SAMARTH EDUCATIONAL TRUST
ARVIND GAVALI COLLEGE OF ENGINEERING
ENGINEERING (B.Tech & M.Tech) BCA MCA B.VOC
NAAC & NBA Accredited AN AUTONOMOUS INSTITUTE ISO 9001:2015
Approved by AICTE, New Delhi, Recognised by Govt. Of Maha.,DTE Mumbai & Affiliated to
Dr.Babasaheb Ambedkar Technological University (BATU), Lonere.

Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
Phone : 02162 - 261122 , 200100
e-mail : agcenggsatara@gmail.com
Website :-www.agce.edu.in
Institute Code : Engg. DTE EN-6545
BCA 6545, MCA 6545, B.Voc 6545

DEPARTMENT OF MECHANICAL ENGINEERING

ABOUT THE DEPARTMENT

Mechanical engineering is the Core Department of the Arvind Gavali College of Engineering. The department has all UGC approved faculty members. The department has well-equipped laboratories.

With the growing demand for Mechanical Engineers in the Government and private sectors, the Department is making the best efforts to produce highly trained and capable engineers who can take up the challenges of the real world. The quality of academic instructions, guidelines, and college activities are designed to produce competent and successful engineers. In the Department, the focus is on preparing professional engineers.

As far as the Department is concerned, academic standards and practical work are the two key parameters. To execute this parameter the department has taken the Initiatives to provide industrial work exposure by sending the students for training to make them fit for future professional challenges. For the extra curriculum activities, the Departmental Association (MESA) has been established by the students. This association conducts various technical and cultural events regularly.

"Nothing is impossible for Mechanical Engineers with Skill Oriented Knowledge."

DEPARTMENT VISION

To develop professional technocrats and socially responsible engineers in the field of Mechanical engineering.

DEPARTMENT MISSION

M1	To provide quality education to enhance academic competency keeping pace with the industrial needs.
M2	To develop attitude and the professional skills for employability and research.
M3	To imbibe ethical values in graduates for the progressive social development.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

Graduates will be able to :

PEO 1	The graduates will be able to apply concepts from the fundamental engineering for solving problems in industry.
PEO 2	The graduates will be able to demonstrate the understanding of Mechanical engineering and allied areas to address complex real-life problems.
PEO 3	The graduates will be able to take responsibility to serve the society and to preserve the environment through ethical values.

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PROGRAM OUTCOMES (PO)	
PO 1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO 3	**Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO 5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSO)	
Students will be able to :	
PSO 1	Students will be able to acquire competencies in the usage of design, thermal, and manufacturing principals to develop product and process.
PSO 2	Students will be able to impart technological inputs and acquire managerial skills to become technocrats and entrepreneurs.

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MAPPING OF PEO'S TO PO'S											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
PEO 1	3	3	3	2	3	2	2	2	2	2	2
PEO 2	2	2	2	3	2	1	1	2	1	1	1
PEO 3	1	1	1	2	1	3	3	2	1	2	1

MAPPING OF PEO's TO PSO's		
	PSO 1	**PSO2**
PEO 1	3	2
PEO 2	2	2
PEO 3	2	3

A. Definition of Credit:

1 Hr. Lecture (L) per week 1	**1 credit**
1 Hr. Tutorial (T) per week	**1 credit**
1 Hr. Practical (P) per week	**0.5 credits**
2 Hours Practical (Lab)/week	**1 credit**

B. Range of Credits:

A range of credits from 160 to 176 for a student to be eligible to get undergraduate degree in engineering. Student will be eligible to get undergraduate degree with honors 18 credits and/or minors 14 credits, if one completes additional credits.

C. Structure & Definition:

SR.NO	DEFINATION	CODE
1.	Basic Science Course	BSC
2.	Engineering Science Course	ESC
3.	Program Core Courses	PCC
4.	Program Elective Course	PEC
5.	Multi Minor	MDM
6.	Open Elective	OE
7.	Vocational and Skill Enhancement Course	VSEC
8.	Ability Enhancement Course	AEC
9.	Entrepreneurship /Economics/ Management Courses (Mgt./Economics/Mkt./Finance)	EEM
10.	Indian Knowledge System	IKS
11.	Value Education Course	VEC
12.	Research Methodology (Project)	ECL
13.	Common Egg. Project/Field Project (PBL/Seminar/Mini Project)	
14.	Project	
15.	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical)	
16.	Co-curricular Courses	CC

D. Credit Framework:

The minimum and maximum credit structure for different levels under the Four-year Bachelor's UG Programme with multiple entry and multiple exit options are as given below:

Credits offered per Semester will be a minimum 20 and a maximum 22. While minimum credits are mandatory as per National Credit Framework, the Universities and Autonomous Engineering Colleges can evolve the mechanism for providing Semester/ Level wise credit attainment flexibility within the broad framework.

LEVEL	QUALIFICATION TITLE	CREDIT REQUIREMENTS		SEMESTER	YEAR
		MINMUM	MAXIMUM		
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	160	176	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. – Honors and Multidisciplinary Minor	180	194	8	4

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E. Structure Categories of UG Program:

SR. NO.	YEAR	FY		SY		TY		B. TECH			
	SEMESTER	I	II	III	IV	V	VI	VII	VIII	ACTUAL	NEP GUIDELINES
1	Basic Science Course	8	8							16	14-18
2	Engineering Science Course	7	5							12	12-16
3	Program Core Courses		2	16	14	10	12	7		61	44-56
4	Program Elective Course					4	6	7		17	20
5	Multi Minor			2	3	3	3	3		14	14
6	Open Elective			2	3	3				8	8
7	Vocational and Skill Enhancement Course	1	4		1	1	1			8	8
8	Ability Enhancement Course	3			1					4	4
9	Entrepreneurship /Economics/ Management Courses (Mgt./Economics/Mkt./Finance)								3	3	4
10	Indian Knowledge System		2							2	2
11	Value Education Course			1	1					2	4
12	Research Methodology (Project)								4	4	4
13	Common Egg. Project/Field Project (PBL/Seminar/Mini Project)			A						--	2
14	Project							4		4	4
15	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical)								12	12	12
16	Co-curricular Courses	1	1							2	4
	Total Credits	**20**	**22**	**21**	**23**	**21**	**22**	**21**	**19**	**169**	
	Examination Total	**900**	**900**	**950**	**950**	**900**	**900**	**800**	**300**	**6600**	
	Total Working Hours/Week	**26**	**27**	**27**	**26**	**24**	**26**	**27**	**37**	**220**	
	NEP Guidelines	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**		**160-176**

F. Semester wise credit distribution:

First Year B. Tech (Common for all Branches) **SEMESTER I**

SR. NO	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	HRS./WEEK	CR	COMPONENTS	MAX	MIN FOR PASSING	
1	BSC	25BSE1101	Engineering Mathematics: Calculus and Algebraic Technique	3	1	0	4	4	CA1 MSE CA2 ESE	15 20 15 50	 20	40
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/ Modern Chemistry	3	0	0	3	3	CA1 MSE CA2 ESE	15 20 15 50	 20	40
3	ESC	25BSE1102	Basic Electrical & Electronics Engineering	3	0	0	3	3	CA1 MSE CA2 ESE	15 20 15 50	 20	40
4	ESC	25BSE1103	C Programming for Problem Solving	2	0	0	2	2	CA1 MSE CA2 ESE	15 20 15 50	 20	40
5	AEC	25BSE1104	Communication Skills	2	0	0	2	2	CA1 MSE CA2 ESE	15 20 15 50	 20	40
6	BSC	25BSE1001L / 25BSE1002L	Engineering Physics Laboratory/ Modern Chemistry Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 --	 --	20
7	ESC	25BSE1102L	Basic Electrical & Electronics Engineering Laboratory	0	0	2	2	1	CA1 CA2 OE	25 25 50	 20	40
8	ESC	25BSE1103L	C Programming for Problem Solving Laboratory	0	0	2	2	1	CA1 CA2 POE	25 25 50	 20	40
9	AEC	25BSE1104L	Communication Skills Laboratory	0	0	2	2	1	CA1 CA2 POE	25 25 --	 --	20
10	VSEC	25BSE1105L	Engineering Practice Laboratory	0	0	2	2	1	CA1 CA2 POE	25 25 --	 --	20
11	CC	25BSE1106L	Yoga	0	0	2	2	1	CA1 CA2 POE	25 25 --	 --	20
			Total	**13**	**1**	**12**	**26**	**20**		**900**		
Total Contact hours 26 Hrs **Total credit 20**												

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First Year B. Tech (Common for all Branches) **SEMESTER II**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	HR/ WEEK	CR	COMPONENTS	MAX	MIN FOR PASSING	
1	BSC	25BSE1201	Engineering Mathematics: Calculus and Transform Methods	3	1	0	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/ Modern Chemistry	3	0	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	ESC	25BSE1202	Engineering Mechanics	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	ESC	25BSE1203	Python Programming	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	VSEC	25BSE1204	Computer Aided Engineering Drawing	2	0	0	2	2	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--		
6	PCC	25PCC1201	Fundamental of Industry Evolution	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
7	IKS	25BSE1205	Energy, Ecology & Environment	2	0	0	2	2	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	BSC	25BSE1001L/ 25BSE1002L	Engineering Physics / Modern Chemistry Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									POE	--	--	
9	ESC	25BSE1203L	Python Programming Laboratory	0	0	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
10	VSEC	25BSE1204L	Computer Aided Engineering Drawing Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									POE	--	--	
11	VSEC	25BSE1205L	Design Thinking	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--	--	
12	CC	25BSE1206L	Community Services	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--	--	
			Total	**16**	**1**	**10**	**27**	**22**		**900**		
Total Contact hours 27 Hrs Total credit 22												

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Second Year B. Tech **SEMESTER III**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING	
1	PCC	25MEC2301	Engineering Materials and Metallurgy	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25MEC2302	Thermodynamics	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25MEC2303	Strength of Material	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PCC	25MEC2304	Fundamental of Mechatronics	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	*OE	25OE23XX	Open Elective I	2	--	--	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	#MDM	25MMXXX2301	Multidisciplinary Minor-I	2	--	--	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
7	VEC	25VEC2002	Universal Human Values	1	--	--	1	1	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	PCC	25MEC2301L	Engineering Science and Metallurgy Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
9	PCC	25MEC2304L	Fundamental of Mechatronics Laboratory	--	--	2	2	1	CA1	25		20
									CA2	25		
									POE	--		
10	PCC	25MEC2305L	Computer Aided Machine Drawing Laboratory	--	--	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
11	CEP	25MEC2306L	Community Engagement Project /Field Project	--	--	2	2	AU	CA1	25		20
									CA2	25		
									POE	--	--	
12	Internship	25MEC2307L	Filed Training/ Internship Evaluation	--	--	--	--	AU	--	--	--	--
Total				**17**	**--**	**10**	**27**	**21**		**950**		
Total Contact hours 27 Hrs **Total credit 21**												

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Open Elective Course – I (OE-I):

Sr. No	Course code	Course Name
1.	25OE2301	Enhancing Soft Skill and Personality
2.	25OE2302	Ethics in Engineering Practices
3.	25OE2303	Introduction to Project Management

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Second Year B. Tech **SEMESTER IV**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING	
1	PCC	25MEC2401	Manufacturing Processes - I	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25MEC2402	Fluid Mechanics	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25MEC2403	Kinematics of Machines and Mechanism	3	1	--	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PCC	25MEC2404	Metrology and Quality Control	2	--	--	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	*OE	25OE24XX	Open Elective II	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	#MDM	25MMXXX2401	Multidisciplinary Minor-II	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
7	VEC	25VEC2001	Constitute of India	1	--	--	1	1	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	AEC	25AEC2001	Modern Language	1	--	--	1	1	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
9	PCC	25MEC2402L	Fluid Mechanics Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
10	PCC	25MEC2404L	Metrology and Quality Control Laboratory	--	--	2	2	1	CA1	25		20
									CA2	25		
									POE	--	--	
11	VSEC	25MEC2405L	Workshop Practices Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
TOTAL				**19**	**1**	**6**	**26**	**22**		**950**		
Total Contact hours 26 Hrs Total credit 22												

*** Student must complete a two week internship after the semester, which will be evaluated in the following semester**

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Open Elective Course – II (OE-II):

Sr. No	Course code	Course Name
1.	25OE2401	Business Communication
2.	25OE2402	E-Business
3.	25OE2403	Intellectual Property Rights

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Third Year B. Tech **SEMESTER V**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING	
1	PCC	25MEC3501	Heat Transfer	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25MEC3502	Design of Machine Elements	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25MEC3503	Robotics and Control System	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PEC	25PEMEC35XX	Program Elective -I	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	*OE	25OE35XX	Open Elective III	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	#MDM	25MMXXX3501	Multidisciplinary Minor-III	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
7	PCC	25MEC3501L	Heat Transfer Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
8	PEC	25PEMEC35XXL	Program Elective –I Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
9	VSEC	25MEC3504L	Numerical Method with Matlab Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
10	Internship	25MEC3505L	Field Training/ Internship Evaluation	--	--	--	--	AU	--	--	--	--
TOTAL				**18**	**--**	**06**	**24**	**21**		**900**		
Total Contact hours 28 Hrs Total credit 21												

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Program Elective Course – I (PEC-I):

Sr. No	Course code	Course Name
1.	25PEMEC3501	Hydraulic and Pneumatics
2.	25PEMEC3502	Automobile Engineering
3.	25PEMEC3503	Fluid Machinery

Open Elective Course – III (OE-III):

Sr. No	Course Name 1	Course Name
1.	25OE3501	Employability and Skills Development
2.	25OE3502	Business Fundamentals for Entrepreneurs
3.	25OE3503	Patent law for engineers and scientists

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Third Year B. Tech **SEMESTER VI**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME		
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING
1	PCC	25MEC3601	Manufacturing Processes-II	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
2	PCC	25MEC3602	Mechanical Vibration and Acoustic	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
3	PCC	25MEC3603	Applied Thermodynamics	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
4	PEC	25PEMEC36XX	Program Elective-II	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
5	PEC	25PEMEC36XX	Program Elective-III	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
6.	#MDM	25MMXXX3601	Multidisciplinary Minor-IV	3	--	--	3	3	CA1	15	40
									MSE	20	
									CA2	15	
									ESE	50	20
7	PCC	25MEC3601L	Manufacturing Processes-II Laboratory	--	--	2	2	1	CA1	25	20
									CA2	25	
									POE	--	--
8	PCC	25MEC3602L	Mechanical Vibration and Acoustic Laboratory	--	--	2	2	1	CA1	25	40
									CA2	25	
									POE	50	20
9	PCC	25MEC3603L	Applied Thermodynamics Laboratory	--	--	2	2	1	CA1	25	40
									CA2	25	
									OE	50	20
10	VESC	25MEC3604L	3D Modelling Laboratory	--	--	2	2	1	CA1	25	40
									CA2	25	
									POE	50	20
TOTAL				**18**	**0**	**8**	**26**	**22**		**900**	
Total Contact hours 26 Hrs Total credit 22											

*** Student must complete a two week internship after the semester, which will be evaluated in the following semester**

Program Elective Course – II (PEC-II):

Sr.No	Course code	Course Name
1.	25PEMEC3601	Product Life Cycle Management
2.	25PEMEC3602	E-Vehicles
3.	25PEMEC3603	Process Equipment Design

Program Elective Course – III (PEC-III):

Sr.No	Course Name 1	Course Name
1.	25MEC3604	Advanced Manufacturing Processes
2.	25MEC3605	Tribology
3.	25MEC3606	Total Quality Management

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Final Year B. Tech **SEMESTER VII**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING	
1	PCC	25MEC4701	CAE	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25MEC4702	IEOR	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PEC	25PEMEC47XX	Program Elective - IV	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PEC	25PEMEC47XX	Program Elective - V	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	#MDM	25MMXXX4701	Multidisciplinary Minor-V	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	PCC	25MEC4701L	CAE Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
7	PEC	25PEMEC47XXL	Program Elective – IV Laboratory	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
8	ELC	25MEC4703P	Mini Project	--	--	8	8	4	CA1	25		40
									CA2	25		
									POE	50	20	
9	Internship	25MEC4704L	Filed Training/ Internship Evaluation	--	--	--	--	AU	--	--	--	--
TOTAL				**15**	**0**	**12**	**27**	**21**		**800**		
Total Contact hours 30 Hrs Total credit 21												

Program Elective Course – IV (PEC-IV):

Sr. No	Course code	Course Name
1.	25PEMEC4701	Additive Manufacturing
2.	25PEMEC4702	Nano Technology
3.	25PEMEC4703	Sustainable Development

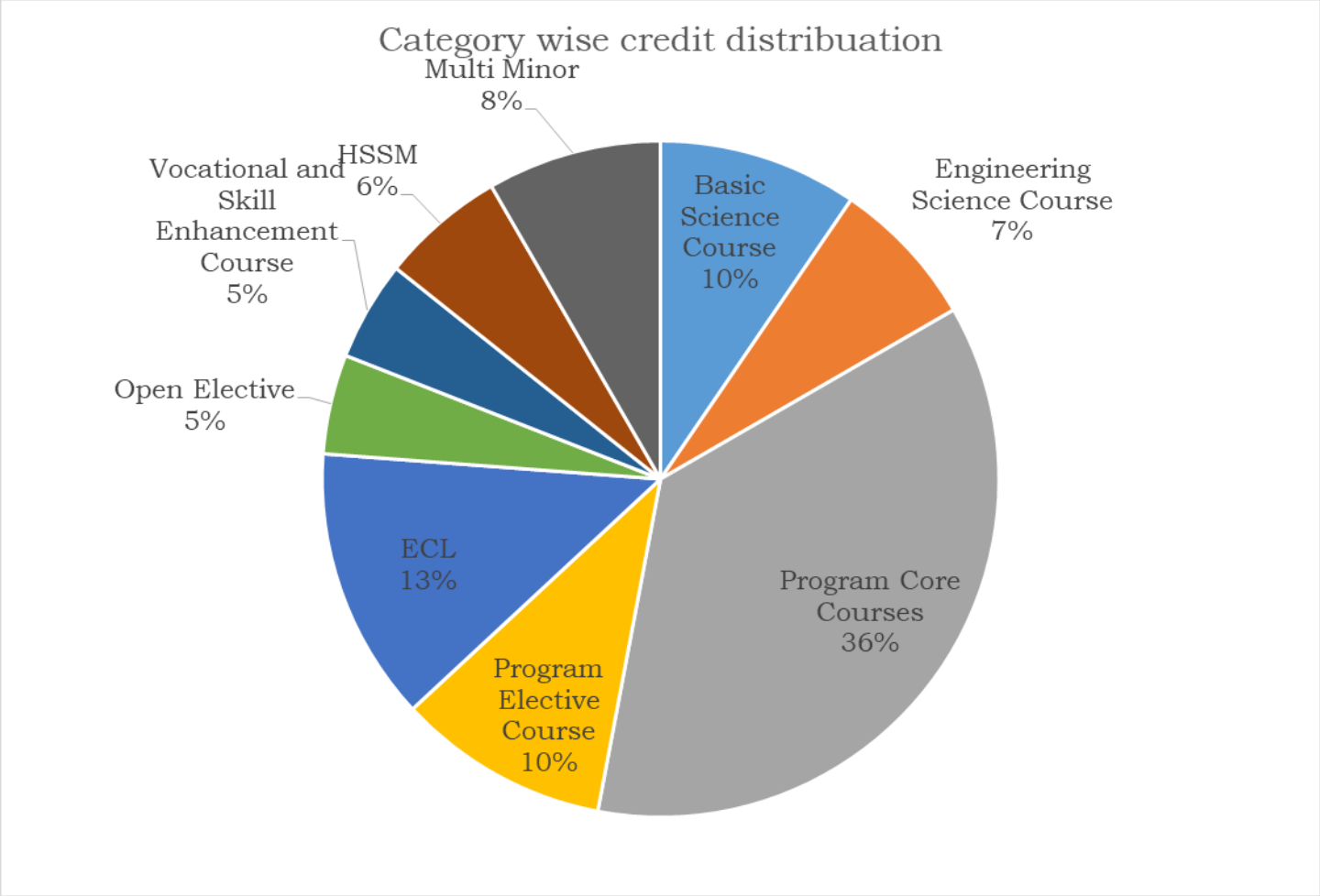
Program Elective Course – V (PEC-V):

Sr. No	Course code	Course Name
1.	25PEMEC4704	Renewable Energy Sources
2.	25PEMEC4705	Solar Energy
3.	25PEMEC4706	Industrial Automation

Final Year B. Tech **SEMESTER VIII**

SR. NO.	CATEGORY	COURSE CODE	COURSE NAME	TEACHING SCHEME					EVALUATION SCHEME			
				L	T	P	Hrs./Week	CR	COMPONANTS	MAX	MIN FOR PASSING	
1	HSSM	25HSM4801	Finance Management	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	ELC	25ELC4801	Research Methodology	4	--	--	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	ELC	25MEC4801	Industrial Internship / Research Internship	--	--	--	30	12	CA	50		40
									OE	50	20	
Total				**7**	**--**	**--**	**37**	**19**		**300**		

G. Category wise Credit Distribution



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PCC: PROGRAM CORE COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PCC1201	Fundamentals of Industry Evolution	2	--	--	2	2
2.	25MEC2301	Engineering Materials and Metallurgy	3	--	2	5	4
3.	25MEC2302	Thermodynamics	3	--	--	3	3
4.	25MEC2303	Strength of Material	3	--	--	3	3
5.	25MEC2304	Fundamental of Mechatronics	3	--	2	5	4
6.	25MEC2305L	Computer Aided Machine Drawing	--	--	4	4	2
7.	25MEC2401	Manufacturing Processes - I	3	--	--	3	3
8.	25MEC2402	Fluid Mechanics	3	--	2	5	4
9.	25MEC2403	Kinematics of Machines and Mechanism	3	1	--	4	4
10.	25MEC2404	Metrology and Quality Control	2	--	2	4	3
11.	25MEC3501	Heat Transfer	3	--	2	5	4
12.	25MEC3502	Design of Machine Elements	3	--	--	3	3
13.	25MEC3503	Robotics and Control System	3	--	--	3	3
14.	25MEC3601	Manufacturing Processes-II	3	--	2	5	4
15.	25MEC3602	Mechanical Vibration and Acoustic	3	--	2	5	4
16.	25MEC3603	Applied Thermodynamics	3	--	2	5	4
17	25MEC4701	CAE	3	--	2	5	4
18	25MEC4702	IEOR	3	--	--	3	3
Total			**49**	**1**	**22**	**72**	**61**

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PEC: PROGRAM ELECTIVE COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PEMEC3501	Hydraulic and Pneumatics	3	--	1	5	4
2.	25PEMEC3502	Automobile Engineering					
3.	25PEMEC3503	Fluid Machinery					
4.	25PEMEC3601	Product Life Cycle Management	3	--	--	3	3
5.	25PEMEC3602	E-Vehicles					
6.	25PEMEC3603	Process Equipment Design					
7.	25PEMEC3604	Advanced Manufacturing Processes	3	--	--	3	3
8.	25PEMEC3605	Tribology					
9.	25PEMEC3606	Total Quality Management					
10	25PEMEC4701	Additive Manufacturing	3	--	2	5	4
11	25PEMEC4702	Nano Technology					
12	25PEMEC4703	Sustainable Development					
13	25PEMEC4704	Renewable Energy Sources	3	--	--	3	3
14	25PEMEC4705	Solar Energy					
15	25PEMEC4706	Industrial Automation					
Total			**15**	**--**	**2**	**19**	**17**

OEC: OPEN ELECTIVE COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25OE2301	Enhancing Soft Skill and Personality	2	--	--	2	2
2.	25OE2302	Ethics in Engineering Practices					
3.	25OE2303	Introduction to Project Management					
4.	25OE2401	Business Communication	3	--	--	3	3
5.	25OE2402	E-Business					
6	25OE2403	Intellectual Property Rights					
7.	25OE3501	Employability and Skills Development	3	--	--	3	3
8.	25OE3502	Business Fundamentals for Entrepreneurs					
9	25OE3503	Patent law for engineers and scientists					
Total			**8**	**--**	**--**	**8**	**8**

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VSEC:VOCATIONAL AND SKILL ENHANCEMENT COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25BSE1105L	Engineering Practice Laboratory	--	--	2	2	1
2.	25BSE1204	Computer Aided Engineering Drawing	2	--	2	4	3
3.	25BSE1205L	Design Thinking	--	--	2	2	1
4.	25MEC2405L	Workshop Practices Laboratory	--	--	2	2	1
5.	25MEC3504L	Numerical Methods with MATLAB	--	--	2	2	1
6.	25MEC3604L	3D Modelling Laboratory	--	--	2	2	1
Total			**2**	**--**	**12**	**14**	**8**

HUMANITIES SOCIAL SCIENCE AND MANAGEMENT COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25BSE1104	Communication Skills	2	--	2	3	3
2.	25BSE1205	Ecology, Energy & Environment	2	--	--	2	2
3	25VEC2001	Constitution of India	1	--	--	1	1
4.	25VEC2002	Universal Human Values	1	--	--	1	1
5	25AEC2401	Modern Language	1	--	--	1	1
6	25HSM4801	Financial Management	3	--	--	3	3
Total			**10**	**--**	**2**	**12**	**11**

EXPERIENTIAL LEARNING							
Sr. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	25MEC2305L	Field project	--	--	2	2	A
2.	25MEC4705P	Project	--	--	8	8	4
3.	25ELC4801	Research Methodology	4	--	--	4	4
3.	25MEC4801	Industrial Internship / Research Internship/	--	--	24	24	12
Total			**4**	**--**	**34**	**38**	**20**

H. Multi-Disciplinary Minor Courses (MDM): Offered by Mechanical Department: Mechatronics

Sr. No.	**Course Code**	**Semester**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	25MMMEC2301	III	Introduction of Mechatronics	2	--	--	2	2
2.	25MMMEC2401	IV	Design of Mechatronics	2	--	1	3	3
3.	25MMMEC3501	V	Sensor technology	3	--	--	3	3
4.	25MMMEC3601	VI	Mechatronics in Automotive System	3	--	--	3	3
5.	25MMMEC4701	VII	Industrial Automation	3	--	--	3	3
Total				**14**	**--**	**--**	**14**	**14**

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Multi-Disciplinary Minor : MDM Courses offered by AI & DS Department (Data Science)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMADS2301	Statistics for Engineers	3	--	--	3	3
2.	25MMADS2401	Data Analytics & Visualisation	2	--	--	2	2
3.	25MMADS3501	Fundamentals of Artificial Intelligence	3	--	--	3	3
4.	25MMADS3601	Machine Learning & Algorithms	3	--	--	3	3
5.	25MMADS4701	Prompt Engineering	3	--	--	3	3
Total			**14**	**--**	**--**	**14**	**14**

Multi-Displinary Minor MDM Courses offered by CSE Department (Minor Machine Learning & Data Science)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMCSE2301	1.Data Structure and Algorithms	2			2	2
2.	25MMCSE2401	2. Mastering Object Oriented Programming	2		2	3	3
3.	25MMCSE3501	3. Database engineering & Distributed System	2	1		3	3
4.	25MMCSE3601	4. Machine Learning & Its Applications	2		2	3	3
5.	25MMCSE4701	5. Deep Learning and Applied Generative AI	2	1		3	3
Total			**10**	**2**	**4**	**14**	**14**

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Multi-Displinary Minor MDM: Courses offered by ETC Department (Minor in IOT & Its Application)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMETC2301	Digital Electronics	3	--	--	3	3
2.	25MMETC2401	Fundamentals of Embedded Systems	2	--	--	2	2
3.	25MMETC3501	Microcontrollers & Interfacing	2	--	2	4	3
4.	25MMETC3601	IOT Architectures & Protocols	3	--	--	3	3
5.	25MMETC4701	IOT Application Development	3	--	--	3	3
Total			**13**	**--**	**2**	**15**	**14**

Multi-Displinary Minor MDM: Courses offered by ELE Department (Electric Vehicle Technology)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMEEE2301	Fundamental of Electric Vehicles	3	--	--	3	3
2.	25MMEEE2401	Embedded System for EV	2	--	--	2	2
3.	25MMEEE3501	AI & IOT in Electric Vehicles	3	--	--	3	3
4.	25MMEEE3601	Autonomous & EV Technology	3	--	--	3	3
5.	25MMEEE4701	Emerging Trends in EV	3	--	--	3	3
Total			**14**	**--**	**--**	**14**	**14**

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I. Exit Courses

EXIT COURSE AFTER FIRST YEAR: ONE YEAR UG DIPLOMA IN Mechanical Engineering

Sr.No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./W	Cr	Components	Max	Min for Passing	
1	VSEC	25MECEX101	Engineering Drawing & CAD Basics	1	--	2	3	2	CA1	25		40
									MSE	--		
									CA2	25		
									ESE	50	20	
2	VSEC	25MECEX102	Employability & Safety Practices	2	-	--	2	2	CA1	25		40
									MSE	--		
									CA2	25		
									ESE	50	20	
3	ELC	25MECEX103	Industrial Internship / Field Training	--	--	8	8	4	CA1	25		40
									CA2	25		
									OE	50	20	
Total				**3**	**--**	**10**	**13**	**8**		**300**		

EXIT COURSE AFTER SECOND YEAR: TWO YEAR UG DIPLOMA IN Mechanical Engineering

Sr.No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./W	Cr	Components	Max	Min for Passing	
1	VSEC	25MECEX201	Industrial Auto CAD Drawing	--	--	4	4	2	CA1	25		40
									MSE	--	--	
									CA2	25		
									ESE	50	20	
2	VSEC	25MECEX202	CNC Programming	--	--	4	4	2	CA1	25		40
									MSE	--	--	
									CA2	25		
									ESE	50	20	
3	ELC	25MECEX203	Industrial Internship in above	--	--	8	8	4	CA1	25		40
									CA2	25	20	
									OE	50		
									CA1	25	--	
Total				**4**	**--**	**14**	**18**	**8**		**300**		

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EXIT COURSE AFTER THIRD YEAR: THIRD YEAR BACHELOR'S DEGREE IN VOCATION (B.VOC) IN Mechanical Engineering

Sr.No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./W	Cr	Components	Max	Min for Passing	
1	VSEC	25MECEX301	Design and Drafting	--	--	4	4	2	CA1	25	--	40
									MSE	--		
									CA2	25		
									ESE	50	20	
2	VSEC	25MECEX302	Piping Design	--	--	2	4	2	CA1	25	--	40
									MSE	--		
									CA2	25		
									ESE	50	20	
3	ELC	25MECEX303	Mini Project	--	--	8	8	4	CA1	25	20	40
									CA2	25		
									OE	50		40
									CA1	25	--	
Total				**2**	**--**	**18**	**20**	**11**		**300**		

J. Emerging/Minor Degree: Mechanical Engineering: Emerging Minor in Green Technology

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25MECEM001	Renewable Energy Systems	3	1	0	4	4
2.	25MECEM002	Industrial Waste Management and Recycling	3	1	0	4	4
3	25MECEM003	Energy Conservation and Management	3	1	0	4	4
4.	25MECEM004	Sustainable Engineering	3	1	0	4	4
5	25MECEM005	Energy Storage Systems	2	0	0	2	2
Total			**18**	**4**	**0**	**22**	**18**

K. Honors Degree: Mechanical Engineering B. Tech (Robotics)

Sr. No.	Course Code	Semester	Course Name	L	T	P	Hrs. / Week	Credits
1.	25MECHS001	III	Fundamentals of robotics	3	1	--	4	4
2.	25MECHS002	IV	Fundamentals of microcontrollers	3	1	--	4	4
3.	25MECHS003	V	Programming & simulations for robotics	3	1	--	4	4
4.	25MECHS004	VI	Robot kinematics and dynamics	3	1	--	4	4
5.	25MECHS005	VII	Mini project	--	--	4	4	2
		Total		**12**	**4**	**4**	**20**	**18**

Title of the Course: Engineering Materials and Metallurgy	**L**	**T**	**P**	**Credit**
Course Code: 25MEC2301	**3**	**--**	**-**	**3**

Course Pre-Requisite: Engg. Physics, Engg. Chemistry

Course Description: This course introduces the fundamental concepts of engineering materials, including their structure, properties, testing, phase transformations, and heat treatment processes. It covers ferrous and non-ferrous alloys, polymers, ceramics, composites, and advanced materials. The course also emphasizes material selection methods and the application of Artificial Intelligence (AI) and Machine Learning (ML) in materials design, characterization, and performance evaluation, enabling students to understand the relationship between material processing, structure, properties, and engineering applications.

Course Objectives:

1. To understand material structures and evaluate their mechanical properties using destructive and non-destructive tests.
2. To study phase diagrams and phase transformations to analyze structural behavior of metals and alloys.
3. To learn the composition, properties, and applications of non-ferrous, non-metallic, and advanced engineering materials.
4. To understand heat treatment processes and equipment used to improve the properties of ferrous and non-ferrous materials.
5. To introduce AI/ML applications in materials engineering for predicting behavior, designing materials, and improving characterization.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Explain crystal structures, deformation, strengthening mechanisms, and evaluate material properties through standard tests.
CO2	Interpret phase diagrams, understand solidification and transformations using TTT/CCT diagrams, and predict microstructures.
CO3	Identify non-ferrous alloys and advanced materials, understand their properties, and select suitable materials for applications.
CO4	Choose and apply heat treatment processes, evaluate hardenability, detect defects, and explain surface and chemical treatments.
CO5	Use AI/ML tools to analyze material data, link processing–structure–property relations, and support data-driven materials design.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	1	2	1					1		2	2
CO2	3	2	2	2	1					1		3	2
CO3	3	2	1	2						1		2	2
CO4	3	3	1	2						1		3	2
CO5	2	2	2	3	3					2		3	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Unit 1: A) Structure of Materials:** Introduction to Metallic, Non-metallic, advanced materials and classification , Crystal Structures: Atomic arrangement: crystalline vs. amorphous materials; unit cell, space lattice, 14 Bravais lattices, lattice parameters, 7 crystal systems; BCC, FCC, and HCP structures: Basic Characteristics: average number of atoms per unit cell, Coordination number, atomic packing factor; Crystal defects, Deformation of metals, Role of dislocations in deformation, Strengthening Mechanisms, **B) Mechanical Properties and their Testing:** Evaluation of properties: proportional stress, elastic limit, ultimate tensile strength, breaking or fracture stress, yield stress, proof stress, resilience, toughness, stiffness, ductility, Introduction: Definition, importance; Microscopy: Specimen preparation; Macroscopy: Procedure and methods; Macro tests: Sulphur printing, flow lines observation, Destructive testing: Tensile, Compressive, Impact, Fatigue, Creep, Hardness Non-destructive testing: Dye penetrant test, magnetic particle inspection, ultrasonic test, radiography, and eddy current test.	10
2	**Unit 2: Phase Diagram and Phase Transformations:** Objectives and classification, System, phases and structural constituent of phase diagram, Solid solutions, Hume-Rothery rules of solid-solubility, Gibb's phase rule, Lever rule, Iron –Carbon equilibrium diagram, Eutectic, Peritectic and eutectoid system, Equilibrium diagrams for non -ferrous alloys, Experimental methods of determining phase diagrams. Phase transformations: - Concept of solidification of metals, Solidification of pure metals, Nucleation, Growth, Growth of the new phase,	10

	Solidification of alloys, Nucleation, growth and overall transformation rates, TTT and CCT diagrams	
3.	**Unit 3: Non-ferrous alloys, Non-metallic and Advanced materials:** Alloys of Copper, Aluminum, Magnesium, Titanium, other alloys of Lid, tin, zinc, nickel, manganese, white metals and bearing alloys, polymers, ceramics, composites, smart materials, nano materials, Bio materials, Copper based alloys: Brass-Types, Bronze-Types [Cu-Sn, Cu-Be, Cu-Ni], Aluminum based alloys: Al-Cu (Duralumin), Al-Si (Modification treatment)	8
4.	**Unit 4: Heat treatment Processes;** Heat Treatment Furnaces and Equipment, Processes: Annealing-Types, Normalizing, Hardening, Tempering, Austempering, Martempering, Phase Transformation During Tempering, Quenching Media, Quenching Mechanism, Hardenability-Concept and Hardenability Measurement and Jominy End Quench Test, Tempering -Types and Purposes , Heat treatment Defects and Remedies, Precipitation Hardening (Non Ferrous), Surface hardening: Flame and Induction, Chemical Heat Treatments-Case hardening- Carburizing, Nitriding, Carbonitriding	8
5.	**Unit 5: Artificial Intelligence and Machine Learning in Materials Engineering**, Ashby Method for Material Selection**,** why AI/ML in Materials Engineering, Correlation between processing with materials structure, Machine Learning Approaches for Materials Design Statistical Tools, Machine Learning, Machine Learning Approaches for Materials Design: Microstructure property correlation, Materials Knowledge and Materials Data Science: AI/ML for materials characterization.	6

Text Books

Sr.No	Title	Author	Publisher
1.	Material science and metallurgy for engineers	V. D. Kodgire,	Everest Publishers Pune
2.	Material Science and Engineering	V Raghwan,	Prentice Hall of India Pvt. Ltd., New Delhi ,3rd Edition, 1995.
3.	Material science and engineering	W. D Callister	Wiley India Pvt. Ltd., 5th Edition.
4.	Principles of Materials Science and Engineering,	William F. Smith,	Third Edition, 2002, McGraw-Hill
5.	Heat Treatments Principles and Practices	T.V. Rajan / C.P. Sharma	Prentice Hall of India Pvt Ltd, New Delhi

Reference Books			
1.	Materials Science and Engineering	V. Raghvan	PHI Publication, 5th Edition, 2009
2.	Engineering Metallurgy	R.A. Higgins	Viva Books Pvt. Ltd., New Delhi, 1 st Edition
3.	The Science and Engineering of materials	Donald Askeland, Pradeep Fuley, Wendelin J. Wright	6th Edition, Publisher Global Engineering

Add resource link like NPTEL - https://nptel.ac.in/courses/113107078

Title of the Course: Thermodynamics **Course Code:** 25MEC2302	**L**	**T**	**P**	**Credit**
	3	--	-	3

Course Pre-Requisite: Engg. Physics, Engg. Mathematics

Course Description: This course introduces the fundamental principles of thermodynamics and their engineering applications. It covers energy interactions, laws of thermodynamics, properties of pure substances, and thermodynamic cycles. The course emphasizes both theoretical understanding and numerical problem-solving related to heat engines, refrigeration systems, and power plants. It provides a foundation for advanced thermal engineering subjects.

Course Objectives:

1. To understand fundamental thermodynamic concepts, systems, properties, and heat-work interactions.
2. To apply the first law of thermodynamics for energy analysis of closed and open systems.
3. To analyze thermodynamic processes using the second law and entropy principles.
4. To evaluate properties of pure substances and ideal gases using thermodynamic relations and charts.
5. To analyze and compare the performance of vapor and air standard power cycles.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Recall thermodynamic concepts, systems, properties, and heat/work interactions.
CO2	Apply the first law of thermodynamics to closed and open systems and solve related numerical problems.
CO3	Analyze thermodynamic systems using the second law and entropy principles.
CO4	Evaluate properties of pure substances and ideal gases using thermodynamic charts and tables.
CO5	Explain the air and vapor power cycle and calculate cycle performance.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	-	-	-	-	1	-	2	-
CO2	3	3	2	2	1	-	-	-	-	1	1	1	-
CO3	3	3	2	2	-	-	1	-	-	1	1	1	-
CO4	3	3	2	2	1	-	-	-	-	1	1	1	-
CO5	3	3	3	2	2	-	1	-	1	1	2	1	-

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Fundamental Concepts and Definitions** Thermodynamic system and its type; Macroscopic vs. Microscopic viewpoint, properties, processes and cycles, point function, path function. Thermodynamic equilibrium, Quasi-static process temperature and its measurement. Zeroth law of thermodynamics. Boyle's law, Charl's law, Avogadro's law, universal gas constant, ideal processes with question, other equation of states.	6
2.	**First Law of Thermodynamics** **Work and heat Transfer**: Work transferred and other types of work, Heat transfer, specific heat and latent heat, relationship between CP and CV (Numerical Treatment). First law of thermodynamics for a closed system undergoing a cycle and change of state, Energy, different forms of energy, Enthalpy, PMM-I control volume. **Application of first law Thermodynamics** Steady flow processes (nozzle, turbine, compressor, pump, boiler, throttle valve etc.) (Numerical Treatment)	9
3.	**Second Law of Thermodynamics** Limitation of first law of thermodynamics, cycle heat engine, refrigerator and heat pump, Kelvin- Plank and Clausius statements and their equivalence, Reversibility and Irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale (Numerical treatment). **Entropy:** Introduction, Clausius theorem, T-s plot, Clausius inequality, Entropy and Irreversibility, Entropy principle and its	9

	application, combined First and Second laws, Entropy and direction, Entropy and disorder.	
4	**Properties of Pure Substance** Formation of steam, representation of processes of steam on p-v, T-s, and other diagrams, Phase change phenomenon of pure substance, phase diagram of pure substance, p-v, T-s, and h-s diagrams properties of steam, critical point parameters, triple point, property table, Dryness fraction and its measurement. (Numerical Treatment)	9
5	**Air and Vapor Power Cycles** **Vapor Power Cycle** Carnot cycle using steam, limitations of Carnot cycle, Rankine cycle, representation on T–s and h–s planes, thermal efficiency, specific steam consumption, work ratio, effect of steam supply pressure and temperature. **Air standard cycles** Basic Considerations in the Analysis of Power Cycles, An Overview of Reciprocating Engines, Otto Cycle, Diesel Cycle, and Brayton Cycle (Numerical Treatment)	9

Text Books

Sr.No	Title	Author	Publisher
1.	Thermodynamics	P. K. Nag	Tata McGraw Hill Publication
2.	Thermal Engineering	R. K. Rajput	Laxmi Publication
3.	Thermal Engineering	Domkundwar A	Dhanpat Rai & Co
4.	Thermodynamics an engineering Approach	Cengel and Boles	Tata McGraw Hill Publication

Reference Books

1.	Thermodynamics	J. P. Holman	Tata McGraw Hill Publication
2.	Fundamentals of Thermodynamics	Sonntag, R. E, Borgnakke, C. and Van Wylen, G.	John Wiley and Sons
3.	Thermal Engineering	Kumar & Vasandani	Metropolitan Book Co.

Useful Link
https://archive.nptel.ac.in/courses/112/105/112105123/

Title of the Course: Strength of Materials **Course Code:** 25MEC2303	**L**	**T**	**P**	**Credit**
	3	--	--	3

Course Pre-Requisite: Engg. Physics, Engg. Mathematics, Engg. Mechanics

Course Description: This course introduces the fundamental concepts of Strength of Materials and their applications in engineering design and analysis. It covers stresses and strains, principal stresses, shear force and bending moment diagrams, deflection of beams, stresses in beams, torsion of shafts, and column theory. The course enables students to analyze the behavior of structural members subjected to different loading conditions and to evaluate their strength, stiffness, and stability for safe engineering applications.

Course Objectives:

1. To understand the concepts of stress, strain, elastic behavior of materials, thermal stresses, and determination of principal stresses using analytical and graphical methods.
2. To develop the ability to analyze different types of beams and construct shear force and bending moment diagrams under various loading conditions.
3. To study bending and shear stresses in beams and apply flexural and shear stress theories for analysis and design of beam sections.
4. To understand the relationship between load, bending moment, slope, and deflection and apply analytical methods for beam deflection calculations.
5. To understand torsional behavior of shafts and stability analysis of columns under axial compressive loading.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Determine stresses, strains, elastic constants, thermal stresses, and principal stresses for engineering components subjected to different loading conditions.
CO2	Calculate shear force and bending moment and draw SFD and BMD for determinate beams subjected to different types of loads.
CO3	Analyze bending and shear stress distribution in beams and design beam sections based on strength requirements.
CO4	Determine slope and deflection of simply supported and cantilever beams using double integration and Macaulay's method.
CO5	Determine torsional stresses and deformation in shafts and evaluate buckling load of columns using Euler's and Rankine's theories.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	3	2	1	1	-	-	-	-	-	2	2	-

CO2	3	3	2	2	1	-	-	-	-	-	2	1	-
CO3	3	3	3	2	1	-	-	-	-	-	2	1	-
CO4	3	3	3	2	2	-	-	-	-	-	2	1	-
CO5	3	3	3	2	2	-	-	-	-	-	2	1	-

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Stresses and Strain** Stresses and Strains Concept of stress and strain (linear, lateral, shear & volumetric), Hooke's Law, Stress- strain curve, Elastic constants & their relationship, stresses, strains and deformation in determinate homogeneous under concentrated loads, poissons ratio, Bulk modulus, interrelationship between elastic constants, thermal stresses. **Principal Stresses** Normal and shear stresses on any oblique planes and concept of principal stresses and planes, expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear. Graphical solution using Mohr's circle of stresses.	9
2.	**Shear Force and Bending Moment Diagram** Introduction to different types of beams, different types of supports & loads. Concept and definition of shear force and bending moment in determinant beams due to concentrated loads, UDL, UVL and couple. Construction of shear force and bending moment diagram for cantilever, and simple beams, defining position of point of contra flexure.	9

3.	**Stresses in Beams** **Theory of simple bending**, Concept and assumptions, Derivation of flexure formula, Bending stresses distribution diagram, Moment of resistance and section modules calculations, design of rectangular and circular (solid and hollow) sections; L, I and T sections **Shear Stress in Beams**: Concept and derivation of shear stress distribution formula, Shear stress distribution diagram for symmetrical and unsymmetrical section, maximum and average shear stress.	9
4	**Deflection of Beams,** Deflection of Beams: Concept and definition, relation between Bending moment, slope and deflection, methods for calculation of slope and deflection for simply supported beam, cantilever beam by double integration and Macaullays method.	7
5	**Torsion and Columns** **Torsion:** Derivation of torsion formula, stresses and deformation in determinate shafts of solid and hollow. **Columns:** Concept of critical load and bucking, Theory of Columns, Short columns and long columns, End conditions, Euler's formula, Rankine's formula.	8

Text Books

Sr.No	Title	Author	Publisher
1.	Strength of Material	S Ramamurtham	Dhanpat Rai & Co
2.	Strength of Material	R. K. Rajput	Laxmi Publication
3.	Mechanics of Materials	Beer and Johnson	McGraw Hill

Reference Books

1.	Strength of Material	G. H. Gidar	Mac Milan India Ltd
2.	Strength of Material	Timoshenko and Youngs	East-West Pvt Press Ltd
3.	Mechanics of Materials	Hibbler R C	Pearson Education Publication

Useful Link

https://onlinecourses.nptel.ac.in/noc23_me140/preview

Title of the Course: Fundamental of Mechatronics	**L**	**T**	**P**	**Credit**
Course Code: 25MEC2304	3	--	--	3

Course Pre-Requisite: Nil

Course Description: This course introduces the fundamentals of mechanisms, machine elements, and motion transmission systems used in mechanical engineering applications. It covers basic concepts of mechatronics systems, control systems, sensors, actuators, and their industrial applications. The course also provides knowledge of PLC architecture, ladder logic programming, and automation systems used in modern industries. Students will understand the integration of mechanical, electrical, and control systems in manufacturing and automation. The course further introduces emerging technologies such as robotics and Industry 4.0.

Course Objectives:

1. To understand fundamentals of mechanical systems and mechanisms.
2. To study machine elements and motion transmission systems.
3. To introduce the fundamentals, scope, and components of mechatronics systems and basic control system concepts.
4. To develop understanding of sensors, transducers, and actuators used in mechatronic and automation systems.
5. To introduce the construction, working principle, functions, and programming concepts of Programmable Logic Controllers used in industrial automation.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Explain mechanical systems, mechanisms and motion analysis.
CO2	Identify machine elements and mechanical power transmission systems.
CO3	Illustrate the concept, scope, and components of mechatronics systems and differentiate between open loop and closed loop control systems.
CO4	Classify sensors, transducers, and actuators and explain their working principles in mechatronic and automation systems.
CO5	Demonstrate PLC functions, hardware components, and basic programming used in industrial automation systems.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	-	1	-	-	-	1	1	-	1	-
CO2	3	3	2	1	2	-	-	-	1	1	-		-

CO3	2	2	2	1	3	-	-	-	1	1	1	1	-
CO4	2	2	2	1	3	-	-	-	1	1	1		-
CO5	2	2	3	2	3	-	1	-	1	1	2		-

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Basics of Mechanisms** Role of Mechanical Engineering in industry and society, Evolution of mechanical systems, Definition of link, pair, kinematic chain and mechanism, Degree of freedom and constrained motion, Kinematic diagrams and inversions, Single and double slider crank mechanisms, Geneva mechanism, quick return mechanism and steering gear mechanism, Applications of mechanisms in automation systems.	8
2.	**Mechanical Engineering Design** Design considerations in machine elements, Engineering materials and mechanical properties, Factor of safety and ergonomics, Belt drives, rope drives and chain drives, Gear drives and classification of gears, Shafts, pulleys, couplings and keys Introduction to motion transmission systems.	9
3.	**Basic Mechatronics System** Introduction, need and scope of mechatronics, Traditional versus mechatronics approach, Block diagram of mechatronics systems, Open loop and closed loop control systems, Basic elements of feedback control systems, Mechatronic system applications in manufacturing and automobiles.	8

4.	**Sensors and Actuators** **Sensors** Introduction, Need of sensors, Classification of sensor, Contact and non-contact type of sensors, strain gauge elements, Capacitive elements, Eddy current sensors, Proximity sensors. **Actuators** Introduction and classification of actuators, Need and scope, Hydraulic actuation system, Linear hydraulic actuation system – Single and double acting, Pneumatic actuation system – Gear motors and vane motors, Stepper motors and servo motors, Solenoids and industrial applications	8
5.	**Programmable Logical Controller** Introduction and principle of PLC, PLC architecture and hardware components, PLC input/output modules, Ladder logic programming basics, PLC timers, counters and relays, Difference between PLC and computer-controlled systems, Industrial automation applications Introduction to robotics and Industry 4.0.	9

Text Books

Sr.No	Title	Author	Publisher
1.	Theory of Machine	R. S. Khurmi and J. K. Gupta	S. Chand
2.	A text book Mechatronics	R. K. Rajput	S. Chand
3.	A Textbook of Production Engineering	P. C. Sharma	S. Chand

Reference Books

1.	Mechatronics- Principal, Concepts, and Application	N. P Mahalik	Tata McGraw Hill Publication
2.	Mechatronics	W. Bolton	Pearson
3.	Theory of Machines	S S Ratan	Tata McGraw Hill Education

Useful Link: https://nptel.ac.in/courses/112107298

Title of the Course: Enhancing Soft Skills and Personality **Course Code:** 25OE2301	**L**	**T**	**P**	**Credit**
	2	**-**	**-**	**2**

Course Pre-Requisite:

Basic communication skills in English, Willingness to participate in individual and group activities, Interest in personal and professional development, Basic awareness of workplace and social interactions, Positive attitude toward self-improvement and lifelong learning.

Course Description:

Enhancing Soft Skills and Personality is designed to develop the personal, interpersonal, and professional competencies required for academic success and career growth. The course focuses on self-awareness, personality development, communication skills, emotional intelligence, leadership, teamwork, professional etiquette, employability skills, and lifelong learning. Students learn to improve their communication abilities, strengthen interpersonal relationships, build confidence, and develop professional behavior required in modern organizations.

Course Objectives:

1. Develop self-awareness and personality development skills.
2. Enhance verbal, non-verbal, written, and interpersonal communication skills.
3. Strengthen leadership, teamwork, and conflict management abilities.
4. Build emotional intelligence and professional workplace behavior.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Analyze personal strengths, weaknesses, emotions, and personality traits for self-development.
CO2	Demonstrate effective verbal, non-verbal, written, and interpersonal communication skills.
CO3	Apply leadership, teamwork, negotiation, and conflict resolution skills in professional settings.
CO4	Exhibit professional etiquette, emotional intelligence, and workplace behavior.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1							1	2	3		1
CO2									3		1
CO3							2	2	3		1

CO4							2	2	3		1

Assessment Scheme:
Two components of Continuous Assessment (CA1 & CA2), one Mid Semester Examination (MSE) and one End Semester Examination (ESE), have 20%, 30% and 50% weightage, respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and CA2 are based on the Assignment/ Surprise test/ Quiz/Seminar/Group discussions / presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Self-Awareness and Personality Development** Self-concept, Self-esteem, SWOT Analysis, Personality Traits, Goal Setting, Positive Attitude, Confidence Building, Time Management, Personal Effectiveness.	**07**
2	**Emotional Intelligence and Communication Skills** Self-Awareness, Verbal Communication, Non-Verbal Communication, Listening Skills, Speaking Skills, Reading Skills, Writing Skills, Interpersonal Communication, Workplace Communication ,Self-Regulation, Motivation, Empathy, Social Skills, Relationship Management, Conflict Resolution, Negotiation Skills	**08**
3	**Leadership and Team Building** Leadership Styles, Team Dynamics, Team Building, Collaboration, Decision Making, Problem Solving, Workplace Ethics, Professional Etiquette	**07**
4	**Career Development and Employability Skills** Resume Writing, Cover Letter Preparation, Group Discussions, Interview Skills, Personal Branding, Professional Networking, Career Planning, Lifelong Learning	**07**

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press
2	Soft Skills: Know Yourself and Know the World	Dr. Alex K.World	S. Chand Publications

Reference Books			
Sr.No	**Title**	**Author**	**Publisher**
1	Developing Communication Skills	Krishna Mohan & Meera Banerji	Macmillan
2	Communication Skills for Engineers and Scientists	Sangeeta Sharma & Binod Mishra	PHI Learning
3	Seven Habits of Highly Effective People	Stephen R. Covey	Simon & Schuster

Title of the Course: Ethics In Engineering Practices **Course Code:** 25OE2302	**L**	**T**	**P**	**Credit**
	2	-	-	2

Course Pre-Requisite:

Basic communication and comprehension skills, Awareness of social and professional responsibilities, Fundamental understanding of engineering disciplines, Interest in ethical, environmental, and societal issues, Ability to analyze situations and make reasoned judgments.

Course Description:

Ethics in Engineering Practices is designed to develop ethical awareness, professional responsibility, and decision-making skills among engineering students. The course examines moral values, professional ethics, accountability, integrity, sustainability, environmental responsibility, and the societal impact of engineering decisions. Students learn to identify ethical dilemmas, evaluate professional responsibilities, apply ethical principles, and contribute to sustainable and socially responsible engineering solutions. The course emphasizes ethical leadership, workplace professionalism, and responsible use of emerging technologies.

Course Objectives:

1. To develop ethical awareness and professional responsibility among engineering students.
2. To understand the impact of engineering decisions on society and the environment.
3. To cultivate ethical decision-making skills in professional practice.
4. To promote sustainable and socially responsible engineering solutions.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Explain ethical principles, moral values, and professional responsibilities.
CO2	Analyze ethical dilemmas and make responsible engineering decisions.
CO3	Evaluate societal, environmental, and sustainability concerns in engineering practices.
CO4	Deliver effective presentations and negotiate professionally.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1							3	3	3		1
CO2		3					3				
CO3						3	3				
CO4			3					3	3		2

Assessment Scheme:

Two components of Continuous Assessment (CA1 & CA2), one Mid Semester Examination (MSE) and one End Semester Examination (ESE), have 20%, 30% and 50% weightage, respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and CA2 are based on the Assignment/ Surprise test/ Quiz/Seminar/Group discussions / presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Foundations of Engineering Ethics** Meaning and Importance of Ethics, Engineering as a Profession, Moral Values and Ethical Principles, Rights Duties and Responsibilities, Ethical Dilemmas in Engineering, Engineering Case Studies	**07**
2	**Professional Responsibility** Professional Codes of Ethics, Accountability and Integrity, Confidentiality and Intellectual Property Rights, Whistleblowing, Ethical Leadership, Workplace Professionalism	**07**
3	**Technology, Society and Sustainability** Engineers and Society, Sustainable Development Goals (SDGs), Environmental Ethics, Green Engineering, Corporate Social Responsibility (CSR), Ethical Use of Emerging Technologies	**07**
4	**Ethical Decision Making and Leadership** Ethical Decision Models, Value-Based Leadership, Organizational Ethics, Governance and Compliance, Stakeholder Management, Ethical Risk Assessment	**07**

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1	Ethics in Engineering	Mike W. Martin & Roland Schinzinger	McGraw-Hill Education

2	Engineering Ethics	Charles E. Harris Jr., Michael Pritchard & Michael Rabins	Cengage Learning

Reference Books			
Sr.No	**Title**	**Author**	**Publisher**
1	Engineering Ethics: Concepts and Cases	Charles E. Harris Jr.	Cengage Learning
2	Ethics, Technology and Engineering	Ibo van de Poel & Lambèr Royakkers	Wiley-Blackwell
3	Practical Ethics for Engineers	John R. Boatright	CRC Press
4	Professional Ethics and Human Values	R. S. Naagarazan	New Age International

Title of the Course: Introduction to Project Management	**L**	**T**	**P**	**Credit**
Course Code: 25OE2303	**2**	**--**	**-**	**2**

Course Pre-Requisite:

Basic understanding of engineering and technology concepts, Fundamental communication and teamwork skills, Logical thinking and problem-solving ability, Awareness of organizational and business environments.

Course Description:

This course introduces students to the fundamentals of project management, including project planning, scheduling, execution, monitoring, and closure. It covers the project life cycle, stakeholder management, risk management, quality management, and the use of common project management tools and techniques. The course aims to develop the ability to plan and manage projects effectively in engineering and business environments.

Course Objectives:

1) To understand the fundamental concepts and importance of project management.
2) To explain the phases of the project life cycle and project planning techniques.
3) To introduce scheduling, budgeting, risk, and quality management practices.
4) To develop skills in project execution, monitoring, and successful project closure.

Course Outcomes:

CO	After completion of the course, the students should be able to
CO1	Explain the principles, objectives, and life cycle of project management.
CO2	Prepare project plans, schedules, and resource allocation strategies.
CO3	Identify and manage project risks, costs, quality, and stakeholder expectations.
CO4	Apply monitoring, control, and project closure techniques to improve project success.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**
CO1	3	2	1	1	1	-	-	-	1	2	2
CO2	3	3	2	2	2	-	-	-	2	2	2
CO3	2	3	3	2	2	1	1	-	2	2	2
CO4	2	2	3	3	2	1	-	1	3	3	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1.	**Introduction** Concept and characteristics of projects, Project management fundamentals, Importance and objectives of project management, Project life cycle, Roles and responsibilities of project manager ,Stakeholders and organizational structures, Project selection and feasibility analysis.	07
2.	**Project Planning and Scheduling** Project scope definition**,** Work Breakdown Structure (WBS)**,** Project planning process**,** Resource planning and allocation, Scheduling techniques**,** Gantt Charts**,** Critical Path Method (CPM)**,** Introduction to PERT.	07
3.	**Project Cost, Risk, and Quality Management** Cost estimation and budgeting, Project financing basics, Risk identification and risk assessment, Risk mitigation strategies, Quality planning and quality assurance, Performance measurement and documentation, Communication management.	08
4.	**Project Execution, Monitoring, and Closure** Project execution and coordination, Team management and leadership, Project monitoring and control, Change management, Performance evaluation, Project documentation and reporting, Project closure and lessons learned, Introduction to project management software tools	08

Text Books:			
Sr. No	**Title**	**Author**	**Publisher**
1.	Project Management: The Managerial Process	Clifford F. Gray, Erik W. Larson	McGraw-Hill Education

Reference Books:			
1.	Project Management: A Systems Approach to Planning, Scheduling, and Controlling	Harold Kerzner	John Wiley & Sons
2.	Information Technology Project Management	Kathy Schwalbe	Cengage Learning
3.	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	Project Management Institute (PMI)	Project Management Institute (PMI)

Certification Course NPTEL Link:

Sr. No.	Course	Provider /Platform	Level	Mode	Certification Authority
1.	Project Management	nptel.ac.in/courses/110104073?utm_source=chatgpt.com	UG	Online	NPTEL
2.	Project Management For Managers	Project management for managers - Course	UG	Online	NPTEL

Title of the Course: Introduction to Mechatronics **Course Code:** 25MMMEC2301	**L**	**T**	**P**	**Credit**
	2	--	-	2

Course Pre-Requisite: NA

Course Description:

This course introduces the fundamental concepts of Mechatronics Engineering by integrating principles of mechanical, electrical, electronics, control and computer engineering systems. The course focuses on sensors, actuators, PLCs, microcontrollers and industrial automation systems used in modern engineering applications. It provides students with interdisciplinary knowledge and practical exposure to smart manufacturing, embedded systems and Industry 4.0 technologies. The course is designed to develop analytical, technical and problem-solving skills required for automation and intelligent engineering systems.

Course Objectives:

1. To understand the fundamentals of mechatronics systems, control systems and modern automation concepts.
2. To study the working principles and applications of sensors, transducers and actuators used in industrial systems.
3. To understand PLC architecture, programming and industrial automation applications.
4. To apply microcontroller concepts in embedded and mechatronics engineering applications.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Explain the fundamentals, architecture and control principles of mechatronics systems.
CO2	Select and analyze sensors, transducers and actuators for engineering applications.
CO3	Describe the operation and applications of PLC-based industrial automation systems.
CO4	Apply microcontroller concepts for embedded and mechatronics applications.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	1	-	2	-	-	-	-	1	-	1	
CO2	3	3	2	1	2	-	-	-	1	-	-	--	1
CO3	2	2	3	1	3	1	-	-	1	1	1	--	1

CO4	3	2	3	2	3	-	-	-	1	1	1	1	--

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	1
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Fundamentals of Mechatronics and Control Systems** Introduction, Need and Scope of Mechatronics, Evolution of Mechatronics systems, Traditional vs Mechatronics approach, Applications of Mechatronics in manufacturing, automotive and robotics industries. Block diagram representation of Mechatronics system and functions of various elements. Open loop and closed loop control systems, Basic elements of closed loop control system, Introduction to smart systems and Industry 4.0 concepts in Mechatronics.	**07**
2.	**Sensors, Transducers and Actuators** Introduction and classification of sensors and transducers, Characteristics of sensors, Contact and non-contact sensors. Study of strain gauge sensors, capacitive sensors, eddy current sensors, proximity sensors, temperature and position sensors. Primary and secondary transducers, Electrical transducers and signal conversion. Actuators: Introduction and classification, Hydraulic actuation systems, Single and double acting cylinders, Pneumatic actuation systems, Rotary actuators, Gear motors and vane motors.	**07**
3.	**PLC and Industrial Automation Systems**	**07**

	Introduction to Programmable Logic Controller (PLC), Principle of operation, Comparison between PLC and computer-controlled systems, Basic PLC architecture and hardware components. PLC input/output modules, PLC block diagram, Basic PLC functions, Introduction to ladder logic programming, Industrial automation applications using PLC. Introduction to SCADA and HMI systems, Industrial safety and automation standards	
4	**Design Microcontrollers and Applications of Mechatronics Systems** Introduction to Microcontrollers, Architecture and pin configuration, Memory organization and interfacing concepts. Comparison of microprocessor and microcontroller, Embedded systems in Mechatronics, Introduction to Arduino and embedded development platforms. Applications of microcontroller-based systems: Antilock Braking System (ABS), Pick and Place Robot, Automatic car parking barrier system, Home and industrial automation systems.	**07**

Text Books

Sr.No	Title	Author	Publisher
1.	Mechatronics	Appu Kuttam K K	Oxford Publication
2.	A text book Mechatronics	R. K. Rajput	S. Chand
3.	Mechatronics System Design	Devdas Shetty and Richard Kolk	Cengage Learning

Reference Books

1.	Mechatronics- Principal, Concepts, and Application	N. P Mahalik	Tata McGraw Hill Publication
2.	Mechatronics	W. Bolton	Pearson
3.	Programmable Logic Controller	Bolton	Elsevier

Useful Link: https://nptel.ac.in/courses/112107298

Title of the Course: Universal Human Values **Course Code**: 25VEC2002	L	T	P	Credit
	1	-	-	1

Course Pre-Requisite: None

Course Description: This course introduces human values, self-exploration, harmony in self, family, society, and nature, and develops ethical competence for a value-based life and profession.

Course Objective

1. To develop an understanding of value education, basic human aspirations, and the methods to achieve continuous happiness and prosperity through right understanding.
2. To enable students to understand the coexistence of self and body and establish harmony through self-regulation and proper health practices.
3. To cultivate values like trust and respect for maintaining harmonious relationships in family and society towards a universal human order.
4. To develop awareness about the interconnectedness of nature and promote harmony through mutual fulfillment among all orders of existence.
5. To apply holistic understanding in professional ethics, promoting human values, sustainable practices, and value-based life and profession.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand value education and human aspirations
CO2	Understand harmony between self and body
CO3	Understand values in relationships and society
CO4	Understand harmony in nature and existence
CO5	Apply human values in professional ethics

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	-	-	-	2	2	3	-	-	-	-	-
CO2	2	-	-	-	-	2	1	3	-	-	-	-	-
CO3	1	1	-	-	-	3	2	3	2	2	-	-	-
CO4	1	1	-	-	-	3	3	2	-	-	-	-	-
CO5	2	2	1	1	1	3	2	3	2	2	1	1	1

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), having 50% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	**Introduction to Value Education** Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity, the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity, Current Scenario, Method to Fulfill the Basic Human Aspirations.	3
2.	**Harmony in the Human Being** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure self-regulation and Health.	3
3.	**Harmony in the Family and Society** Harmony in the Family, the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order.	3
4	**Harmony in the Nature (Existence)** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	4
5	**Implications of the Holistic Understanding** Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics- Holistic Technologies, Production	4

	Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi
2.	Jeevan Vidya: Ek Parichaya	A Nagaraj,	Charotar Publishing House, Anand, India.
3.	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi
Reference Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	Jeevan Vidya Prakashan
2.	Hind Swaraj	Mohandas K. Gandhi.	Jeevan Vidya Prakashan

Title of the Course: Engineering Materials and Metallurgy Laboratory	**L**	**T**	**P**	**Credit**
Course Code: 25MEC2301L	**-**	**-**	**2 hr/week**	**1**

Course Pre-Requisite: Basic knowledge of engineering materials, mechanical properties, and workshop practices.

Course Description: This laboratory course provides hands-on experience in material characterization, mechanical testing, metallographic specimen preparation, microstructure analysis, and non-destructive testing techniques. Students perform experiments related to ferrous and non-ferrous materials, phase diagrams, polymers, composites, and heat treatment concepts. The course also introduces AI/ML-based approaches for material property prediction, enabling students to correlate material structure, properties, and performance for engineering applications.

Course Objectives:

1. To develop skills in specimen preparation and metallographic examination.
2. To evaluate mechanical properties of materials using standard tests.
3. To identify microstructures of ferrous and non-ferrous materials.
4. To understand phase diagrams, lever rule, and cooling behavior.
5. To apply NDT techniques and modern tools (AI/ML) in material analysis.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Prepare specimens and examine microstructures using metallurgical techniques.
CO2	Perform tensile, hardness, and impact tests and interpret results.
CO3	Identify structures of steels, cast iron, and non-ferrous alloys.
CO4	Apply phase diagram concepts and lever rule for material analysis.
CO5	Use NDT methods and basic AI/ML tools for defect detection and property prediction.

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	1	2	1					1		3	2
CO2	3	2	2	2	1					1		3	2
CO3	3	2	1	2						1		3	2
CO4	3	3	1	2						1		3	2
CO5	3	2	2	3	3					2		3	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	-
CA2	25
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents: Perform any eight experiments

Expt. No.	Contents	Hours
1.	**Specimen Preparation for Metallographic Examination** – cutting, mounting, grinding, polishing, etching.	2
2.	**Microstructure Examination of Steels / Cast Iron** using metallurgical microscope.	2
3.	**Tensile Test on Mild Steel** – determination of UTS, yield point, % elongation.	2
4.	**Hardness Test** – Brinell / Rockwell / Vickers testing and comparison.	2
5.	**Impact Test (Izod / Charpy)** – measurement of impact toughness.	2
6.	**Dye Penetrant Test (DPT)** – detection of surface cracks (NDT).	2
7.	Study of Iron–Carbon Phase Diagram & Microstructure Identification.	2
8.	**Lever Rule Calculations and Cooling Curve Study** for phase fraction determination.	2
9.	**Study of Non-ferrous Alloys (Brass, Bronze, Duralumin)** – composition, properties & microstructure.	2
10.	**Identification & Simple Testing of Polymers / Composites** – hardness, density, burning test.	2
11.	**AI/ML-based Material Property Prediction (Demo)** – correlation of carbon % vs hardness using Excel/Python.	2
12.	Industrial Visit / Virtual Lab	

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	Material science and metallurgy for engineers	V. D. Kodgire,	Everest Publishers Pune
2.	Material Science and Engineering	V Raghwan,	Prentice Hall of India Pvt. Ltd., New Delhi ,3rd Edition, 1995.
3.	Material science and engineering	W. D Callister	Wiley India Pvt. Ltd., 5th Edition.
4.	Principles of Materials Science and Engineering,	William F. Smith,	Third Edition, 2002, McGraw-Hill
5.	Heat Treatments Principles and Practices	T.V. Rajan / C.P. Sharma	Prentice Hall of India Pvt Ltd, New Delhi

Reference Books		
Materials Science and Engineering	V. Raghvan	PHI Publication, 5th Edition, 2009
Engineering Metallurgy	R.A. Higgins	Viva Books Pvt. Ltd., New Delhi, 1 st Edition
The Science and Engineering of materials	Donald Askeland, Pradeep Fuley, Wendelin J. Wright	6th Edition, Publisher Global Engineering

Add resource link like NPTEL - https://sites.google.com/view/mechanicalenggvirtuallab/home/sy-btech/materials-science-and-metallurgy-lab?authuser=0

Title of the Course: Fundamental of Mechatronics Laboratory	**L**	**T**	**P**	**Credit**
Course Code: 25MEC2304L	**-**	**-**	**2 hr/week**	**1**

Course Pre-Requisite: Basic knowledge of Electrical and Electronics Engineering

Course Description: This laboratory course provides practical exposure to the fundamental concepts and applications of Mechatronics systems. The course integrates mechanical, electrical, electronics, hydraulic, pneumatic, and computer control technologies through hands-on experiments and demonstrations. Students will develop practical skills in sensors, motor control, PLC programming, microprocessor and microcontroller interfacing, pneumatic and hydraulic circuit development, and industrial process control using PID controllers. The course emphasizes industrial automation and interdisciplinary engineering applications.

Course Objectives:

1. To familiarize students with various sensors, actuators, and electrical motor control systems used in mechatronic applications.
2. To develop practical skills in pneumatic, electro-pneumatic, hydraulic, and electro-hydraulic circuit design and implementation.
3. To provide hands-on experience in programming microprocessors, microcontrollers, and PLCs for automation applications.
4. To understand the operation and implementation of industrial process control systems using PID controllers.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Identify and demonstrate the working of various sensors, actuators, and electrical motor control systems used in mechatronics.
CO2	Develop and test pneumatic, electro-pneumatic, hydraulic, and electro-hydraulic circuits for industrial automation applications.
CO3	Apply programming techniques for microprocessors, microcontrollers, and PLCs in automation systems.
CO4	Analyze and implement process control systems such as temperature, level, and flow control using PID controllers.

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	1	2	-	-	-	-	-	-	3	2
CO2	3	3	3	2	2	-	-	-	1	-	-	3	2
CO3	3	2	3	2	3	-	-	-	1	1	-	3	2
CO4	3	3	2	3	2	-	-	-	1	-	-	3	2

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	-
CA2	25
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents: Perform any Eight Experiments

Expt. No.	Contents	Hours
1.	Assignment on different Mechanism used in real word applications.	2
2.	Assignment on transmission system.	2
3.	Study and demonstration of various types of sensors 4. Minimum two circuits on Electro-Pneumatics to be developed on Electro- Pneumatic trainer kit 5. Minimum two circuits on Hydraulics and Electro-hydraulics to be developed on Hydraulic trainer kit 6. Programming of Microprocessor and Microcontroller 7. Programming on PLC 8. Demonstration of Process control such as temperature, level, flow, etc. control using PID controller	2
4.	Speed control of various types of Electrical Motors	2
5.	Minimum two circuits on Pneumatics to be developed on Pneumatic trainer kit	2
6.	Minimum two circuits on Electro-Pneumatics to be developed on Electro-Pneumatic trainer kit	2
7.	Minimum two circuits on Hydraulics and Electro-hydraulics to be developed on Hydraulic trainer kit	2
8.	Programming of Microprocessor and Microcontroller	2
9.	Programming on PLC	2
10.	Demonstration of Process control such as temperature, level, flow, etc. control using PID controller	2

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	Theory of Machine	R. S. Khurmi and J. K. Gupta	S. Chand
2.	A text book Mechatronics	R. K. Rajput	S. Chand
3.	A Textbook of Production Engineering	P. C. Sharma	S. Chand

Reference Books			
1.	Mechatronics- Principal, Concepts, and Application	N. P Mahalik	Tata McGraw Hill Publication
2.	Mechatronics	W. Bolton	Pearson
3.	Theory of Machines	S S Ratan	Tata McGraw Hill Education

Add resource link like NPTEL -

Title of the Course: Computer Aided Machine Drawing Laboratory **Course Code:** 25MEC2305L	**L**	**T**	**P**	**Credit**
		--	4 hr. / week	2

Course Pre-Requisite: Basic knowledge of Engineering Drawing (lines, projections, scales). Understanding of geometrical constructions. Fundamentals of machine elements. Basic computer skills (for CAD)

Course Description:

This course focuses on the graphical representation of machine components and assemblies. It covers sectional views, machine elements, interpenetration of surfaces, and assembly drawings. The course also introduces Computer Aided Design (CAD) using AutoCAD for 2D and basic 3D modeling. Students will learn to interpret and create production drawings, including limits, fits, tolerances, and surface roughness symbols.

Course Objectives:

1. To develop understanding of sectional views and drawing standards
2. To study and represent basic machine elements and components
3. To apply principles for interpenetration of surfaces in engineering problems
4. To introduce CAD tools and assembly drawing techniques.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Prepare and interpret engineering drawings of standard components, symbols (pipe, weld, rivet), surface finish, limits, fits, and tolerances as per BIS standards.
CO2	Develop assembly and detailed drawings of machine components such as valves, pumps, joints, and engine parts with proper dimensioning and representation.
CO3	Construct and analyze curves of interpenetration of different solids.
CO4	Develop assembly drawings and use CAD tools for 2D/3D modeling and production drawings

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	2	-	1	-	-	-	-	1	-	3	1
CO2	3	2	2	-	1	-	-	-	-	1	-	3	1
CO3	3	3	2	1	1	-	-	-	-	1	-	2	1
CO4	3	2	3	1	3	-	-	-	1	2	1	2	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), and End Semester Examination (ESE) having 50% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	50

CA1 and **CA2** are based on Experimental performance, Viva, Manual performance, etc.
ESE is based on 100% course content

Course Contents.

Expt No.	Contents	Hours
1.	One full imperial drawing sheet consisting the drawing/sketches of representation of standard components, symbols of pipe joints, weld joints, rivet joint etc., surface finish symbols and grades, limit, fit and tolerance sketches.	4
2.	One full imperial drawing sheets, one consisting of assembly and the other consisting of details of any one standard component such as valves, components of various machine tools, pumps, joints, engine parts, etc.	4
3.	One full imperial drawing sheets, one consisting of assembly and the other consisting of details of any one standard component such as valves, components of various machine tools, pumps, joints, engine parts, etc.	4
4.	One assignment of AutoCAD: Orthographic Projections of any one simple machine component such as bracket, Bearing Housing or Cast component for Engineers such as connecting rod, Piston, etc.; with dimensioning and detailing of three views of components.	4
5	One assignment of AutoCAD: Orthographic Projections of any one simple machine component such as bracket, Bearing Housing or Cast component for Engineers such as connecting rod, Piston, etc.; with dimensioning and detailing of three views of components.	6
6	3-D model of at least one simple machine component	6

Text Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	Engineering Drawing	N. D. Bhatt,	Charotar Publishing House, Anand, India.
2.	Machine Drawing	N. D. Bhatt,	Charotar Publishing House, Anand, India.
3.	Working with Auto CAD 2000	Ajeet Sing,	Tata McGraw Hill, New Delhi.

Reference Books			
Sr.No	**Title**	**Author**	**Publisher**
1.	Machine Drawing	Narayana, Kannaiah, Reddy	New Age International Publishers.
2.	Auto CAD and AutoLISP manuals	Autodesk Corp. U.S.A.	Autodesk Corp. U.S.A.
3.	Standard Drawing Practices for Engineering Institutes	IS Code: SP46-1988	IS Code: SP46-1988

Title of the Course: Mini Project **Course Code:** 25MEC2306L	**L**	**T**	**P**	**Credit**
		--	2 hr. / week	AU

Course Pre-Requisite: Engineering Knowledge

Course Description:

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving. Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility.

Course Objectives:

1. To develop understanding of sectional views and drawing standards
2. To study and represent basic machine elements and components
3. To apply principles for interpenetration of surfaces in engineering problems
4. To introduce CAD tools and assembly drawing techniques.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Select the appropriate method for solving the problem and use of various engineering techniques / tools to give a solution
CO2	Justify the methods/tools used to develop the solution
CO3	Design / simulate the model / project work
CO4	Describe the solution with help of a project report and presentation and conclude the outcomes of project

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PSO1**	**PSO2**
CO1	3	2	2	-	1	-	-	-	-	1	-	2	1
CO2	3	2	2	-	1	-	-	-	-	1	-	1	1
CO3	1	3	2	1	1	-	-	-	-	1	-	2	1
CO4	2	2	3	1	3	-	-	-	1	2	1	2	1

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), having 50% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on progress of project and presentation, etc.

Course Contents.

Week	Contents	Hours
1.	**Survey Design-1** Ensure case study group students have made necessary communication and done a preparatory visit. Watch the lecture on survey design and study the notes. Prepare a questionnaire and try it out with your group members as mock.	2
2.	**Survey Design-2** Review survey questionnaire prepared by case study groups. Decide sampling strategy. Prepare a detailed schedule for fieldwork.	2
3.	**Fieldwork** **Data Collection:** Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). Use data collection tools like questionnaires, observation checklists, and digital analysis. Ensure accuracy and reliability through proper sampling and recording methods.	2
4.	**Trails and Experimentation-1** Initial Setup and Configuration, Concept Validation, Feasibility Testing	2
5	**Trails and Experimentation-2** Prototyping, Functionality Testing	2
6	**Trails and Experimentation-3** Bug Identification and Fixing, Integration Testing, Security Testing, 75% Results has to be conducted by mentor/guide based on above activity.	2
7	**Results** Coordinator has to check and verify below points in term of result: Functional Performance, Accuracy and Precision, Efficiency, Safety.	2
8	**Validations** Coordinator has to check and verify below points in term of validation: Testing and Verification, Compliance with Standards.	2
9	**Integration Testing** Validate that the hardware integrates seamlessly with other systems or components as intended. Perform compatibility tests with software, other hardware, and network systems.	2

10	**Documentation and Reporting** Maintain comprehensive documentation of design, development, testing, and validation processes. Provide detailed reports on test results, issues found, and corrective actions taken.	2
11	**Final Presentations** 100% Presentation has to be conducted by mentor/guide based on above activity. Prototype/Final Software solution is mandatory at the time of final presentation along with report.	2