching characteristics -BJT, SCR, TRIAC, GTO, MOSFET, IGBT and IGCT-: SCR, MOSFET and IGBT - Triggering and commutation circuit - Introduction to Driver and snubber circuits

**Unit-2 DRIVE CHARACTERISTICS 9 Periods**

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, torque, and Direction starting & stopping – Selection of motor.

**Unit-3 DC MOTORS AND DRIVES 9 Periods**

DC Servomotor - Types of PMDC & BLDC motors - principle of operation- emf and torque equations - characteristics and control – Drives- H bridge - Single and Three Phases – 4 quadrant operation – Applications

**Unit-4 AC MOTORS AND DRIVES 9 Periods**

Introduction – Induction motor drives – Speed control of 3-phase induction motor – Stator voltage control – Stator frequency control – Stator voltage and frequency control – Stator current control – Static rotor resistance control – Slip power recovery control.

**Unit-5 STEPPER AND SERVO MOTOR 9 Periods**

Stepper Motor: Classifications- Construction and Principle of Operation – Modes of Excitation Drive System-Logic Sequencer - Applications. Servo Mechanism – DC Servo motor - AC Servo motor – Applications.

**Total Theory: 45 Periods**

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
1. Load test on DC Shunt Motor 2. Load test on 3 Phase squirrel cage Induction Motor 3. Rheostat based Speed control of DC motors 4. Switching circuits of MOSFET, IGBT, SCR and TRAIC 5. Position and direction control DC servomotor 6. Position, Direction and speed control of stepper Motor 7. AC servomotor position, direction and speed control using Power Electronic Drive.	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	1. Muhammad H. Rashid "Power Electronics: Devices, Circuits, and Applications", 4th Pearson Education Edition, 2017, ISBN: 97 8-8120345317. 2. Vedam Subrahmanyam "Electric Drives: Concept and Application" McGraw Hill Education, 2nd Edition 2017, ISBN: 978-0070701991.	1. Gopal K. Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosal Publishing House, New Delhi, 2022, ISBN: 978-81-7319-428-3. 2. Theraja B.L., " Fundamentals of Electrical Engineering and Electronics", 2nd Edition, S.Chand & Co. Ltd., New Delhi, 2022, ISBN: 978-9355010599. 3. P. S. Bimbhra, "Power Electronics" Seventh Revised Edition Khanna Publishers-Delhi, 2022, E-ISBN: 978-81-95123-12-4. 4. Singh M.D. & Kanchandhani K.B., "Power Electronics", McGraw Hill, 2017, ISBN: 978-0070583894. 5. Simy Joy, Payal Anand, Priya Nair Rajeev "Electric Motor Drives" First Edition, Pearson Education, 2015, ISBN: 9789332549715.

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%				

Course Code	24MH304	Course Name	MECHANICS OF MATERIALS	Course Category	T	Engineering Science Courses	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Engineering Physics, Engineering Mechanics	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Mechatronics Engineering		Data Book / Codes / Standards	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To develop the understanding of the principle concepts of stress, strain and deformation of solids for various engineering applications.
- To analyze plane stress conditions and apply Mohr's circle for stress evaluation in engineering structures.
- To analyse the flexural and shear stresses induced in beams due to different loading conditions
- To analyse the effect of torsion on shafts and buckling.
- To examine the stresses induced in thin and thick shells.

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand stress, strain, and deformation in solids for various engineering applications.	U	3	3	3	3	2					1	2	2	3	2	2
<b>CO-2:</b>	Apply plane stress analysis and Mohr's circle for stress evaluation in structures.	AP	3	3	3	3	2						2	2	3	2	2
<b>CO-3:</b>	Compute shear forces, bending moments, and flexural stresses in beams under different loading conditions.	AP	3	3	3	3	2					1	2	2	3	2	2
<b>CO-4:</b>	Determine the effect of torsion on shafts and determine buckling loads for columns with various support conditions.	AP	3	3	3	3	2					1	2	2	3	2	2
<b>CO-5:</b>	Analyze stresses in thin and thick-walled cylinders and failure theories.	AN	3	3	3	3	2						2	2	3	2	2

**Unit-1 STRESS AND STRAIN**

**9 Periods**

Introduction, Hooke's law, Calculation of stresses in straight, Stepped and tapered sections, Composite sections, stresses due to temperature change, Shear stress and strain, Lateral strain and Poisson's ratio, Bulk modulus, Relationship between elastic constants.

**Unit-2 ANALYSIS OF STRESS AND STRAIN**

**9 Periods**

Plane stress, Stresses on inclined planes, Principal stresses and maximum shear stress, Principal angles, Shear stresses on principal planes, Maximum shear stress. Mohr circle for plane stress conditions.

**Unit-3 SHEAR FORCES AND BENDING MOMENTS**

**9 Periods**

Type of beams, Loads and reactions, Relationship between loads, shear forces and bending moments, Shear force and bending moments of cantilever beams, Pin support and roller supported beams subjected to concentrated loads and uniformly distributed constant / varying loads.

**Stress in Beams:** Pure bending, Curvature of a beam, Longitudinal strains in beams, Normal stresses in Beams with rectangular, circular, 'I' and 'T' cross sections, Flexure Formula, Bending Stresses, Deflection of beams (Curvature).

**Unit-4 TORSION AND BUCKLING**

**9 Periods**

Circular solid and hollow shafts, Torsional moment of resistance, Power transmission of straight and stepped shafts, Twist in shaft sections

**Columns:** Buckling and stability, Critical load, Columns with pinned ends, Columns with other support conditions, Effective length of columns, Secant formula for columns.

<b>Unit-5</b>	<b>THEORIES OF FAILURE, THIN &amp; THICK SHELLS</b>	<b>9 Periods</b>
<b>Theories of Failure:</b> Maximum Principal stress theory, Maximum shear stress theory.		
<b>Cylinders:</b> Thin cylinder: Hoop's stress, maximum shear stress, circumferential and longitudinal strains, Thick cylinders: Lames equations.		
		<b>Total: 45 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	<ol style="list-style-type: none"> <li>Hibbeler, R.C., Mechanics of Materials, Pearson Education, 10th Edition, Tenth edition, 2022, ISBN: 978-9354492259, 9354492258.</li> <li>Rajput, R.K., Strength of Materials, S Chand and Company Ltd., New Delhi, Seventh edition, 2022, ISBN: 9789385401367, 9789355010704.</li> </ol>	<ol style="list-style-type: none"> <li>Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2018, Sixth Edition, ISBN: 978-8131808146, 9788131808146.</li> <li>Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2015, Second edition, ISBN: 9332550212, 978-9332550216.</li> <li>Ferdinand P. Beer, Russell Johnson, Jr. and John J. Dewole Mechanics of Materials, Seventh Edition, Tata McGraw Hill publishing co. Ltd., New Delhi, 2016, ISBN: 978-0073398167, 0073398160.</li> <li>Subramanian R., Strength of Materials, Oxford University Press, Oxford Higher Education Series, 2010, Second Edition, ISBN: 978-0198061106, 0198061102.</li> </ol>

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
* The expected levels for Bloom's Taxonomy should be: - Lower-order thinking skills: not more than 40% - Higher-order thinking skills: not less than 60%		

<b>Course Code</b>	24SD311	<b>Course Name</b>	APTITUDE AND CODING SKILLS -1	<b>Course Category</b>	P	Employability Enhancement Courses	L	T	P	C
							0	0	2	1

<b>Pre-requisite Courses</b>	Nil	<b>Co-requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil	
<b>Course Offering Department</b>	Computer Science and Engineering (Common to all Branches)		<b>Data Book / Codes / Standards</b>	Nil		

**Course Objective: *The purpose of learning this course is to:***

- Provide logical reasoning abilities through scenario-based problems
- Enhance problem solving skills related to divisibility decimal fractions, profit, loss and compound interest
- Augment fundamentals related to probabilities, number system, ages, speed, time and distance
- Supplement the foundational coding concepts
- Develop the C-programming skills in searching and sorting problems

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Apply their logical reasoning and analytical abilities to solve scenario-based problems, namely deductive reasoning, objective reasoning, inductive reasoning and abductive reasoning.	AP																
<b>CO-2:</b>	Solve problems related to divisibility decimal fractions, profit, loss and compound interest	AP																
<b>CO-3:</b>	Apply quantitative reasoning ability to solve problems in logarithms, permutation, combinations, number system, ages, speed, time and distance	AP																
<b>CO-4:</b>	Code for simple programming examples using foundational concepts	AP																
<b>CO-5:</b>	Design and develop algorithm, pseudo code and codes for searching and sorting problems	AN																

**List of Exercises**

**30 Periods**

**1. Logical Reasoning**

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

**2. Quantitative Aptitude – Foundational Problems**

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest

**3. Quantitative Aptitude – Moderate Problems**

Engineering Mathematics: Logarithms, Permutation and Combinations, Probability, Number system, percentage

**4. Programming – Foundational Concepts**

Data Types/Operators, Managing input& output/if else statement, Logical, Unary, ternary operators/Constants MACROS /goto, continue statements, Loops(for/while/do while), switch break

<b>Course Code</b>	24EL311	<b>Course Name</b>	INNOVATION AND PRODUCT DEVELOPMENT-1 (IDEA GENERATION)	<b>Course Category</b>	P	Employability Enhancement Courses						L	T	P	C					
												0	0	2	1					
<b>Pre-requisite Courses</b>	Nil		<b>Co-requisite Courses</b>	Nil		<b>Progressive Courses</b>	24EL411													
<b>Course Offering Department</b>				<b>Data Book/Codes/Standards</b>	Nil															
<b>Course Objective: <i>The purpose of learning this course is:</i></b>																				
<ul style="list-style-type: none"> <li>The students will understand the concepts of idea generation to develop the market driven product by generating, assessing, and refining creative ideas using structured brainstorming, feedback integration, and feasibility evaluation.</li> </ul>																				
												<b>Program Outcomes (PO)</b>				<b>Program Specific Outcome (PSO)</b>				
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>					<b>BL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO-1:</b>	Generate creative ideas to address specific problems through structured brainstorming sessions.				C	3	3	3	3		2			3			2			
<b>CO-2:</b>	Assess and refine initial ideas by integrating feedback and evaluating feasibility.				E	3	3	3	3		2			3			2			
<b>CO-3:</b>	Analyze problems and articulate solutions using the Problem Statement and Value Proposition Canvas.				AN	3	3	3	3		2			3			2			
<b>CO-4:</b>	Conduct SWOT analyses to evaluate strengths, weaknesses, opportunities and threats of their ideas, effectively assessing viability and potential impact.				AN	3	3	3	3		2			3			2			
<b>CO-5:</b>	Construct comprehensive documentation detailing key features, functionalities, and target audience of refined concepts.				U	3	3	3	3		2			3			2			
<b>List of Activity</b>																				
Team of three to five members preferably from a multi-disciplinary department initiates the innovative Product development journey by fostering creative idea generation and Strategic planning. They shall follow the below activities but not limited to;																				
<b>Week1-2:</b> Engage in brainstorming sessions with a focus on addressing specific problems or fulfilling particular needs.																				
<b>Week 3-4:</b> Iterate on the initial ideas by incorporating feedback and assessing their feasibility.																				
<b>Week 5-6:</b> Make the Problem Statement Canvas and the Value Proposition Canvas to articulate and refine the problem being addressed and the unique value proposition offered by the concept.																				
<b>Week 7-8:</b> Conduct the SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) of each idea to assess its viability and potential impact.																				
<b>Week 9-10:</b> Document the refined concept comprehensively, outlining its key features, functionalities, and target audience.																				
<b>Key Deliverables:</b> Problem Statement Canvas, Value Proposition Canvas and SWOT analysis reports.																				

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100 % weightage)</b>		
<b>Report 40%</b>	<b>Presentation 40%</b>	<b>Viva-Voce 20%</b>

# Semester IV

<b>Course Code</b>	24MH401	<b>Course Name</b>	SENSORS AND INSTRUMENTATION	<b>Course Category</b>	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>	Basic Electrical and Electronics Engineering	<b>Co- requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To understand the concepts of measurement technology
- To learn the various sensors used to measure various physical parameters
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development
- To learn about the optical, pressure and temperature sensor
- To understand the signal conditioning and DAQ systems

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Understand various calibration techniques and signal types used for sensors.	U	3	3	1										1	3	3	2
<b>CO-2:</b>	Explain the sensors used to measure various physical parameters.	U	3	3	1										1	3	3	2
<b>CO-3:</b>	Apply the various sensors and transducers in various applications	AP	3	3	2	2	1								1	3	3	2
<b>CO-4:</b>	Select the appropriate sensor for different applications	R	3	3	2	1	1								1	3	3	2
<b>CO-5:</b>	Implement effective signal conditioning, data acquisition and communication systems.	AP	3	3	2	2	1								1	3	3	2

**Unit-1 INTRODUCTION 9 Periods**

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors –Sensor calibration techniques – Sensor Output Signal Types.

**Unit-2 MOTION, PROXIMITY AND RANGING SENSORS 9 Periods**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

**Unit-3 FORCE, MAGNETIC AND HEADING SENSORS 8 Periods**

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

**Unit-4 OPTICAL, PRESSURE AND TEMPERATURE SENSORS 10 Periods**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

**Unit-5 SIGNAL CONDITIONING AND DAQ SYSTEMS 9 Periods**

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multichannel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

**Total Theory : 45 Periods**

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Determination of the characteristics of Pressure Sensor and Piezoelectric Force Sensor</li> <li>2. Determine the Characteristics of Various Temperature Sensors</li> <li>3. Determine the Characteristics of Various Light Detectors (Optical Sensors).</li> <li>4. Distance Measurement using Ultrasonic and Laser Sensor.</li> <li>5. Direction measurement using Magnetometer.</li> <li>6. Force measurement using multi-axis force sensors.</li> <li>7. Force Measurement using tactile sensors.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, Fifth Edition, 2017, ISBN: 9780070173354.</li> <li>2. Robert B. Northrop Introduction to Instrumentation and Measurements, 3rd Edition, CRC Press, 2017, ISBN: 9781138071902.</li> </ol>	<ol style="list-style-type: none"> <li>1. C. Sujatha ... Dyer, S.A., Survey of Instrumentation and Measurement, John Wiley &amp; Sons, Canada, 2004, ISBN: 978-0-471-22165-4.</li> <li>2. Hans Kurt Tönshoff (Editor), Ichiro, "Sensors in Manufacturing" Volume 1, Wiley-VCH, 2001, ISBN: 978-3527295586.</li> <li>3. Alan S. Morris, Reza Langari, Measurement and Instrumentation, Third Edition, 2020, ISBN: 9780128171417.</li> <li>4. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015, ISBN: 9781315215488.</li> <li>5. Baskar K, B, Kumaresan R, "Sensors and Transducers", ARS Publications, 2017, ISBN: 9789387255548.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

work

<b>Course Code</b>	24MH402	<b>Course Name</b>	EMBEDDED SYSTEMS AND PROGRAMMING	<b>Course Category</b>	TP	Professional Core Courses				L	T	P	C
										3	0	2	4

<b>Pre-requisite Courses</b>	Digital Electronics and Microprocessor	<b>Co- requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL	
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes Standards</b>	NIL		

**Course Objective: *The purpose of learning this course is to:***

- To familiarize the architecture and fundamental units of microcontroller.
- To know the microcontroller programming methodology and to acquire the interfacing skills and data exchange methods using various communication protocols.
- To design the interface circuit and programming of I/O devices, sensors and actuators.
- To understand ARM processor architecture and its functions
- to meet out the computational and interface needs of growing mechatronic systems.
- To familiarize the knowledge of real time embedded operating system for advanced system developments.

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>	
<b>CO-1:</b>	Understand the various functional units of microcontroller, processors and system-on-chip based on the features and specifications.	U	3	3	3									1	3	2	3	
<b>CO-2:</b>	Explain the role of each functional units in microcontroller, processors and system-on-chip based on the features and specifications	U	3	3	3									1	3	2	3	
<b>CO-3:</b>	Apply the peripheral interfacing, I/O programming, and motor control.	AP	3	3	3	2	2						1	1	1	3	2	3
<b>CO-4:</b>	Design the circuit and write the programming microcontroller, processors and system on chip	AP	3	3	3	2	2						1	1	1	3	2	3
<b>CO-5:</b>	Develop the applications using Embedded system.	AP	3	3	3	2	2						1	1	1	3	2	3

**Unit-1 INTRODUCTION TO MICROCONTROLLER**

**6 Periods**

Fundamentals Functions of ALU - Microprocessor - Microcontrollers – CISC and RISC – Types Microcontroller - 8051 Family - Architecture - Features and Specifications - Memory Organization -Instruction Sets – Addressing Modes.

**Unit-2 PROGRAMMING AND COMMUNICATION**

**6 Periods**

Fundamentals of Assembly Language Programming – Instruction to Assembler – Compiler and IDE - C Programming for 8051 Microcontroller – Basic Arithmetic and Logical Programming -Timer and Counter - Interrupts – Interfacing and Programming of Serial Communication, I<sup>2</sup>C, SPI and CAN of 8051 Microcontroller – Bluetooth and WI-FI interfacing of 8051 Microcontroller.

**Unit-3 PERIPHERAL INTERFACING**

**6 Periods**

I/O Programming – Interfacing of Memory, Key Board and Displays – Alphanumeric and Graphic, RTC, interfacing of ADC and DAC, Sensors - Relays - Solenoid Valve and Heater - Stepper Motors, DC Motors - PWM Programming – Closed Loop Control Programming of Servomotor –Traffic Light

**Unit-4 ARM PROCESSOR**

**6 Periods**

Introduction ARM 7 Processor - Internal Architecture – Modes of Operations – Register Set –Instruction Sets – ARM Thumb - Thumb State Registers – Pipelining – basic programming of ARM 7 - Applications.

<b>Unit-5</b>	<b>SINGLE BOARD COMPUTERS AND PROGRAMMING</b>	<b>6 Periods</b>
System on Chip - Broadcom BCM2711 SoC – SBC architecture - Models and Languages – Embedded Design – Real Time Embedded Operating Systems - Real Time Programming Languages -- Python for Embedded Systems- GPIO Programming – Interfacing		
		<b>Total Theory: 30 Periods</b>

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Assembly Language Programming and Simulation of 8051.</li> <li>2. Input switches and keyboard interfacing of 8051.</li> <li>3. Sensor Interfacing with ADC to 8051 and DAC &amp; RTC Interfacing with 8051.</li> <li>4. Stepper Motor (Unipolar &amp; Bipolar Motor) and PWM Servo Motor Control to Interfacing with 8051.</li> <li>5. Interfacing and Programming of Bluetooth and Wi-Fi with 8051</li> <li>6. Programming of ARM Processor for Sensor Interface.</li> <li>7. Wireless Communication of ARM Processor with Computation Platform.</li> <li>8. IOT application using SBC.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Kenneth J. Aylala, The 8051 Microcontroller, the Architecture and Programming Applications”, 3 rd edition, “2007, ISBN: 9788131502006.</li> <li>2. Rajkamal Embedded system, Mc Graw Hill, 2020, ISBN: 9353168023, 978-9353168025.</li> </ol>	<ol style="list-style-type: none"> <li>1. Muhammad Ali Mazidi , Janice Gillispe Mazidi, Rollin D.McKInlay The 8051 Microcontroller and embedded systems using assembly and C, 2005, ISBN:9788131758991.</li> <li>2.Simon Monk, Programming the Raspberry Pi, Second Edition: Getting Started with Python McGraw Hill TAB; 2nd edition, 2015, ISBN: 978-1259587405.</li> <li>3. James W. Stewart, “The 8051 Microcontroller Hardware, Software and Interfacing”, Regents Prentice Hall, 2003, ISBN: 9780135840467.</li> <li>4. John B. Peatman, “Design with Microcontrollers”, McGraw Hill International, USA, 2005, ISBN: 8178660598.</li> <li>5. Joseph Yiu,The Definitive Guide to ARM CORTEX - M3 and CORTEX M4 Processors - 3rd-Edition. 2024, ISBN: 9780124080829.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
* The expected levels for Bloom’s Taxonomy should be: <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

<b>Course Code</b>	24MH403	<b>Course Name</b>	THEORY OF MACHINES	<b>Course Category</b>	T	Professional Core Courses				L	T	P	C
										3	1	0	4

<b>Pre-requisite Courses</b>	Engineering Mechanics and Engineering Mathematics	<b>Co-requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes / Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To understand the basic components and layout of linkages in the assembly of a system/machine and also learn about the mechanisms
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.
- To learn about the concepts in friction
- To understand the principles in force analysis
- To learn about the basic concept of static and dynamic balancing and vibration

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand the kinematics, inversion of mechanism, and cam mechanism for specified output motion.	U	3	3	2	2	1							1	3	2	1
<b>CO-2:</b>	Calculate the gear parameters of toothed gearing and speeds of gear trains in various applications.	AP	3	3	1	1	1						1	1	3	2	1
<b>CO-3:</b>	Evaluate the frictional torque in screw threads and power transmission in belt & rope drives.	AP	3	3	1	1								1	3	2	1
<b>CO-4:</b>	Analyze and estimate the forces on members of mechanisms during static and dynamic equilibrium conditions.	AN	3	3	2	1	1						1	1	3	2	1
<b>CO-5:</b>	Determine the balancing masses on rotating machineries and the natural frequencies of free and forced vibratory systems.	AP	3	3	2	2	1						1	1	3	2	1

**Unit-1 KINEMATIC OF MACHINES**

**12 Periods**

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slider crank chain, kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of follower's motion

**Unit-2 GEARS AND GEAR TRAINS**

**12 Periods**

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains –epicyclic gear trains – automotive transmission gear trains.

**Unit-3 FRICTION**

**12 Periods**

Sliding and Rolling Friction angle – friction in threads – Friction Drives – Belt and rope drives.

**Unit-4 FORCE ANALYSIS**

**12 Periods**

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle –dynamic Force Analysis in simple machine members.

**Unit-5 BALANCING AND VIBRATION**

**12 Periods**

Static and Dynamic balancing – Balancing of revolving masses – Balancing machines – Free vibrations – natural Frequency – Damped Vibration – Critical speed of simple shafts – Forced vibration.

**Total: 60 Periods**

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	<ol style="list-style-type: none"> <li>1. J. J. Uicker, Jr, G. R. Pennock, and J. E. Shigley, Theory of Machines and Mechanisms, 6th ed. Cambridge: Cambridge University Press, 2023, ISBN: 9781009303644.</li> <li>2. Rattan. S. S, “Theory of Machines”, Tata McGraw–Hill Publishing Co., New Delhi, Fifth edition, 2020, ISBN 9353166330, 9789353166335.</li> </ol>	<ol style="list-style-type: none"> <li>1. R.S. Khurmi, “Theory of Machines”, S. Chand Publishers, New Delhi, 2020, ISBN: 812192524X, 9788121925242.</li> <li>2. Thomas Bevan, “Theory of Machines”, 3<sup>rd</sup> edition, CBS Publishers and Distributors, 2005, ISBN: 978-8123908748.</li> <li>3. Ramamurthi, Mechanisms of Machines, 3<sup>rd</sup> edition, Narosa Publishing House, 2009, ISBN: 8173198926, 978-8173198922.</li> <li>4. Ambekar A. G., “Mechanism and Machine Theory” Prentice Hall of India, New Delhi, 2007, ISBN: 8120331346, 978-8120331341.</li> <li>5. R.K. Bansal, J.S. Brar “Theory of Machines” Laxmi Publications, 2016, ISBN: 813180805X, 978-8131808054.</li> </ol>

**Learning Assessment**

<b>Continuous Learning Assessment (CLA) (40% weightage)</b>		<b>End Semester Examination (60% weightage)</b>
<b>Average of Internal Test (20%)</b>	<b>Critical Thinking Assessment (20%)</b>	
<p>* The expected levels for Bloom’s Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

<b>Course Code</b>	24MH404	<b>Course Name</b>	MANUFACTURING TECHNOLOGY	<b>Course Category</b>	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>	Material Science and Metallurgy	<b>Co- requisite Courses</b>	NIL	<b>Progressive Courses</b>	NIL
<b>Course Offering Department</b>	Mechatronics Engineering		<b>Data Book / Codes Standards</b>	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To study the concepts and basic mechanics of metal cutting and the factors affecting machinability.
- To learn working of basic and advanced turning machines.
- To teach the basics of machine tools with reciprocating and rotating motions and gear cutting methods.
- To study the basic concepts of grinding and the commonly used abrasive processes.
- To learn the basics of CNC programming concepts to develop the part programme for Machine centre and turning centre.

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand metal cutting mechanics, tool nomenclature, chip formation, tool wear, and machinability.	U	3	3	2	2	2		2				1	2	3	3	1
<b>CO-2:</b>	Explain the constructional and operational features of centre lathe and other special purpose lathes.	U	3	3	2								1	2	3	2	1
<b>CO-3:</b>	Describe the constructional and operational features of reciprocating machine tools and various gear cutting method	U	3	3	2								1	2	3	1	1
<b>CO-4:</b>	Apply the process parameters and the physics of grinding, and explain the commonly used abrasive finishing processes	AP	3	3	2	2	2						2	2	3	3	1
<b>CO-5:</b>	Develop the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.	AN	3	3	3	2	3						2	2	3	3	1

**Unit-1 MECHANICS OF METAL CUTTING 9 Periods**

Mechanics of chip formation, forces in machining, Types of chip, cutting tools – single point cutting tool nomenclature, orthogonal and oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life equation, surface finish, cutting fluids and Machinability.

**Unit-2 TURNING MACHINES 9 Periods**

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, surface roughness in turning, machining time and power estimation. Specialized lathes.

**Unit-3 RECIPROCATING MACHINE TOOLS 9 Periods**

Reciprocating machine tool operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutters– machining time calculation - Gear cutting and gear finishing methods; broaching machines: broach construction – push, pull, surface broaching.

**Unit-4 ABRASIVE PROCESSES 9 Periods**

Grinding - Mechanics of grinding and specific energy in grinding, grinding wheel – specifications and selection, types of grinding process, Surface integrity in grinding - Traditional micro-/nano-finishing methods - Honing, Lapping, Superfinishing - Typical applications, Hybrid mass finishing of AM parts.

<b>Unit-5 COMPUTER NUMERICAL CONTROL MACHINE TOOLS</b>	<b>9 Periods</b>
Computer Numerical Control (CNC) machine tools – Need, types, constructional details, special features - ball screws, ATC, sensors, machining centre, part programming fundamentals – G-codes and M-codes, manual part programming and computer assisted part programming.	
<b>Total Theory: 45 Periods</b>	

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Taper Turning and Eccentric Turning on circular parts using lathe machine.</li> <li>2. Knurling, external and internal thread cutting on circular parts using lathe machine.</li> <li>3. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.</li> <li>4. Drilling and Reaming using vertical drilling machine.</li> <li>5. Milling contours on plates using vertical milling machine.</li> <li>6. Cutting spur gear using milling machine.</li> <li>7. Grinding components using surface grinding machine.</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education; Eighth Edition, 2020, ISBN: 9789332587908.</li> <li>2. Michael Fitzpatrick, Machining and CNC Technology, McGraw-Hill Education; 3rd edition, 2013, ISBN: 9780073373782.</li> </ol>	<ol style="list-style-type: none"> <li>1. Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006, ISBN: 9780205118175.</li> <li>2. GeoffreyBoothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 2005, ISBN: 978-1574446593.</li> <li>3. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, Fourth Edition, New Delhi, 2018, ISBN: 978-9353160524.</li> <li>4. A. B. Chattopadhyay, Machining and Machine Tools, Wiley, 2nd edition, 2017, ISBN: 9788126564743.</li> <li>5. P. Radhakrishnan, Computer Numerical Control Machines and Computer Aided Manufacture, New Age International Pvt Ltd; First Edition, 2018, ISBN: 978-8122433975.</li> </ol>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

<b>Course Code</b>	24CS202	<b>Course Name</b>	C PROGRAMMING AND DATA STRUCTURES	<b>Course Category</b>	TP	Professional Core Courses	L	T	P	C
							3	0	2	4

<b>Pre-requisite Courses</b>		<b>Co-requisite Courses</b>		<b>Progressive Courses</b>	
<b>Course Offering Department</b>	Computer Science and Engineering		<b>Data Book / Codes Standards</b>		

**Course Objective: *The purpose of learning this course is to:***

- Introduce the basics of C programming language.
- Learn the concepts of advanced features of C.
- Understand the concepts of ADTs and linear data structures.
- Know the concepts of non-linear data structure and hashing
- Familiarize the concepts of sorting and searching techniques.

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>			
		<b>BL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO-1:</b>	Develop C programs for any real world/technical application.	AP	2	3	1	2	2	1	1	-	1	2	1	3			
<b>CO-2:</b>	Apply advanced features of C in solving problems.	AP	1	2	1	2	2	-	-	-	1	1	1	2			
<b>CO-3:</b>	Suggest and use appropriate linear data structure operations for solving a given problem	AN	2	3	1	2	3	-	-	-	1	1	1	2			
<b>CO-4:</b>	Suggest and use appropriate non-linear data structure operations and hashing function for solving a given problem	AN	2	1	-	1	1	-	-	-	2	1	1	2			
<b>CO-5:</b>	Appropriately use sort and search algorithms for a given application	AP	1	2	1	2	2	1	1	-	1	2	1	3			

**Unit-1 C PROGRAMMING FUNDAMENTALS 9 Periods**

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.

**Unit-2 C PROGRAMMING - ADVANCED FEATURES 9 Periods**

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives.

**Unit-3 LINEAR DATA STRUCTURES 9 Periods**

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.

**Unit-4 NON-LINEAR DATA STRUCTURES 9 Periods**

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

**Unit-5 SORTING AND SEARCHING TECHNIQUES 9 Periods**

Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.

**Total Theory: 45 Periods**

<b>List of Experiments</b>	<b>Total Practical: 30 Periods</b>
<ol style="list-style-type: none"> <li>1. Practice of C programming using statements, expressions, decision making and iterative statements.</li> <li>2. Practice of C programming using Functions and Arrays</li> <li>3. Implement C programs using Pointers and Structures</li> <li>4. Implement C programs using Files</li> <li>5. Array implementation of Stack, Queue and List ADTs</li> <li>6. Linked list implementation of Stack, Queue and List ADTs</li> <li>7. Implementation of Binary Trees and operations of Binary Trees</li> <li>8. Implementation of searching techniques</li> <li>9. Implementation of sorting algorithms</li> <li>10. Implementation of Hashing algorithms</li> </ol>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.</li> <li>2. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.</li> </ol>	<ol style="list-style-type: none"> <li>1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.</li> <li>2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.</li> <li>3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.</li> <li>4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.</li> </ol> <p>List of Open Source Software/ Learning website:  <a href="https://www.coursera.org/specializations/data-structures-algorithms">https://www.coursera.org/specializations/data-structures-algorithms</a>  <a href="https://nptel.ac.in/courses/112107243">https://nptel.ac.in/courses/112107243</a>  <a href="https://nptel.ac.in/courses/112105598">https://nptel.ac.in/courses/112105598</a></p>

<b>Learning Assessment</b>				
<b>Continuous Learning Assessment (CLA) (50% weightage)</b>				<b>End Semester Examination (50% weightage)</b>
<b>Theory (25% weightage)</b>		<b>Practical (25% weightage)</b>		
<b>Average of Internal Test (15%)</b>	<b>Critical Thinking Assessment (10%)</b>	<b>Evaluation of Laboratory Observation, Record (15%)</b>	<b>Model Lab Exam (10%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>				

Course Code	24MH411	Course Name	THEORY OF MACHINES LABORATORY	Course Category	P	Professional Core Courses	L	T	P	C
							0	0	4	2

Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL
Course Offering Department	Mechatronics Engineering		Data Book / Codes / Standards	NIL	

**Course Objective: *The purpose of learning this course is to:***

- To learn about the various concept in gears and gear trains, Simple mechanisms
- To Analyze the kinematics of various linkages and mechanical systems, including four-bar mechanisms and universal joints.
- To study mass moment of inertia for different mechanical systems and validate theoretical principles through experiments.
- To understand gyroscopic effects, governor characteristics, and cam profiles in mechanical systems.
- To explore vibration analysis, including natural frequencies, damping effects, balancing of rotating/reciprocating masses, and critical speeds of shafts.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>			Program Outcomes (PO)												Program Specific Outcome (PSO)		
		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Determine the mass moment of inertia for various mechanical systems.	U	3	3	3	2	2					1	1	1	3	1	1
<b>CO-2:</b>	Calculate gyroscopic effects, governor characteristics, and motion curve, jump speed of cam profiles.	AN	3	3	3	3	2					1	1	2	3	1	1
<b>CO-3:</b>	Compute natural frequencies, damping coefficient of spring mass system.	AP	3	3	3	2	2					1	1	1	3	1	1
<b>CO-4:</b>	Evaluate balance of rotating/revolving parts, and critical shaft speeds.	AN	3	3	3	3	2					1	1	2	3	1	1
<b>CO-5:</b>	Estimate the transverse and forced vibration of various beams.	AN	3	3	3	2	2					1	1	2	3	1	1

**List of Experiments (Any 10 Experiments)**

**60 Periods**

1. a) Study of gear parameters. b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms. b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system. b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus. c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination. b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems. - Undamped and Damped Natural frequencies. b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
10. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
11. a) Balancing of rotating masses. b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses. b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
13. Determination of transmissibility ratio using vibrating table.

**Learning Assessment**

<b>Continuous Learning Assessment (CLA) (60% weightage)</b>		<b>End Semester Examination (40% weightage)</b>
<b>Evaluation of Laboratory Observation, Record (45%)</b>	<b>Model Lab Exam (15%)</b>	
<p>* The expected levels for Bloom's Taxonomy should be:</p> <ul style="list-style-type: none"> <li>- Lower-order thinking skills: not more than 40%</li> <li>- Higher-order thinking skills: not less than 60%</li> </ul>		

<b>Course Code</b>	24SD411	<b>Course Name</b>	APTITUDE AND CODING SKILLS -2	<b>Course Category</b>	P	Employability Enhancement Courses	L	T	P	C
							0	0	2	1

<b>Pre-requisite Courses</b>	Nil	<b>Co-requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil
<b>Course Offering Department</b>	Computer Science and Engineering (Common to all Branches)		<b>Data Book / Codes / Standards</b>	Nil	

**Course Objective: *The purpose of learning this course is to:***

- Build quantitative skills in ages, speed, time and distance
- Enhance analytical reasoning skills to solve problems in surds, indices, boats, streams, pipes, cisterns, allegation and mixtures
- Supplement foundational data structure concepts in programming
- Provide problem solving skills in data structures and algorithms
- Develop advanced level coding skills

					Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>					<i>BL</i>	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Solve aptitude problems in Ages, Speed, Time and Distance, Ratio and proportion, Arithmetic progression				AP															
<b>CO-2:</b>	Apply analytical reasoning skills to solve problems in surds, indices, boats, streams, pipes, cisterns, allegation and mixtures				AP															
<b>CO-3:</b>	Code for foundational data structure concepts				AP															
<b>CO-4:</b>	Apply data structures and algorithms in problem solving.				AP															
<b>CO-5:</b>	Design algorithms and code for advanced level problems				AN															

**List of Exercises**

**30 periods**

- 1. Quantitative Aptitude – Advanced Problems-I**  
Ages, Speed, Time and Distance, Ratio and proportion, Arithmetic progression
- 2. Quantitative Aptitude – Advanced Problems-II**  
Surds-and-Indices, Boats-and-Streams, Pipes-Cisterns, allegation and mixtures
- 3. Coding – Data Structure Foundational Concepts**  
Linked List – Singly and Doubly linked list, Stack and Queue, Array implementation of stack and queue
- 4. Coding – Data Structure Moderate Problems**  
Linked list implementation of stack and queue, Problems using Trees and Graphs
- 5. Coding – Data Structure Advanced-level problems**  
Hashing, Minimum path problems, Pattern search problems and problems using Greedy algorithms

<b>Course Code</b>	24EL411	<b>Course Name</b>	INNOVATION AND PRODUCT DEVELOPMENT - 2 (CONCEPTUALIZATION)	<b>Course Category</b>	P	Employability Enhancement Courses							L	T	P	C				
														0	0	2	1			
<b>Pre-requisite Courses</b>	Nil			<b>Co-requisite Courses</b>	Nil			<b>Progressive Courses</b>	24EL511											
<b>Course Offering Department</b>				<b>Data Book/Codes/Standards</b>	Nil															
<b>Course Objective: <i>The purpose of learning this course is to:</i></b>																				
The students will learn to transform conceptual ideas into tangible designs and viable product concepts with focusing on customer needs and aspirations. This course focuses on the early stages of the product development process, emphasizing ideation, market analysis, conceptual design, and feasibility assessment																				
												<b>Program Outcomes (PO)</b>						<b>Program Specific Outcome (PSO)</b>		
<b>Course Outcomes(CO): <i>At the end of this course, learners will be able to:</i></b>					<b>BL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>CO-1:</b>	Enumerate detailed product specifications, including dimensions, materials, software, and technical requirements				C	3	3	3	3	3	2			3			2			
<b>CO-2:</b>	Create sketches or digital renderings to visualize and refine the product design.				C	3	3	3	3	3	2			3			2			
<b>CO-3:</b>	Integrate insights from the Business Model Canvas to align the product concept with the business strategy.				AP	3	3	3	3	3	2			3			2			
<b>CO-4:</b>	Outline prototype development steps and resources with the Prototype Planning Canvas.				AP	3	3	3	3	3	2			3			2			
<b>CO-5:</b>	Determine the key features and functionalities of the MVP with the MVP Canvas, focusing on delivering maximum value to early adopters				AP	3	3	3	3	3	2			3			2			

### List of Experiments

Students shall continue their semester 1 ideation to conceptualization focussing on shaping the product concept into a tangible design aligned with customer needs. They shall follow the below activities but not limited to;

**Week 1-2:** Defining detailed product specifications, covering aspects such as dimensions, materials, Software specifications and technical requirements

**Week 3-4:** Sketching or digital rendering/wireframe to visualize the design of a product, facilitating communication and idea refinement

**Week 5-6:** Incorporate insights from the Business Model Canvas to align the product concept with the overall business strategy, considering aspects such as revenue streams, cost structure, and customer segments.

**Week 7-8:** Utilize the Prototype Planning Canvas to outline the steps and resources required for prototype development, ensuring a systematic and efficient approach.

**Week 9-10:** Define the key features and functionalities of the Minimum Viable Product (MVP) using the MVP Canvas, focusing on delivering maximum value to early adopters with minimal resources.

**Key Deliverables:** Detailed product specifications, Initial sketches or digital renderings, Aligned Business Model Canvas, and a Structured Prototype Planning Canvas.

### Learning Assessment

#### Continuous Learning Assessment (CLA) (100 % weightage)

<b>Report</b> 40%	<b>Presentation</b> 40%	<b>Viva Voce</b> 20%
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Course Code	24MC301	Course Name	INTRODUCTION TO WOMEN AND GENDER STUDIES	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department			Data Book / Codes / Standards	Nil	

<b>Course Objective: <i>The purpose of learning this course is to:</i></b>																															
<ul style="list-style-type: none"> <li>Introduce students with foundational concepts in Women and Gender Studies.</li> <li>Familiarize students with the key feminist theories to understanding gender inequality.</li> <li>Explore the historical and contemporary women's movements globally and in the Indian context.</li> <li>Study the intersection of gender with language, representation, and media.</li> <li>Equip students with critical tools to challenge gender norms and engage in informed gender discourse.</li> </ul>																															
												<b>Program Outcomes (PO)</b>					<b>Program Specific Outcome (PSO)</b>														
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>												BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
CO-1:	Understand and differentiate core concepts of gender and analyze its societal structures.											U			2			1													
CO-2:	Critically evaluate various feminist theoretical frameworks and eco feminist perspectives.											E			2			1													
CO-3:	Recognize the development and impact of women's movements both globally and in India.											U			2			1													
CO-4:	Comprehend and assess the role of discourse in perpetuating gender norms through language.											U			2			1				3									
CO-5:	Critically assess gender representation in mainstream, alternative and social media platforms.											E			2		2	1													

<b>Unit-1</b>	<b>CONCEPTS</b>	<b>6 Periods</b>
Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.		
<b>Unit-2</b>	<b>FEMINIST THEORY</b>	<b>6 Periods</b>
Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.		
<b>Unit-3</b>	<b>WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL</b>	<b>6 Periods</b>
Rise of Feminism in Europe and America. Women's Movement in India.		
<b>Unit-4</b>	<b>GENDER AND LANGUAGE</b>	<b>6 Periods</b>
Linguistic Forms and Gender. Gender and narratives.		
<b>Unit-5</b>	<b>GENDER AND REPRESENTATION</b>	<b>6 Periods</b>
Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.		
<b>Total:</b>		<b>30 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	<ol style="list-style-type: none"> <li>1. Colleen Lutz Clemens, "Introduction to Women's &amp; Gender Studies" 1st Edition, The Pennsylvania Alliance, 2023.</li> <li>2. Madhu Nagla "Women and Gender Studies" 1st Edition, Rawat Publications, 2025.</li> </ol>	<ol style="list-style-type: none"> <li>1. Melissa J. Gillis , Andrew T. Jacobs " Introduction to Women's and Gender Studies : An Interdisciplinary Approach" 3<sup>rd</sup> Edition, 2024.</li> <li>2. L. Ayu Saraswati, Barbara L. Shaw, and Heather Rellihan, "Introduction to Women's, Gender and Sexuality Studies: Interdisciplinary and Intersectional Approaches" 3rd Edition, Oxford University Press, 2025.</li> </ol>

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<i>Average of Internal Test (0%)</i>	<i>Critical Thinking Assessment (100%)</i>	

Course Code	24MC302	Course Name	ELEMENTS OF LITERATURE	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department			Data Book / Codes / Standards	Nil	

**Course Objective: *The purpose of learning this course is to:***

- To make the students aware about the finer sensibilities of human existence through an art form.
- The students will learn to appreciate different forms of literature as suitable modes of expressing human experience.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.	U						3	2	2	2	2		3			
<b>CO-2:</b>	Differentiate between fiction, fact, and literary truth, and explain how fiction constructs meaning.	U						1	0	2	2	3		1			
<b>CO-3:</b>	Interpret the emotional and imaginative elements that define poetic expression.	U										3		2			
<b>CO-4:</b>	Students will understand the basic elements of drama and how it is performed on stage.	U										3		1			
<b>CO-5:</b>	Students will identify different types of drama like tragedy, comedy and satire.	U						2	2	0		3		1			

<b>Unit-1 RELEVANCE OF LITERATURE</b>	<b>6 Periods</b>
Enhances Reading, thinking, discussing and writing skills-Develops finer sensibility for better human relationship-Increases understanding of the problem of humanity without bias-Providing space to reconcile and get a cathartic effect.	
<b>Unit-2 ELEMENTS OF FICTION</b>	<b>6 Periods</b>
Fiction, fact and literary truth-Fictional modes and patterns-Plot character and perspective.	
<b>Unit-3 ELEMENTS OF POETRY</b>	<b>6 Periods</b>
Emotions and imaginations-Figurative language-Simile, metaphor, conceit, symbol, pun and irony-Personification and animation-Rhetoric and trend.	
<b>Unit-4 FUNDAMENTALS OF DRAMA</b>	<b>6 Periods</b>
Elements of drama. Drama as a representational act. Content mode and elements. Theatrical performance.	
<b>Unit-5 FORMS AND FUNCTIONS OF DRAMA</b>	<b>6 Periods</b>
Drama as narration, mediation and persuasion. Features of comedy. Features of satire.	
<b>Total: 30 Periods</b>	

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1.An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007. 2.An Introduction to Literary Studies, Mario Klarer, Routledge, 2013. 3.The Experience of Poetry, Graham Mode, Open college of Arts with Open Unv Press, 1991. 4.The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114. 5.The Elements of Drama, J.L.Styan, Literary Licensing, 2011.	To be decided by the teacher and student, on the basis of individual students so as to enable him or her to write the term paper.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<i>Average of Internal Test (0%)</i>	<i>Critical Thinking Assessment (100%)</i>	

Course Code	24MC303	Course Name	FILM APPRECIATION	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Data Book / Codes / Standards			Nil	

**Course Objective: *The purpose of learning this course is to:***

- In this course on film appreciation, the students will be introduced broadly to the development of film as an art and entertainment form. It will also discuss the language of cinema as it evolved over a century. The students will be taught as to how to read a film and appreciate the various nuances of a film as a text. The students will be guided to study film joyfully.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Students will understand the basic elements involved in making a film, including equipment, script, crew and production process.	U						1	1	1	2	3	2	2			
<b>CO-2:</b>	Students will learn how film language developed from early silent films to talkies, and understand key milestones in film history.	U						2	3	1		2		3			
<b>CO-3:</b>	Students will be able to recognize major film theories and apply them to analyze and appreciate films	U						2	2	3		2		2			
<b>CO-4:</b>	Students will explore the development of cinema in different countries like the Soviet Union, Japan, Italy and the U.S	U						2	2	2		2		2			
<b>CO-5:</b>	Students will gain knowledge about the history of Indian Cinema, important directors, regional films and documentaries.	U						2	2	2		2		2			

**Unit-1 THE COMPONENT OF FILMS**

**6 Periods**

- A-1: The material and equipment
- A-2: The story, screenplay and script
- A-3: The actors, crew members, and the director
- A-4: The process of film making... structure of a film

**Unit-2 EVOLUTION OF FILM LANGUAGE**

**6 Periods**

- B-1: Film language, form, movement etc.
- B-2: Early cinema... silent film (Particularly French)
- B-3: The emergence of feature films: Birth of a Nation
- B-4: Talkies

**Unit-3 FILM THEORIES AND CRITICISM/APPRECIATION**

**6 Periods**

- C-1: Realist theory; Auteurists
- C-2: Psychoanalytic, Ideological, Feminists
- C-3: How to read films?
- C-4: Film Criticism / Appreciation

<b>Unit-4 DEVELOPMENT OF FILMS</b>	<b>6 Periods</b>
D-1: Representative Soviet films D-2: Representative Japanese films D-3: Representative Italian films D-4: Representative Hollywood film and the studio system	
<b>Unit-5 INDIAN FILMS</b>	<b>6 Periods</b>
E-1: The early era E-2: The important films made by the directors E-3: The regional films E-4: The documentaries in India	
<b>Total: 30 Periods</b>	

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.	To be decided by the course handling faculty and student, on the basis of individual students.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<i>Average of Internal Test (0%)</i>	<i>Critical Thinking Assessment (100%)</i>	

<b>Course Code</b>	24MC304	<b>Course Name</b>	WELL – BEING WITH TRADITIONAL PRACTICES – YOGA, AYURVEDA, SIDDHA	<b>Course Category</b>	T	Mandatory Courses	L	T	P	C
							2	0	0	0

<b>Pre-requisite Courses</b>	Nil	<b>Co- requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil
<b>Course Offering Department</b>		<b>Data Book / Codes / Standards</b>	Nil		

**Course Objective: *The purpose of learning this course is to:***

- To enjoy life happily with fun filled new style activities that help to maintain health also
- To adapt a few life style changes that will prevent many health disorders
- To be cool and handle every emotion very smoothly in every walk of life
- To learn to eat cost effective but healthy foods that are rich in essential nutrients
- To develop immunity naturally that will improve resistance against many health disorders

		Program Outcomes (PO)												Program Specific Outcome (PSO)			
<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Learn about holistic health and lifestyle habits to prevent disease and stay healthy.	U	2	1	3			2	2	3	3	2		3			
<b>CO-2:</b>	Understand the importance of a balanced diet, nutrients, and healthy cooking for good nutrition and weight management.	U	2	1	3				1	3	3	2		3			
<b>CO-3:</b>	Explore Ayurveda and Siddha for their preventive health practices and lifestyle approaches.	U	2	1	3			2	1	3	3	2		3			
<b>CO-4:</b>	Learn how to manage stress, improve sleep, boost immunity, and support mental well-being.	U	2	1	3			2	1	3	3	2		3			
<b>CO-5:</b>	Understand and practice yoga for physical health, mental clarity, and overall well-being.	U	1	1	3			2	1	3	3	2		3			

**Unit-1 HEALTH AND ITS IMPORTANCE**

**6 Periods**

Health: Definition-Importance of maintaining health- More importance on prevention than treatment Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmental health - Occupational/Professional health. Present health status- The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease – cancer – diabetes - chronic pulmonary diseases - risk factors – tobacco – alcohol - unhealthy diet - lack of physical activities. Types of diseases and disorders- Lifestyle disorders – Obesity – Diabetes - Cardiovascular diseases – Cancer – Strokes – COPD - Arthritis - Mental health issues. Causes of the above diseases /disorders -Importance of prevention of illness- Takes care of health - Improves quality of life - Reduces absenteeism - Increase satisfaction - Saves time

**Unit-2 DIET**

**6 Periods**

Role of diet in maintaining health- energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps to reduce risk of developing lifestyle disorders like diabetes – arthritis – hypertension – PCOD – infertility – ADHD – sleeplessness -helps to reduce the risk of heart diseases - keeps the teeth and bones strong. Balanced Diet and its 7 Components- Carbohydrates – Proteins – Fats – Vitamins – Minerals - Fibre and Water. Food additives and their merits & demerits- Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions

Definition of BMI and maintaining it with diet: Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM	
<b>Unit-3</b>	<b>ROLE OF AYURVEDA &amp; SIDDHA SYSTEMS IN MAINTAINING HEALTH</b>
AYUSH systems and their role in maintaining health- preventive aspect of AYUSH - AYUSH as a soft therapy. Secrets of traditional healthy living- Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life. Principles of Siddha & Ayurveda systems- Macrocosm and Microcosm theory - Panchekarana Theory / (Five Element Theory) 96 fundamental Principles – Uyir Thathukkal(Tri-Dosha Theory) – Udal Thathukkal	
<b>Unit-4</b>	<b>MENTAL WELLNESS</b>
Emotional health- Definition and types - Three key elements: the subjective experience - the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life -Short term and long term effects of emotional disturbances - Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions. Stress management- Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement. Sleep- Sleep and its importance for mental wellness - Sleep and digestion.	
<b>Unit-5</b>	<b>YOGA</b>
Definition and importance of yoga- Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.	
<b>Total: 30 Periods</b>	

	<b>Text Books</b>	<b>References</b>
<b>Learning Resources</b>	1. Nutrition and Dietetics - Ashley Martin, Published by White Word Publications, New York, NY 10001, USA 2. Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body, by Cory Martin, Copyright © 2015 by Althea Press, Berkeley, California	To be decided by the teacher and student, on the basis of individual students so as to enable him or her to write the term paper.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<b>Average of Internal Test (0%)</b>	<b>Critical Thinking Assessment (100%)</b>	

Course Code	24MC305	Course Name	HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department			Data Book / Codes / Standards	Nil	

**Course Objective: *The purpose of learning this course is to:***

- To help students understand the basic ideas and methods used in writing history, especially about science and technology.
- To introduce students to important Indian thinkers who studied the history of science and technology.
- To learn about how science and technology developed in ancient India.
- To study the growth and exchange of scientific knowledge in medieval India.
- To understand how British rule affected science and technology in India.

				Program Outcomes (PO)												Program Specific Outcome (PSO)			
Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>				BL	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Students will be able to explain basic historical ideas and how they relate to science and technology.			U						2	2	2		2		3			
<b>CO-2:</b>	Students will know about key Indian scholars and their work on science and technology history.			U						2	2	2		2		2			
<b>CO-3:</b>	Students will describe important scientific and technological progress in ancient India.			U						2	3	2		2		2			
<b>CO-4:</b>	Students will understand the scientific developments and cultural exchanges in medieval India.			U						3	3	2		2		2			
<b>CO-5:</b>	Students will explain how colonialism changed science and technology in India.			U						3	3	3		3		2			

**Unit-1 CONCEPTS AND PERSPECTIVES**

**6 Periods**

Meaning of History, Objectivity, Determinism, Relativism, Causation, Generalization in History; Moral judgment in history Extent of subjectivity, contrast with physical sciences, interpretation and speculation, causation verses evidence, concept of historical inevitability, Historical Positivism. Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India.

**Unit-2 HISTORIOGRAPHY OF SCIENCE AND TECHNOLOGY IN INDIA**

**6 Periods**

Introduction to the works of D.D. Kosambi, Dharmapal, Debiprasad Chattopadhyay, Rehman, S. Irfan Habib, Deepak Kumar, Dhruv Raina, and others.

**Unit-3 SCIENCE AND TECHNOLOGY IN ANCIENT INDIA**

**6 Periods**

Technology in pre-historic period, Beginning of agriculture and its impact on technology, Science and Technology during Vedic and Later Vedic times Science and technology from 1st century AD to C-1200.

**Unit-4 SCIENCE AND TECHNOLOGY IN MEDIEVAL INDIA**

**6 Periods**

Legacy of technology in Medieval India, Interactions with Arabs, Development in medical knowledge, interaction between Unani and Ayurveda and alchemy Astronomy and Mathematics: interaction with Arabic Sciences, Science and Technology on the eve of British conquest

<b>Unit-5</b>	<b>SCIENCE AND TECHNOLOGY IN COLONIAL INDIA</b>	<b>6 Periods</b>
Science and the Empire, Indian response to Western Science Growth of techno-scientific institutions		
		<b>Total: 30 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. History of Indian Science, Technology and Culture (Vol. III, Part I), A. Rahman, 1999, Oxford University Press.	1. History of Science, Philosophy and Culture in Indian Civilization: Science, Technology and Medicine in Colonial India (Vol. XV, Part 1), Deepak Kumar, 1999, Pearson Education India

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<b>Average of Internal Test (0%)</b>	<b>Critical Thinking Assessment (100%)</b>	

<b>Course Code</b>	24MC306	<b>Course Name</b>	POLITICAL AND ECONOMIC THOUGHT FOR A HUMANE SOCIETY	<b>Course Category</b>	T	Mandatory Courses	L	T	P	C
							2	0	0	0

<b>Pre-requisite Courses</b>	Nil	<b>Co-requisite Courses</b>	Nil	<b>Progressive Courses</b>	Nil
<b>Course Offering Department</b>		<b>Data Book / Codes / Standards</b>	Nil		

**Course Objective: *The purpose of learning this course is to:***

- This course will begin with a short overview of human needs and desires and how different political-economic systems try to fulfil them. In the process, we will end with a critique of different systems and their implementations in the past, with possible future directions.

<b>Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i></b>		<b>BL</b>	<b>Program Outcomes (PO)</b>												<b>Program Specific Outcome (PSO)</b>		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Understand the principles of a humane society and the importance of harmony within individuals, communities, and nature.	U						3	3	3	1	2		3			
<b>CO-2:</b>	Analyze the characteristics and impacts of capitalism, liberal democracy, fascism, and totalitarian regimes in modern history.	AN						3	2	2	1	2		2			
<b>CO-3:</b>	Explain the fundamental concepts of communism and welfare states and their influence on society and human empowerment.	U						3	2	3	1	2		2			
<b>CO-4:</b>	Appreciate Gandhian philosophy and its relevance to Indian civilization, community governance, and ecological balance.	U						3	3	3							
<b>CO-5:</b>	Evaluate the role of technology and education in societal development and envision future directions for social progress.	E						3	1	1							

<b>Unit-1</b>	<b>CONCEPTS OF HUMANE SOCIETY AND SOCIETAL HARMONY</b>	<b>6 Periods</b>
Considerations for humane society, holistic thought. Human desires, harmony in self, relationships, society, and nature. Societal systems		
<b>Unit-2</b>	<b>ECONOMIC AND POLITICAL SYSTEMS – CAPITALISM, FASCISM, AND TOTALITARIANISM</b>	<b>6 Periods</b>
Capitalism: free markets, demand-supply, competition, laissez-faire, monopolies, imperialism. Liberal democracy. Fascism, totalitarianism, World War I & II, Cold War		
<b>Unit-3</b>	<b>COMMUNISM AND WELFARE STATE</b>	<b>6 Periods</b>
Communism: mode of production, theory of labour, surplus value, class struggle, dialectical & historical materialism. Russian and Chinese models . Welfare state, relation with human desires, empowerment		
<b>Unit-4</b>	<b>GANDHIAN THOUGHT AND INDIAN CIVILIZATION</b>	<b>6 Periods</b>
Gandhian philosophy: Swaraj, decentralized economy and polity, community, control over lives. Relationship with nature. Essential elements of Indian civilization		
<b>Unit-5</b>	<b>TECHNOLOGY, EDUCATION, AND FUTURE DIRECTIONS</b>	<b>6 Periods</b>
Technology as a driver of society. Role of education in shaping society. Future societal directions.		
<b>Total:</b>		<b>30 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. Social and Political Philosophy: Readings from Plato to Gandhi. John G. Gunnell, Robert B. Talisse. Wadsworth Publishing	1. Political Philosophy: A Very Short Introduction, David Miller, Oxford University Press.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<i>Average of Internal Test (0%)</i>	<i>Critical Thinking Assessment (100%)</i>	

Course Code	24MC307	Course Name	INDIAN CONSTITUTION	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department			Data Book / Codes / Standards	Nil	

**Course Objective: *The purpose of learning this course is to:***

- Understand the historical background and philosophical foundations of the Indian Constitution.
- Explore the structure and functions of both Union and State Governments under the Constitution.
- Gain knowledge of the Fundamental Rights and Directive Principles of State Policy.
- Study the roles of various political institutions and judicial bodies in the governance of India.
- Develop an understanding of the process of constitutional amendments and the dynamic nature of the Constitution.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>CO-1:</b>	Demonstrate an understanding of the evolution and key philosophical principles of the Indian Constitution.	U						1		1								
<b>CO-2:</b>	Analyze the structure, functions, and powers of the Union and State Governments.	AN						1		1								
<b>CO-3:</b>	Assess the relationship between Fundamental Rights and Directive Principles of State Policy.	E						1		1								
<b>CO-4:</b>	Critically examine the role of the Judiciary in interpreting the Constitution.	E						1		1								
<b>CO-5:</b>	Understand and explain the processes involved in the amendment of the Constitution.	U						1		1								

<b>Unit-1 INTRODUCTION TO THE INDIAN CONSTITUTION</b>	<b>6 Periods</b>
Historical Background - Constituent Assembly of India - Philosophical Foundations of the Indian Constitution - Preamble of the Constitution- Fundamental Rights -Directive Principles of State Policy (DPSP)- Fundamental Duties – Citizenship - Constitutional Remedies for Citizens	
<b>Unit-2 UNION GOVERNMENT</b>	<b>6 Periods</b>
Structure of Union Government - President of India - Vice President of India - Prime Minister and Cabinet - Parliament of India - Supreme Court of India	
<b>Unit-3 STATE GOVERNMENT</b>	<b>6 Periods</b>
Structure of State Government - Governor of the State - Chief Minister and Cabinet - State Legislature - Judicial System in States (High Courts and Subordinate Courts)	
<b>Unit-4 LOCAL GOVERNMENT AND PANCHAYATS</b>	<b>6 Periods</b>
Structure and Functions of Local Government - Panchayati Raj System - Municipalities and Local Administration	
<b>Unit-5 AMENDMENT PROCESS AND SPECIAL PROVISIONS</b>	<b>6 Periods</b>
Constitutional Amendment Process - Special Provisions for States -Recent Amendments to the Constitution	
<b>Total: 30 Periods</b>	

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1. "Introduction to the Constitution of India" by D.D. Basu 2. "Indian Polity" by M. Laxmikanth 3. "The Constitution of India" by P.M. Bakshi	1."Indian Constitution: A Comprehensive Commentary" by H.M.Seervai 2."The Indian Constitution" by V. N. Shukla 3."Constitutional Law of India" by J.N. Pandey 4."Indian Political System" by Rajni Kothari 5."Constitution of India: Text and Commentary" by S. C. Kashyap

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<i>Average of Internal Test (0%)</i>	<i>Critical Thinking Assessment (100%)</i>	

Course Code	24MC308	Course Name	BUREAU OF INDIAN STANDARDS	Course Category	T	Mandatory Courses	L	T	P	C
							2	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department			Data Book / Codes / Standards	Nil	

**Course Objective: *The purpose of learning this course is to:***

- To provide an understanding of the history, evolution, and role of the Bureau of Indian Standards (BIS) in national and international standardization processes.
- To familiarize students with the BIS Act, rules, and regulations, and the legal framework governing the certification and quality control processes.
- To explore the various types of Indian Standards (IS), codes of practice, and their application across different sectors.
- To introduce the services and activities provided by BIS, including product certification, quality control, and consumer protection.
- To highlight the international cooperation of BIS, its role in global standardization forums, and its contributions to global trade and sustainable development.

Course Outcomes (CO): <i>At the end of this course, learners will be able to:</i>		BL	Program Outcomes (PO)												Program Specific Outcome (PSO)		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO-1:</b>	Demonstrate a clear understanding of the Bureau of Indian Standards, its functions, history, and importance in the standardization process.	U						2	2	1		2		2			
<b>CO-2:</b>	Analyze the BIS Act and its legal framework, understanding the processes of certification, compliance, and the legal consequences of non-adherence.	AN						3	2	3		2		2			
<b>CO-3:</b>	Identify various Indian Standards (IS) and their relevance in ensuring quality, safety, and uniformity in products and services.	AP						3	2	2				1			
<b>CO-4:</b>	Understand the services offered by BIS, including product certification and quality control, and how they benefit industries, consumers, and the economy.	U						1		1		1		1			
<b>CO-5:</b>	Evaluate the role of BIS in international cooperation, particularly in aligning Indian standards with global standards, and its contribution to international trade and sustainable development goals.	E							1	1		1		1			

<b>Unit-1 INTRODUCTION TO BUREAU OF INDIAN STANDARDS (BIS)</b>	<b>6 Periods</b>
Overview of BIS - History and Evolution of BIS - Role and Functions of BIS -BIS Organizational Structure - Importance of Standardization in India - BIS and its relationship with International Standardization Bodies (ISO, IEC, etc.)	
<b>Unit-2 BIS ACTS, RULES, AND REGULATIONS</b>	<b>6 Periods</b>
BIS Act, 2016: Objectives and Provisions - Legal Framework and Powers of BIS - Certification Marks (ISI Mark) - BIS Certification Process for Products and Services = Legal Consequences of Non-Compliance.	
<b>Unit-3 STANDARDS AND CODES OF PRACTICE</b>	<b>6 Periods</b>
Types of Standards: Product Standards, Process Standards, etc. - National Standards and their Importance - IS (Indian Standard) Codes and their Application - Adoption of International Standards in India - Role of BIS in Developing Standards for Various Sectors.	
<b>Unit-4 BIS SERVICES AND ACTIVITIES</b>	<b>6 Periods</b>
Product Certification and Quality Control - Training and Awareness Programs by BIS - BIS and Consumer Protection - Role of BIS in Ensuring Safety and Quality of Products - Research and Development Activities by BIS.	

<b>Unit-5</b>	<b>BIS AND INTERNATIONAL COOPERATION</b>	<b>6 Periods</b>
BIS's Role in International Standardization Forums - BIS's Membership in ISO, IEC, and Other Global Bodies - Harmonization of Indian Standards with International Standards - BIS's Contributions to Sustainable Development Goals (SDGs) - BIS and Global Trade: Ensuring Export Quality and Compliance.		
		<b>Total: 30 Periods</b>

<b>Learning Resources</b>	<b>Text Books</b>	<b>References</b>
	1."Bureau of Indian Standards (BIS) Handbook" Bureau of Indian Standards. 2."Indian Standards and Quality Control" M. P. P. K. Nair. 3."Standardization and Quality Control" S. K. Gupta.	1."The Bureau of Indian Standards Act, 2016" Indian Government. 2."Fundamentals of Quality Control and Improvement". Amitava Mitra. 3."International Standards and Certification" C. B. Gupta. 4."Standardization in Global Supply Chains: Opportunities and Challenges". Rajesh Kumar.

<b>Learning Assessment</b>		
<b>Continuous Learning Assessment (CLA) (100% weightage)</b>		<b>End Semester Examination (0% weightage)</b>
<b>Average of Internal Test (0%)</b>	<b>Critical Thinking Assessment (100%)</b>	