Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON, SANGLI- 416304.

An Autonomous Institute

Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad

(Accredited by NAAC)

B.Tech. MECHANICAL ENGINEERING

Curriculum for

B.Tech. MECHANICAL ENGINEERING

In accordance with the *National Education Policy (NEP) 2020*, including curriculum structure and evaluation scheme

Effective from Academic Year 2026–2027

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon, Sangli (MS) – 416304

(An Autonomous Institute)

Affiliated to

Dr. Babasaheb Ambedkar Technological University,
Lonere, Raigad

(Accredited by NAAC)

Department of Mechanical Engineering

Structure Undergraduate Degree Programme

B. Tech. in Mechanical Engineering

In accordance with National Education Policy (NEP – 2020)

w. e. f.
Academic Year: 2026-27

Institute Vision Mission

Vision:

"To be a premier autonomous institute known for academic excellence, research innovation, and transformative engineering education."

Missions:

Mission1: Academic Excellence

Providing quality engineering education through an outcome-based curriculum, effective teaching–learning processes, and continuous academic improvement.

Mission 2: Research and Innovation

Promoting a strong research and innovation culture by encouraging faculty and students to engage in research projects, publications, patents, and interdisciplinary collaborations.

Mission 3: Industry-Oriented learning

Strengthening industry–institute collaboration through internships, industry-supported laboratories, expert lectures, and real-world engineering projects to enhance employability.

Mission 4: Holistic and Ethical Development

Developing competent engineers with professional ethics, leadership qualities, lifelong learning ability, and commitment to societal and sustainable development.

Department Vision Mission

Vision:

To be a leading center in Mechanical Engineering, promoting entrepreneurship, innovation and sustainable development for societal needs.

Missions:

Mission1: Academic Excellence

Developing competent mechanical engineers by providing outcome-based education (OBE) in mechanical engineering principles, practical knowledge, and emerging technologies.

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Mission 2: Research and Innovation

Fostering a culture of research, innovation, and entrepreneurship by encouraging students and faculty to engage in interdisciplinary projects, publications, patents, and emerging technologies.

Mission 3: Industry-Oriented learning

Bridging the gap between academia and industry by fostering practical skills, internships, and technological adaptability through experiential and industry-driven learning.

Mission 4: Holistic and Ethical Development

Nurturing well-rounded engineers who demonstrate integrity, leadership, teamwork, and a sense of responsibility towards society, environment, and lifelong professional growth.

Programme Educational Objectives (PEOs)

PEO1: (Professional Career)

To develop competent mechanical engineers with strong analytical and technical skills to solve real-world engineering problems effectively.

PEO2: (Research and Innovation)

To nurture innovation, research aptitude, and the ability to work collaboratively in multidisciplinary and rapidly evolving technological environments.

PEO3: (Leadership, Ethics, Social Awareness)

To inculcate professional ethics, social awareness, environmental consciousness, and commitment towards sustainable engineering practices.

PEO4: (Lifelong Learning and Entrepreneurship)

To empower graduates with leadership qualities, teamwork, communication skills, and entrepreneurial mindset for successful professional growth and societal contribution.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

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WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Programme Outcome (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems (WK1 to WK4).

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

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PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, & WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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Programme Specific Outcome (PSOs)

PSO1: Analyse, design, and optimize mechanical systems and processes by applying principles of thermal, design and manufacturing for industrial applications.

PSO2: Develop and implement mechanical and automated systems using modern engineering tools, experimental techniques, and professional practices to address real-world engineering challenges.

Abbreviations

L: Lecture Hours / Week
T: Tutorial Hours / Week
P: Practical Hours / Week
CA: Continuous Assessment
MSE: Mid Semester Examination
ESE: End Semester Examination
ISE1: In-Semester Evaluation 1
ISE2: In-Semester Evaluation 2
FY: First Year
SY: Second Year
TY: Third Year
B.Tech: Bachelor of Technology
PCC: Professional Core Course
PEC: Professional Elective Course
IKS: Indian Knowledge System
MDM: Multidisciplinary Minor
OEC: Open Elective Course
BSC: Basic Science Course
ESC: Engineering Science Course
CEP: Community Engagement Project
VSEC: Vocational and Skill Enhancement Course
AEC: Ability Enhancement Course
HSSM: Humanities Social Science and Management
VEC: Value Education Courses
RM: Research Methodology
PR: Project
OJT: On Job Training
MOOC: Massive Open Online Course

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

Semester-wise Credit distribution for Four Year UG Engineering Programme in Mechanical (One Major, One Minor)

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	8	8	--	--	--	--	--	--	16
Engineering Science Course		6	9	4	--	--	--	--	--	19
Programme Core Courses (PCC)	Program Courses	--	--	11	15	16	12	9	3	66
Programme Elective Courses (PEC)		--	--	--	--	--	7	3	3	13
Multidisciplinary Minor (MDM)	Multidisciplinary Courses	--	--	3	3	3	3	2	--	14
Open Elective (OE) Other than particular program		--	--	--	2	2	--	--	--	4
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	1	2	--	1	--	2	--	--	6
Ability Enhancement Course (AEC-01, AEC-02)	Humanities Social Science and Management (HSSM)	3	--	--	1	--	--	--	--	4
Entrepreneurship / Economics / Management Courses		--	--	2	--	1	--	3	--	6
Indian Knowledge System (IKS)		2	--		--	--	--	--	--	2
Value Education Course (VEC)		--	--	2	2	--	--	--	--	4
Research Methodology (RM)	Experimental Learning Courses	--	--	--	--	--	--	2		2
Community Engagement Project (CEP) / Field Project (FP)		--	--	1	--	--	--	--	--	1
Project (PR)		--	--	--	--	--	--	4	2	6
Internship / On job training (OJT)		--	--			--	--	--	10	10
Co-curricular Courses (CC)	Liberal Learning Courses	--	1		--	--	--	--	--	1
Total Credits (Major)		**20**	**20**	**23**	**24**	**22**	**24**	**23**	**18**	**174**

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Distribution of Credits:

Course Category	Number of Subjects	Credit as per PVPIT
Humanities, Social Science, and Management Courses + **IKS (1) + VEC (2)**	08	**16**
Basic Science Course (BSC)	04	**16**
Engineering Science Course (ESC)	05	**19**
Professional Core Course (PCC)	28	**66**
Professional Elective Course (PEC)	03	**13**
Open Elective Course (OEC)	02	**04**
Project work, Seminar/cep, and Internship in industry or elsewhere (PrSI) + RM	05	**19**
Mandatory Courses [Environmental Sciences, **Induction Program**, Indian Constitution, Essence of Indian Knowledge Tradition] (AUC) + **CC**	01	**01**
***VSEC**	04	**06**
Total Credit Point		**160**
Minor Courses	05	**14**
Honours Courses	--	--

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

S.Y. B.Tech Semester III Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEESC201	Engineering Mathematics and Numerical Methods	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC202	Thermodynamics	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC203	Materials Science and Metallurgy	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC204	Machine Drawing and Introduction of CAD	2	0	0	2	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM205	MDM - I	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEVEC206	Environmental Studies	2	0	0	2	ISE	50	20	-	-	50
0MEHSSM207	Principles of Management	2	0	0	2	ISE	50	20	-	-	50
0MEPCC208	Materials Science and Metallurgy Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC209	Machine Drawing and Introduction of CAD Lab	0	0	4	2	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MECEP210	Community Engagement Project	0	0	2	1	ISE	-	-	50	20	50
TOTAL		18	1	8	23	TOTAL MARKS					850
Total Contact Hours Per Week		27									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	4	11		3	-	-	-	2	-	2	-	1	-	-	-	23
Cumulative	16	19	11	-	3	-	3	3	2	2	2	-	1	-	-	1	63

Multidisciplinary Minor offered by Mechanical Engineering	
Course Code	Course Name
0MEMDM205	Micro Electro Mechanical Systems (MEMS)

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

S.Y. B.Tech Semester IV Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC251	Fluid Mechanics	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC252	Applied Thermodynamics	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC253	Strength of Materials	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC254	Manufacturing Processes	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM255	MDM - II	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEOE256	Open Elective-I	2	0	0	2	ISE	50	20	-	-	50
0MEVEC257	Universal Human Values	2	0	0	2	ISE	50	20	-	-	50
0MEAEC258	Soft Skills	0	0	2	1	ISE	25	10	-	-	25
0MEPCC259	Fluid Mechanics Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEVSEC260	Manufacturing Processes Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC261	Strength of Materials Lab	0	0	2	1	ISE	-	-	25	10	25
TOTAL		19	1	8	24	TOTAL MARKS					850
Total Contact Hours Per Week		28									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	15	-	3	2	1	1	-	-	2	-	-	-	-	-	24
Cumulative	16	19	26	-	6	2	4	4	2	2	4	-	1	-	-	1	87

Multidisciplinary Minor offered by Mechanical Engineering		Open Elective-I offered by Mechanical Engineering	
Course Code	Course Name	Course Code	Course Name
0MEMDM255	Robotics	0MEOE256	Industrial Safety

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Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

T.Y. B.Tech Semester V Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC301	Heat Transfer	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC302	Theory of Machines and Mechanism	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC303	Design of Static Element	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC304	Manufacturing and Automation	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM305	MDM-III	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0MEOE306	Open Elective-II	2	0	0	2	ISE	50	20	-	-	50
0MEHSSM307	Entrepreneurship Development	1	0	0	1	ISE	50	20	-	-	50
0MEPCC308	Heat Transfer Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC309	Manufacturing and Automation Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE			50	20	50
0MEPCC310	CAD Modelling Lab	0	0	2	1	ISE	-	-	50	20	50
TOTAL		18	1	6	22	TOTAL MARKS					850
Total Contact Hours Per Week		25									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	16	-	3	2	-	-	1	-	-	-	-	-	-	-	22
Cumulative	16	19	42	-	9	4	4	4	3	2	4	-	1	-	-	1	109

Multidisciplinary Minor offered by Mechanical Engineering		Open Elective-II offered by Mechanical Engineering	
Course Code	Course Name	Course Code	Course Name
0MEMDM305	Mechatronics	0MEOE306	Economics for Engineers

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Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

T.Y. B.Tech Semester VI Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC351	Metrology and Measurement	3	0	0	3	ISE1 MSE ISE2 ESE	10 20 10 60	40*	-	-	100
0MEPCC352	Design of Dynamic Elements	3	0	0	3	ISE1 MSE ISE2 ESE	10 20 10 60	40*	-	-	100
0MEPCC353	Dynamics of Machines	3	0	0	3	ISE1 MSE ISE2 ESE	10 20 10 60	40*	-	-	100
0MEPEC354	Programme Elective Course-I	3	1	0	4	ISE1 MSE ISE2 ESE	10 20 10 60	40*	-	-	100
0MEPEC355	Programme Elective Course-II	3	0	0	3	ISE 1 MSE ISE 2 ESE	10 20 10 60	40*	-	-	100
0MEMDM356	MDM-IV	3	0	0	3	ISE	-	-	50	20	50
0MEVSEC357	Mini Project	0	0	4	2	ISE	-	-	50	20	50
0MEPCC358	Metrology and Measurement Lab	0	0	2	1	ISE ESE	- -	- -	50 50	20 20	50 50
0MEPCC359	Dynamics of Machines Lab	0	0	2	1	ISE ESE	- -	- -	50 50	20 20	50 50
0MEPCC360	Design of Dynamic Elements Lab	0	0	2	1	ISE	-	-	50	20	50
TOTAL		18	1	10	24	TOTAL MARKS					850
Total Contact Hours Per Week		29									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	12	7	3	-	2	-	-	-	-	-	-	-	-	-	24
Cumulative	16	19	54	7	12	4	6	4	3	2	4	-	1	-	-	1	133

Multidisciplinary Minor offered by Mechanical Engineering	
Course Code	Course Name
0MEMDM356	Industrial Automation

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Programme Elective Course

Course Code	Programme Elective Course-I	Course Code	Programme Elective Course-II
0MEPEC354A	Fluid Machinery	0MEPEC355A	Renewable Energy Resources
0MEPEC354B	Advanced Machining Processes	0MEPEC355B	Computer Integrated Manufacturing
0MEPEC354C	Tribology	0MEPEC355C	Product Design and Development

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

Final Year B.Tech Semester VII Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC401	Mechatronics and Robotics	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC402	Refrigeration and Air Conditioning	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPEC403	Programme Elective Course-III	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEHSSM404	Industrial Management and Operation Research	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM405	MDM-V	2	0	0	2	ISE	-	-	50	20	50
0MERM406	Research Methodology	2	0	0	2	ISE	-	-	50	20	50
0MEPCC407	Mechatronics and Robotics Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC408	Refrigeration and Air Conditioning Lab	0	0	2	1	ISE	-	-	50	20	50
0MEPR409	Project Phase-I	0	0	8	4	ISE	-	-	100	40	100
						ESE	-	-	50	20	100
TOTAL		16	1	12	23	TOTAL MARKS					850
Total Contact Hours Per Week		29									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	9	3	2	-	-	-	3	-	-	2	-	4	-	-	23
Cumulative	16	19	63	10	14	4	6	4	6	2	4	2	1	4	-	1	156

Multidisciplinary Minor offered by Mechanical Engineering	
Course Code	Course Name
0MEMDM405	Mini Project

Programme Elective Course-III	
Course Code	Course Name
0MEPEC402A	Automobile Engineering
0MEPEC402B	Total Quality Management
0MEPEC402C	Finite Element Analysis

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwords)

Final Year B.Tech Semester VIII Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC451	MOOC Course – I	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPEC452	MOOC Course – II	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPR453	Project Phase – II	0	0	4	2	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEOJT454	Internship / OJT	0	0	20	10	ISE	-	-	100	40	100
						ESE	-		100	40	100
TOTAL		6	0	24	18	TOTAL MARKS					500
Total Contact Hours Per Week		30									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	3	3	-	-	-	-	-	-	-	-	-	2	10	-	18
Cumulative	16	19	66	13	14	4	6	4	6	2	4	2	1	6	10	1	174

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Open Elective Bucket offered by Mechanical Engineering

OE	Course Code	Open Elective	Semester	Credits
I	0MEOE256	Industrial Safety	IV	2
II	0MEOE306	Economics for Engineers	V	2

Multidisciplinary Minor Bucket offered by Mechanical Engineering

MDM	Course Code	Multidisciplinary Minor	Semester	Credits
I	0MEMDM205	Micro Electro Mechanical Systems (MEMS)	III	3
II	0MEMDM255	Robotics	IV	3
III	0MEMDM305	Mechatronics	V	3
IV	0MEMDM356	Industrial Automation	VI	3
V	0MEMDM405	Mini Project	VII	2

Program Elective Course

Sr. No.	Stream Name	Program Elective Course – I (0MEPEC354)	Program Elective Course – II (0MEPEC355)	Program Elective Course – III (0MEPEC403)
Class ⟹		B. Tech (Sem – VI)	B. Tech (Sem – VI)	B. Tech (Sem – VII)
A	Heat Power	Fluid Machinery	Renewable Energy Resources	Automobile Engineering
B	Production	Advanced Machining Processes	Computer Integrated Manufacturing	Total Quality Management
C	Design	Tribology	Product Design and Development	Finite Element Analysis

Semester	Credit
I	20
II	20
III	23
IV	24
V	22
VI	24
VII	23
VIII	18
Total	**174**

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Multidisciplinary Minor Bucket

Sr. No.	MDM Track	MDM Course (Sem III-VII)	Department offering this MDM Track	Department may opt this MDM Track	Department may not opt this MDM Track
1	Artificial Intelligence	Introduction to AI	Artificial Intelligence and Data Science	• Chemical Engg. • Civil Engg. • Electronics and Telecomm. • Instrumentation and Control • Mechanical Engg.	• Artificial Intelligence and Data Science • Computer Science & Engg. • Electrical and Computer Engg. • Electronics and Computer Sci,
		Prompt Engineering			
		Introduction to Machine Learning			
		Generative AI			
		Mini Project			
2	Construction Management	Engineering Management	Civil Engineering	• Artificial Intelligence and Data Science • Chemical Engg. • Computer Science& Engg. • Electrical and Computer Engg. • Electronics and Computer Sci, • Electronics and Telecomm. • Instrumentation and Control • Mechanical Engg.	Civil Engineering
		Supply Chain Management			
		Engineering Procurement and Construction Contract			
		Project Management			
		Mini Project			

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Sr. No.	MDM Track	MDM Course (Sem III-VII)	Department offering this MDM Track	Department may opt this MDM Track	Department may not opt this MDM Track
3	Energy and Environment	Environmental Engineering & Pollution Control Introduction to Sustainable Energy Systems Energy Conservation and Recovery Carbon Capture, Utilization, and Storage (CCUS) Mini Project	Chemical Engineering	• Artificial Intelligence and Data Science • Civil Engg. • Computer Science & Engg • Electrical and Computer Engg. • Electronics and Computer Sci. • Electronics and Telecomm. • Instrumentation and Control • Mechanical Engg.	Chemical Engineering
4	Cyber Security	Network Security Fundamentals of Cryptography Cloud security Cyber forensics Mini Project	Computer Science and Engineering	• Artificial Intelligence and Data Science • Chemical Engg. • Civil Engg. • Electrical and Computer Engg. • Electronics and Computer Sci. • Electronics and Telecomm. • Instrumentation and Control • Mechanical Engg.	Computer Science and Engineering

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Sr. No.	MDM Track	MDM Course (Sem III-VII)	Department offering this MDM Track	Department may opt this MDM Track	Department may not opt this MDM Track
5	Electric Vehicles	Fundamental of Electric Vehicles EV Energy and Charging Systems Electric Drives and Motor Control for EVs Sustainable Mobility and Emerging EV Technologies Mini Project	Electrical and Computer Engineering	• Artificial Intelligence and Data Science • Chemical Engg. • Civil Engg. • Computer Science & Engg • Electronics and Computer Sci. • Electronics and Telecomm. • Instrumentation and Control • Mechanical Engg.	Electrical and Computer Engineering
6	Internet of Things	Fundamentals of IoT IoT Technologies and Protocols Industrial IoT IoT System Design Mini Project	Electronics and Computer Science	• Chemical Engg. • Civil Engg • Instrumentation and Control • Mechanical Engg.	• Artificial Intelligence and Data Science • Computer Science & Engg. • Electrical and Computer Engg. • Electronics and Computer Sci. • Electronics and Telecomm.

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Sr. No.	MDM Track	MDM Course (Sem III-VII)	Department offering MDM Track	Eligible Departments	Departments Not Eligible
7	Communication	Analog Communication Digital Communication Mobile and Satellite Communication Introduction to Arduino and IOT Mini Project	Electronics and Telecommunication	• Artificial Intelligence and Data Science • Chemical Engg. • Civil Engg • Computer Science & Engg. • Electrical and Computer • Mechanical Engg.	• Electronics and Computer Sci. • Electronics and Telecomm • Instrumentation and Control
8	Intelligent Sensory System	Measuring Instruments Electrical and Electronics Measurement Linear Integrated Circuits Process Equipment Design Mini Project	Instrumentation and Control Engineering	• AIDS Artificial Intelligence and Data Science • Chemical Engg. • Civil Engg • Computer Science & Engg. • Electronics and Computer Sci. • Mechanical Engg	• Electrical and Computer • Electronics and Telecomm • Instrumentation and Control
9	Robotics and Automation	Micro electro Mechanical Systems (MEMS) Robotics Mechatronics Industrial Automation Mini Project	Mechanical Engineering	• AIDS Artificial Intelligence and Data Science • Chemical Engg. • Civil Engg • Computer Science & Engg. • Electrical and Computer • Electronics and Computer Sci. • Electronics and Telecomm	• Instrumentation and Control • Mechanical Engg.

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List Open Elective for Semester-IV

Sr. No.	Department offering Open Elective to other Departments	Course Code	Course Title
1	Artificial Intelligence and Data Science	0AIOE256	Prompt Engineering
2	Civil Engineering	0CVOE256	Disaster Management
3	Chemical Engineering	0CHOE256	Introduction to AI in Process Industries
4	Computer Science and Engineering	0CSOE256	Information Security
5	Electrical and Computer Engineering	0ECEOE256	Sustainable Power Generation
6	Electronics and Computer Science	0ECSOE256	Intellectual Property Rights
7	Electronics and Telecommunication	0ETOE256	Digital Marketing
8	Instrumentation and Control Engineering	0ICOE256	Industrial Economics
9	Mechanical Engineering	0MEOE256	Industrial Safety

List Open Elective for Semester-V

Sr. No.	Department offering Open Elective to other Departments	Course Code	Course Title
1	Artificial Intelligence and Data Science	0AIOE306	Generative AI
2	Civil Engineering	0CVOE306	Human Resources Development
3	Chemical Engineering	0CHOE306	Energy Audit and Conservation
4	Computer Science and Engineering	0CSOE306	Ethical Hacking
5	Electrical and Computer Engineering	0ECEOE306	Intelligent Energy Management
6	Electronics and Computer Science	0ECSOE306	Investment and Financial Planning
7	Electronics and Telecommunication	0ETOE306	Remote Sensing and GIS
8	Instrumentation and Control Engineering	0ICOE306	Principles of Finance and Economics
9	Mechanical Engineering	0MEOE306	Economics for Engineers

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Lonere, Raigad

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Department of Mechanical Engineering

Curriculum for Second Year Undergraduate Degree Programme

B. Tech. in Mechanical Engineering

In accordance with National Education Policy (NEP – 2020)

w. e. f.

Academic Year: 2026-27

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

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Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwards)

S.Y. B.Tech Semester III Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEESC201	Engineering Mathematics and Numerical Methods	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC202	Thermodynamics	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC203	Materials Science and Metallurgy	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC204	Machine Drawing and Introduction of CAD	2	0	0	2	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM205	MDM - I	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEVEC206	Environmental Studies	2	0	0	2	ISE	50	20	-	-	50
0MEHSSM207	Principles of Management	2	0	0	2	ISE	50	20	-	-	50
0MEPCC208	Materials Science and Metallurgy Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC209	Machine Drawing and Introduction of CAD Lab	0	0	4	2	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MECEP210	Community Engagement Project	0	0	2	1	ISE	-	-	50	20	50
TOTAL		18	1	8	23	TOTAL MARKS					850
Total Contact Hours Per Week		27									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	4	11		3	-	-	-	2	-	2	-	1	-	-	-	23
Cumulative	16	19	11	-	3	-	3	3	2	2	2	-	1	-	-	1	63

Multidisciplinary Minor offered by Mechanical Engineering

Course Code	Course Name
0MEMDM205	Micro Electro Mechanical Systems (MEMS)

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0MEESC201 ENGINEERING MATHEMATICS AND NUMERICAL METHODS

Course Details:

Course Code and Course Title	**OMEESC201** **Engineering Mathematics and Numerical Methods**			
Semester:	III			
Prerequisites	Engineering Mathematics - I Engineering Mathematics - II			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	**04**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Solve linear differential equations with constant coefficients by using Laplace transform.	3
CO2	Use numerical techniques to solve algebraic and transcendental (non-linear) equations.	3
CO3	Apply numerical differentiation and integration techniques to solve engineering problems.	3
CO4	Solve one-dimensional heat, wave, and Laplace equations using standard analytical methods.	3
CO5	Apply statistical methods to interpret data by using least-square method.	3

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Laplace Transform:** Definition, Transform of elementary functions. Properties of Laplace transform, Inverse Laplace transform, Partial fraction method and Convolution Theorem, Applications to find the solutions of linear differential equations.	07
Unit 2	**Error Analysis and Solution of Non-linear Equations:** Introduction of Errors, Types of errors, Roots of equation: Bisection method, Regula-Falsi method, Newton-Raphson method, Secant method.	06
Unit 3	**Numerical Differentiation:** Newton's forward difference formula, Newton's backward difference formula, central difference formula, Newton's divided difference formula.	06
Unit 4	**Partial Differential Equation and its Applications:** Formation of Partial differential equations by eliminating arbitrary constants and Functions, Method of separation of variables – applications to find solutions of one-dimensional heat flow equation and wave equation, Solution of Laplace equation by Gauss Seidel Method.	07

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Unit 5	**Curve Fitting:** Fitting of curves by method of Least–squares, Coefficient of correlation, Spearman's rank correlation coefficients and lines of regression of bivariate data.	07
Unit 6	**Numerical Integration:** Numerical integration: Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Weddle's Rule.	06
	Total Hrs.	**39**

List of Tutorials:

Sr. No.	Tutorial Name
1	Write a C program to calculate error values.
2	Write a C program for Newton Raphson Method.
3	Write a C program for Bisection method.
4	Write a C program for Secant method.
5	Write a C program for Regula Falsi method.
6	Write a C program for Gauss Seidel method.
7	Write a C program for Least-Squares method
8	Write a C program for Trapezoidal rule
9	Write a C program for Simpson's 1/3 rule and Simpson's 3/8 rule
10	Write a C program for Weddle's rule

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Engineering Mathematics	H. K. Dass	S. Chand Publishing	Revised Edition	2022
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44th	2021
3	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India	10th	2015
4	Numerical Methods in Engineering and Science	Dr. B. S. Grewal	Khanna Publishers, New Delhi	11th	2021
5	Introductory Methods of Numerical Analysis	S. S. Sastry	Prentice Hall India (PHI)	5th	2022
6	Numerical Methods for Scientific and Engineering Computation	M. K. Jain, S. R. K. Iyengar, R. K. Jain	New Age International Publishers	6th	2015
7	Numerical Methods	P. Kandasamy	S. Chand Publications	Reprint Edition	2007

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Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Probability and Statistics for Engineers and Scientists	Sheldon M. Ross	Academic Press	5th	2020
2	Numerical Methods for Scientific and Engineering Computation	M. K. Jain, S. R. K. Iyengar, R. K. Jain	New Age International Publishers	7th	2019
4	Advanced Engineering Mathematics	Dennis G. Zill, Warren S. Wright	Jones & Bartlett Learning	7th	2020
5	Numerical Methods for Engineers	Steven C. Chapra, Raymond P. Canale	McGraw-Hill Education	8th	2021
6	Mechanical Numerical Analysis	Richard L. Burden, J. Douglas Faires	Cengage Learning	10th	2015
7	Elementary Numerical Analysis	Kendall Atkinson, Weimin Han	Wiley India / John Wiley & Sons	3rd	2004

Useful links /Web Resources:

1. https://www.codewithc.com/numerical-methods-tutorial.
2. https://numericalmethodstutorials.readthedocs.io/en/latest.
3. https://www.getyoureducation.net/course/numerical-methods-for-engineers.
4. https://www.academy.websyro.com/courses/computer-oriented-numerical-methods.
5. https://sceweb.uhcl.edu/feagin/courses/csci3321.html.
6. https://nptel.ac.in/courses/111107105.

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0MEPCC202 THERMODYNAMICS

Course Details:

Course Code and Course Title	**0MEPCC202 Thermodynamics**			
Semester:	III			
Prerequisites	Engineering Physics Engineering Chemistry Engineering Mathematics			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Relate fundamental concepts and laws of thermodynamics to various systems undergoing cyclic and non cyclic processes.	2
CO2	Apply thermodynamic laws to compute the performance of various thermodynamic systems.	3
CO3	Apply ideal gas laws and equations of state to determine thermodynamic properties during ideal gas processes.	4
CO4	Analyze the effects of governing thermodynamic properties on the performance of systems under varying operating conditions.	4

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Basic concepts and properties:** Introduction, thermodynamic system, control volume, macroscopic and microscopic approaches, state of a system, point and path functions- heat and work, properties, thermodynamic equilibrium, processes and cycles, quasistatic process, zeroth law of thermodynamics, temperature scales.	6
Unit 2	**Ideal gas theory:** Ideal gases, gas laws, equation of state, gas constant, universal gas constant, ideal gas processes, thermodynamic work and heat, work in a compressible system, work done during various processes on p-v diagram (Numerical treatment)	5
Unit 3	**First law of Thermodynamics:** Law of conservation of energy, first law applied to closed system undergoing a cycle and a process, Joule's experiment, Energy- a property of system, enthalpy, specific heats, change in internal energy and heat transfer during various non-flow processes. First law applied to open systems: steady-state steady flow process (Numerical treatment on entire unit).	7
Unit 4	**Second law of Thermodynamics:** Cyclic devices: heat engines, refrigerators and heat pumps and their Performance, Limitations of the first law, Kelvin-plank and Clausius statements, their equivalence, reversible and irreversible processes, Carnot	7

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	cycle, Carnot theorem and its corollaries, the thermodynamic temperature scale, reversed Carnot cycle (Numerical treatment on entire unit).	
Unit 5	**Entropy:** Clausius' Inequality principle, entropy: a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, T-s diagram, Tds equations, Thermodynamic processes on P-v and T-s diagrams (numerical treatment), Principle of increase of entropy, Entropy generation, Availability and unavailability, Second law efficiency.	8
Unit 6	**Pure Substance:** Phase change process of a pure substance, P-V, P-T diagram, P-V-T Surface, Critical and triple point. **Steam tables and their use:** Properties of steam, dryness fraction of steam, throttling of steam, determination of dryness fraction, T-S, H-S diagram (Mollier chart) (numerical treatment).	6
	Total Hrs.	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Engineering Thermodynamics	P. K. Nag	McGraw Hill Education	7th	2025
2	Thermodynamics: An Engineering Approach	Yunus A. Çengel, Michael A. Boles	McGraw Hill Education	10th	2023
3	Engineering Thermodynamics	R. K. Rajput	Laxmi Publications	6th	2023
4	A Textbook of Thermal Engineering	R. S. Khurmi, J. K. Gupta	S. Chand Publications.	15th	2013
5	A Course in Thermal Engineering	Domkundwar	Dhanpat Rai Publications	6th	2008
6	Steam Tables with Mollier Diagram	R. S. Khurmi	S. Chand Publications.	9th (Reprint)	2025

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Engineering Thermodynamics	Moran, M.J. & Shapiro, H.N.	Wiley Publications	9th	2018
2	Fundamentals of Thermodynamics	Borgnakke C. & Sonntag R.E.	Wiley Publications	11th	2024
3	A Course in Thermal Engineering	P. L. Ballaney	Khanna Publications	24th 7th Reprint	2012
4	Thermal Engineering	Mahesh M Rathore	McGraw Hill, Education, New Delhi	1st 14th Reprint	2010
5	Fundamentals of Thermodynamics and Applications	Ingo Muller, Wolfgang H. Muller	Springer	1st	2009

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Useful Links:

1. NPTEL- Basic Thermodynamics, IIT Kanpur- Prof. Y.V.C. Rao, Prof. Gautam Biswas https://nptel.ac.in/courses/112104113
2. NPTEL – Engineering Thermodynamics, IIT Kanpur – Prof. D.P. Mishra https://nptel.ac.in/courses/101104063.
3. NPTEL – Engineering Thermodynamics, IIT Madras – Prof. Babu Viswanathan, https://nptel.ac.in/courses/112106310 .
4. NPTEL – Engineering Thermodynamics, IIT Kharagpur – Prof. Suman Chakraborty, https://nptel.ac.in/courses/112105123.
5. COURSERA - Introduction to Thermodynamics: Transferring Energy from Here to There, University of Michigan, https://www.coursera.org/learn/thermodynamics-intro

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OMEPCC203 MATERIAL SCIENCE AND METALLURGY

Course Details:

Course Code and Course Title	**0MEPCC203** **Material Science and Metallurgy**			
Semester:	III			
Prerequisites	Engineering Physics Engineering Chemistry			
Teaching Scheme: - **Lecture/Tutorial/Practical**	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	03			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Identify various crystal structures of engineering materials for understanding material properties and applications.	2
CO2	Use mechanical properties of materials with appropriate equations for evaluating material behaviour.	3
CO3	Draw phase diagrams of engineering materials for understanding phase transformations.	3
CO4	Examine heat treatment processes for improving properties of different materials.	4
CO5	Analyze metallurgical techniques for evaluating material characteristics and defect detection in engineering applications.	4

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Introduction to Metals and alloy systems:** Crystal structures, indexing of lattice planes, Indexing of lattice directions, Imperfections in crystals-point defects, line defects, surface and bulk defects, Cooling curves, Dendrite-cored Structure	6
Unit 2	**Mechanical Properties and their Testing:** Tensile test, engineering stress-strain curve, true stress-strain curve, types of stress-strain curves, compression test, bend test, torsion test, formability, hardness testing, different hardness tests-Vickers, Rockwell, Brinell, Impact test, fatigue test, creep test.	7
Unit 3	**Equilibrium Diagrams:** Definitions of terms, rules of solid-solubility, Gibb's phase rule, solidification of a pure metal, plotting of equilibrium diagrams, lever rule, Iron-iron carbide equilibrium diagram, critical temperatures, solidification and microstructure of slowly cooled steels, non- equilibrium cooling of steels, property variation with microstructures, classification and application of steels, specification of steels, transformation products of austenite, TTT diagram critical cooling rate,	7

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	CCT diagram	
Unit 4	**Heat Treatment:** Heat treatment of steels, cooling media, annealing processes, normalizing, hardening, tempering, quenching and hardenability, surface hardening processes-nitriding, carbo- nitriding, flame hardening, induction hardening.	7
Unit 5	**Metallography:** Microscopy, specimen preparation, polishing abrasives and cloths, specimen mounting, electrolytic polishing, etching procedure and reagents, electrolytic etching, optical metallurgical microscope, macroscopy, sulphur printing, flow line observations, examination of fractures, spark test, electron microscope	6
Unit 6	**Power Metallurgy and Non-destructive Testing:** Principle, process Advantages and Application of Power metallurgy. Magnetic particle inspection, dye Penetrant inspection, ultrasonic inspection, radiography, eddy current testing, acoustic emission inspection	6
	Total Hrs.	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Material Science and Metallurgy for Engineers	V. D. Kodgire, S. V. Kodgire	Everest Publishing House, Pune	24th	2008
2	Materials Science and Engineering: An Introduction	W. D. Callister	John Wiley and Sons	5th	2001
3	Material Science Engineering	V. Raghavan	Prentice Hall of India Ltd.	—	1992
4	Introduction to Physical Metallurgy	S. H. Avner	Tata McGraw Hill	2nd	1997
5	Engineering Metallurgy: Part I	R. A. Higgins	ELBS	6th	1996

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Engineering Materials	V. B. John	ELBS	6th	2001
2	Materials Science and Engineering	G. F. Carter, D. E. Paul	ASM International	3rd	2000
3	Physical Metallurgy Principles	T. E. Reed-Hill, R. Abbaschian	Thomson	3rd	2003

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Useful links /Web Resources:

1. http://digimat.in/nptel/courses/video/113102080/L125.html\
2. https://ocw.mit.edu/courses/3-012-fundamentals-of-materials-science-fall-2005/
3. https://www.youtube.com/channel/UC9sKRSg8Kn5axYdORJUnqFw
4. https://ocw.mit.edu/courses/3-012-fundamentals-of-materials-science-fall-2005/

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0MEPCC204 MACHINE DRAWING AND INTRODUCTION OF AUTO CAD

Course Details:

Course Code and Course Title	**0MEPCC204** **Machine Drawing and Introduction of Auto CAD**			
Semester:	III			
Prerequisites	Engineering Graphics			
Teaching Scheme: -	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	2	-	-	
Credit	**02**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Identify constructional features and applications of machine elements from standard engineering drawings and industrial practices.	2
CO2	Explain the principles of CADD along with AutoCAD commands and 3-D visualization techniques.	2
CO3	Draw intersectional curves and surface of engineering solids using principles of geometrical drafting.	3
CO4	Construct assembly and detail drawings of machine components considering limits, fits, tolerances, and surface roughness as per manufacturing requirements.	4

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Study of Machine Elements:** Study of simple machine elements and components like screwed fasteners, shaft couplings, pipe joints, riveted and welded joints, bearings, gears, etc.	6
Unit 2	**Interpenetration of Surfaces (Emphasis on Applied Cases):** Line or curve of intersection of two solid like cylinders and cylinder, Cone and cylinder, prism and cylinder, cone and prism, Forged ends, etc.	6
Unit 3	**Interpretation of industrial drawing, Assembly and Details:** Limit, Fits, Tolerances, Surfaces roughness, Production drawings, Interpretation of industrial drawing, Part drawing of standard machine components like valves, components of various machine tools, pumps, shaft couplings, joints, pipe fittings, engine parts, etc.	8
Unit 4	**Computer Aided Drafting:** Introduction to Computer Aided Design and Drafting (CADD), Advantages of CADD, study of preliminary Auto CAD commands like drawing, dimensioning, viewing commands. Drawing 3-D views in AutoCAD.	4
	Total Hrs.	**24**

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Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Machine Drawing	N. D. Bhatt	Charotar Publishing House Pvt. Ltd.	53rd	2022
2	Machine Drawing	K. L. Narayana, P. Kannaiah K. Venkata Reddy	New Age International Publishers	4th	2021
3	Machine Drawing	K. R. Gopalakrishna	Subhas Publications	23rd	2019
4	Engineering Drawing	P. S. Gill	S. K. Kataria & Sons	13th	2025
5	Engineering Drawing with AutoCAD	Dhananjay A. Jolhe	Tata McGraw-Hill Education	1st	2008

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Engineering Drawing and Design	Cecil H. Jensen, Jay D. Helsel & Dennis R. Short	McGraw-Hill Education	7th	2007
2	Fundamentals of Engineering Drawing	Warren J. Luzadder & Jon M. Duff	Pearson / Prentice Hall	11th	2015
3	AutoCAD for Engineers and Designers	Sham Tickoo	Drea MTech Press (Wiley India)	14th	2024
4	Architectural Graphics	Francis D. K. Ching	Wiley	7th	2020
5	Engineering Drawing	Warren J. Luzadder	Prentice Hall	10th	1989

Useful links /Web Resources:

1. NPTEL – Engineering Drawing Course (IIT Guwahati)
   Complete course on engineering drawing fundamentals
2. NPTEL – CAD/CAM Course (IIT Delhi)
   Covers basics of computer-aided design and applications
3. NPTEL – Engineering Drawing & Computer Graphics
   Combined learning of manual drawing + CAD concepts
4. Autodesk Student & AutoCAD Resources
   Free AutoCAD software, tutorials, and certifications for students
5. Autodesk CAD Learning (Intro to Engineering Design)
   Beginner-friendly CAD tutorials and 3D modelling basic

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0MEMDM205 MICRO ELECTRO MECHANICAL SYSTEMS

Course Details:

Course Code and Course Title	**0MEMDM205** **Micro Electro Mechanical Systems (MEMS)**			
Semester:	III			
Prerequisites	Engineering Physics Basic Electrical and Electronics			
Teaching Scheme: - **Lecture/Tutorial/Practical**	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Explain the fundamentals and mechanics of MEMS requires for microfabrication.	2
CO2	Illustrate the various microfabrication processes used in manufacturing of MEMS components.	2
CO3	Use the various MEMS sensors and actuators for robotics and automation applications.	3
CO4	Identify modern applications and emerging trends in MEMS.	3
CO5	Analyse the MEMS components using suitable engineering modelling approaches.	4

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Introduction of MEMS:** Introduction and historical development of MEMS, Need and limitation of miniaturization, Microsystems vs. Microelectronics, Smart Materials, Smart Structures and Smart Systems, Integrated Microsystems, Micro fabrication process, Applications of MEMS.	6
Unit 2	**Materials and Solid Mechanics in MEMS:** Silicon as a MEMS material, Specialized Materials, Smart Materials; Stress and Strain, Hooke's law, Poisson ratio, Thermal stress and strain, Bending stress, Scaling laws in MEMS.	6
Unit 3	**Basic Processes in Micro Fabrication:** Thermal Oxidation, Physical Vapour Deposition (PVD), Chemical Vapour Deposition (CVD), Oxidation vs. Deposition, Lithography, Etching: Wet etching, Dry etching.	7
Unit 4	**Advanced Processes for Micro fabrication:** Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, LIGA process, Isotropic etching and anisotropic etching,	6

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	Wafer bonding.	
Unit 5	**MEMS sensors, actuators and systems:** Principles of micro sensors and actuator, Capacitive accelerometer, Capacitive vibratory gyroscope, Piezoresistive pressure sensor, Conduct metric gas sensor; Electrostatic comb drive, U-Shaped Electrothermal Actuators, Magnetic microrelay, Piezoelectric actuators, Applications of MEMS in robotics and automation.	8
Unit 6	**Advanced Microsystems and Overview of MEMS modelling:** Portable blood analyzer, Piezoelectric inkjet print head, Micromirror array for video projection; Energy methods of analysis, Overview of Finite Element Method, Coupled electromechanical systems modelling.	6
	Total Hrs.	**39**

Textbooks:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	An Introduction to MEMS and NEMS	Nikhil P. Ambole	KDP	1st	2026
2	Foundations of MEMS	Chang Liu	Pearson	2nd	2024
3	Introduction to MEMS	Rohit Manglik	EduGorilla	1st	2024
4	Fundamentals of Microelectromechanical Systems (MEMS)	Eun Sok Kim	McGraw-Hill	1st	2021
5	Microelectromechanical Systems (MEMS)	Dilip Bhattacharya Brajesh Kaushik	Cengage Learning	1st	2015

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Microsensors, Actuators, and Smart Systems	Mahalik Nitaigour Premchand	Taylor & Francis	1st	2021
2	The MEMS Handbook: MEMS Introduction and Fundamentals	Mohamed Gad-el-Hak	CRC Press	2nd	2018
3	MEMS and Microsensors	Lenzi Francesco, Giorgio Donato Carlo	Politecnico di Milano	1st	2021
4	MEMS	Mahalik Nitaigour Premchand	Tata McGraw-Hill	6th	2012
5	MEMS & Microsystems: Design and Manufacture	Tai-Ran Hsu	McGraw-Hill	2nd	2008

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Useful links /Web Resources:

1. NPTEL course (MEMS and Microsystems, IIT Kharagpur by Prof. Santiram Kal)
   https://nptel.ac.in/courses/117105082
2. NOC course (BioMEMS and Microfluidics, IIT Kanpur by Prof. Shantanu Bhattacharya)
   https://nptel.ac.in/courses/112104181
3. e-book (An Introduction to MEMS and NEMS by Nikhil P. Ambole)
   https://amzn.in/d/08WH4MCD
4. MIT Open Course Ware (Microelectronics Processing Technology)
   https://ocw.mit.edu

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Dr. K. K. Pandyaji
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Dr. S. S. Mohite
Director

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0MEVEC206 ENVIRONMENTAL STUDIES

Course Details:

Course Code & Course Title	0MEVEC206 Environmental Studies		
Semester	III		
Prerequisites	--		
Teaching Scheme	Lecture	Tutorial	Practical
	2	--	--
Credit	02		
Evaluation Scheme	ISE	MSE	ESE
	50 Marks	--	--

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		BL
CO1	Explain the components and importance of Environment, ecosystems and Bio-diversity	2
CO2	Discuss the various natural resources and strategies for their management	3
CO3	Explain the sources of pollution, effects and control measures	2
CO4	Apply the knowledge of EIA, EMS and Audits for the preparation of reports.	3

Course Contents:

Unit No.	Contents	Hrs.
Unit 1	**Introduction to Environmental Studies:** Definition, scope and importance, Components of environment, Multidisciplinary nature of environmental studies. Ecosystems- Types, Structure and function, energy flow, food chains and food webs. Biodiversity- Types, Importance and conservation	6
Unit 2	**Natural resources and Management:** Natural resources- Forest, Water, Mineral food, Energy and Land. Energy resources- Renewable-Wind, Hydropower, Tidal, Ocean thermal, Solar, Biomass, Biogas, Geothermal and Hydrogen. Non-renewable- Coal Petroleum, Natural gas, nuclear energy, Sustainable management of resources	6
Unit 3	**Environmental pollution and climate change:** Types of pollution- Water, Air, Solid waste, Soil and Noise, Sources, effects and control measures, Global effects of pollution	6
Unit 4	**EIA, EMS, Social issues and legislation:** Environmental Impact Assessment (EIA)- Purpose and process. Engineering Management Systems (EMS)-Principles and steps, Introduction to Environmental Audit and Green audit	6
	Total Hours	**24**

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Text/Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Ecological and Environmental studies	S. K. Garg	Khanna publishers	1st	2006
2	Essentials of Environmental studies	Kurian Joseph R. Nagendran	Pearson Education, Singapore	2nd	2004
3	Environmental studies	Suresh K. Dhameja	Katson books	4th	2012
4	Environmental studies	P. D. Raut	Shivaji University, Kolhapur	4th	2012

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0MEHSSM207 PRINCIPLES OF MANAGEMENT

Course Details:

Course Code & Course Title	0MEHSSM207 Principles of Management		
Semester	III		
Prerequisites	--		
Teaching Scheme	Lecture	Tutorial	Practical
	2	--	--
Credit	02		
Evaluation Scheme	ISE	MSE	ESE
	50 Marks	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		BL
CO1	Develop analytical and managerial abilities for solving organizational and workplace problems using management concepts and theories.	3
CO2	Identify and classify different types of plans such as policies, procedures, rules, programs, budgets, and strategies used in organizations.	3
CO3	Describe different types of organizational structures and evaluate their suitability in various business environments.	3
CO4	Identify and compare different leadership styles and major leadership theories used in management practices.	3

Course Contents		
Unit No.	Contents	Hrs
Unit 1	**Introduction to Management:** Definition, nature, scope, and importance of management, Functions of management, Levels of management, Managerial roles and skills, Evolution of management thought, Scientific Management – F.W. Taylor, Administrative Theory – Henri Fayol, Bureaucratic Theory – Max Weber, Human Relations Approach – Elton Mayo, Management as science, art, and profession.	7
Unit 2	**Planning and Decision Making:** Nature and importance of planning. Types of plans, Planning process, Strategic planning, Forecasting techniques, Decision-making process, Types of decisions, Decision-making models, Problem-solving techniques, Management by Objectives (MBO).	5
Unit 3	**Organizing and Staffing:** Principles of organization, Organizational structure, Departmentation, Delegation and decentralization, Authority and responsibility, Span of control, Line and staff organization, Staffing process, Recruitment and selection, Training and development, Performance appraisal.	5
Unit 4	**Leadership, Motivation, and Communication:** Nature and importance of leadership, Leadership styles and theories, Motivation concepts, Maslow's Need Hierarchy Theory, Herzberg's Two-Factor Theory, McGregor's Theory X and Theory Y, Communication process,	7

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	Types and barriers of communication, Team dynamics and conflict management, Emotional intelligence.	
	Total Hours	**24**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Essentials of Management	Koontz, H. and Weihrich, H	McGraw Hill	12th	2023
2	Management	Robbins, S.P. and Coulter, M.	Pearson	16th	2024
3	Principles of Management	Gupta, C.B.	Sultan Chand & Sons	18th	2023
4	Principles and Practice of Management	Prasad, L.M.	Sultan Chand & Sons	10th	2020
5	Principles of Management	Tripathi, P.C. and Reddy, P.N.	McGraw Hill	6th	2017

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1.	The Practice of Management	Peter Drucker	Harper Business	Classic/Reissue	2006
2.	Organizational Behaviour	Fred Luthans	McGraw Hill	14th	2021
3.	Management	Stoner, Freeman & Gilbert	Pearson / Prentice Hall	6th	2018
4.	Organizational Behaviour	Stephen Robbins	Pearson	19th	2023

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0MEPCC208 MATERIAL SCIENCE AND METALLURGY LAB

Preamble:

Materials Science and Metallurgy are fundamental branches of engineering that deal with the structure, properties, behavior, and performance of engineering materials. Knowledge of material characteristics and testing techniques is essential for selecting suitable materials for various industrial and engineering applications. Practical understanding of metallic and non-metallic materials enables students to correlate theoretical concepts with industrial practices.

This laboratory course is designed to provide hands-on experience in the testing, analysis, and microscopic examination of engineering materials. The experiments included in the course familiarize students with destructive and non-destructive testing methods, hardness testing techniques, metallurgical specimen preparation, heat treatment analysis, and microscopic study of ferrous and non-ferrous materials. The course also emphasizes the importance of microstructure in determining the mechanical and physical properties of materials.

Course Code	**0MEPCC208**			
Course Title	**Material Science and Metallurgy Lab**			
Semester	III			
Prerequisites	Engineering Physics, Engineering Chemistry			
Teaching Scheme	Lecture	Tutorial	Practical	
	--	--	2 Hrs/Week	
Credit	**01**			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	25 Marks	--	25 Marks	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	Measure hardness of given material using Brinell and Rockwell Hardness test.	3
CO2	Prepare sample specimen for observing the microstructure of the material.	3
CO3	Demonstrate sulphur printing and spark testing techniques for material identification.	3
CO4	Draw microstructures of plain carbon and heat-treated steels using metallurgical microscope.	2
CO5	Understand the importance of material testing and evaluation in ensuring the safety, reliability, and quality of engineering components for societal welfare.	2

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Course Contents		
List of Experiments (At least eight experiments are to be conducted and completed)		
Expt. No.	**Experiment**	**Hrs**
1	Experiment on Hardness Testing by using, A) Brinell Hardness Tester B) Rockwell Hardness tester	2
2	Experiment on Non-Destructive Testing by using, A) Magnaflux Test B) Dye penetrant Test	2
3	Study and Preparation of Specimen 0.2 % Carbon Steel for Metallurgical Microscopy	2
4	Experiment of Sulphur Print Test	2
5	Experiment of Spark Test	2
6	Study of microscopic examination of plain carbon steels of varying carbon Percentage	2
7	Study of microscopic examination of heat-treated steels	2
8	Experiment on Jominy End Quench Test for Hardenability	2
9	Study of microscopic examination of microstructures of cast irons.	2
10	Study of microscopic examination of non-ferrous alloys	2
	Total Hours	**16**

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Director

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0MEPCC209 MACHINE DRAWING AND INTRODUCTION OF AUTO CAD LAB

Preamble:

The Machine Drawing and Introduction of AutoCAD Laboratory provides practical understanding of engineering drawing principles, machine drawing standards, and computer-aided drafting techniques used in industries. The laboratory helps students develop skills in preparing conventional representations of machine elements, pipe joints, weld joints, fasteners, assembly drawings, production drawings, and intersection of solid surfaces according to BIS/ISO standards.

The course develops skills in visualization, interpretation of industrial drawings, dimensioning, limits, fits, tolerances, surface finish symbols, and preparation of accurate 2D and basic 3D models using AutoCAD commands such as drawing, modifying, EXTRUDE, REVOLVE, and BOOLEAN operations. It also enhances drafting accuracy, CAD modeling ability, and technical documentation skills required for manufacturing and production applications.

On successful completion of the laboratory course, students will be able to prepare and interpret engineering and production drawings using standard drafting practices and AutoCAD tools for mechanical engineering applications.

Course Code	**0MEPCC209**			
Course Title	**Machine Drawing and Introduction of Auto CAD Lab.**			
Semester	III			
Prerequisites	Engineering Graphics			
Teaching Scheme	Lecture	Tutorial	Practical	
	--	--	4 Hrs/Week	
Credit	**01**			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	25 Marks	--	25 Marks	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	Draw BIS/ISO representations of machine elements, fasteners, pipe joints, and weld joints using standard drafting practices.	2
CO2	Construct intersections of solid surfaces using geometrical projection methods with drawing accuracy.	3
CO3	Prepare assembly and detail drawings with dimensions, fits, tolerances, and surface finish symbols as per standards.	3
CO4	Draft 2D drawings and 3D part model of machine elements using AutoCAD drafting, modelling commands.	4
CO5	Integrate ergonomics, environmental and societal factors in machine drawing representation.	3

Course Contents:		
List of Experiments (All experiments shall be conducted.)		
Sr. No.	**Experiment**	**Hrs**
1.	**Conventional Representation:** Sheet showing standard representations of machine elements BIS/ISO, pipe joints, weld joints, and fasteners.	**4**

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2.	**Machine Elements:** Draw machine elements such as bolts, nuts, keys, and gears using machine drawing conventions.	4
3.	**Intersection of Solid Surfaces:** Sheet showing intersection of two solids (e.g., cylinder–cylinder, cone–prism)	4
4.	**Assembly / Detail Drawing / Industrial Drawing:** Draw two Sheets of assembly from details or details from assembly, including dimensions, limits, fits, tolerances, and surface finish symbols.	4
5.	**Introduction to AutoCAD:** Prepare 2D drawing for a simple component using basic drawing, modifying, and dimensioning commands.	4
6.	**Machine Elements:** Prepare 2D drawings standard of machine elements with proper dimensioning and tolerances.	4
7.	**Production / Assembly Drawing:** Prepare production or assembly drawings with proper dimensioning and tolerances.	4
8.	**3D Part Modeling:** Create a 3D model using commands like EXTRUDE, REVOLVE, and BOOLEAN operations and prepare dimensioned orthographic views.	4
	Total Hours	**32**

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0MECEP210 COMMUNITY ENGAGEMENT PROJECT

Course Code	**0MECEP210**			
Course Title	**Community Engagement Project**			
Semester	III			
Prerequisite	Design Thinking			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hrs/Week	
Credit	**01**			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	25 Marks	--	25 Marks	--

Course Outcomes (CO's): Upon successful completion of this course, the student will able to:		**BL**
CO1	Understand environmental and social issues to identify community problems through field surveys and visits.	1
CO2	Recognize teamwork, leadership, communication, and ethical responsibility while working with diverse community groups.	2
CO3	Apply feasible and sustainable solutions to address identified community problems using interdisciplinary engineering knowledge.	3
CO4	Evaluate the impact of community interventions and suggest improvements based on knowledge and observations.	2
CO5	Solve community needs and propose practical solutions for identified problems.	3

Course Contents:		
	Contents	
	Introduction: Each batch/group of students is expected to work on a Community Project. For a community project group has to consider any problem statement and find solutions to those problems which should be helpful to the community. Students shall identify community needs, planning interventions, implementing solutions, and evaluating outcomes with active participation from both students and community members. Students' groups shall submit project report in a systematic technical format about the project. The report shall be checked and evaluated by the concerned teacher (Guide). **Focus Areas:** The CEP should focus on addressing a specific community or societal issues. Projects may fall under the following themes: **1. Education and Awareness:** Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, or career planning for local stakeholders.	

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	2. Technology for Social Good: Develop a simple prototype or solution that addresses a real-world problem. **3. Environmental Sustainability:** Waste management, organize clean-up drives, tree plantations, reduce, reuse and recycle campaigns, or energy conservation techniques. **4. Skill Development:** Teach basic computer or technical skills to students, staff, or the community.	

	Contents	Hrs.
	Steps: **1. Planning Phase:** a. Team Formation: A team or group of 3-4 students with a balance of skills and interests. b. Project Selection: Choose a project theme with a clear aim that aligns with the objective of CEP. c. Proposal Submission: Submit a one-page summary of proposed project. **2. Execution Phase:** a. Phase 1 Activities · Conduct initial outreach and engage with the community or target participants. · Implement planned activities with close teamwork and documentation. b. Phase 2 Activities · Continue engagement and collect feedback from the participants. · Begin summarizing the outcomes of the project. **3. Reporting Phase:** a. Create a detailed report containing: · Title, objective, and scope of the project. · Activities conducted · Outcomes and community feedback. · Photos/videos of the activities (if permitted). · Challenges faced and how they were addressed. b. Presentation: · Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes.	26
	Total Hours	26

Reference Books:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of Edition
1	Principles Of Community Engagement	Elizabeth Cohn RN	CDC US	1st	2016

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2	Service-Learning Essentials: Questions, Answers, and Lessons Learned	Barbara Jacoby	John Wiley & Sons	1st	2014
3	Engineering and Sustainable Community Development	Juan C. Lucena, Jen Schneider, Jon A. Leydens.	Morgan & Claypool Publishers	2nd	2010
4	Building with the Community: Engineering Projects to Meet the Needs of Both Men and Women	Brian Reed	WEDC, Loughborough University	1st	2005
5	Community engagement in higher education: trends, practices and policies Analytical report	Thomas Farnell	European Union	1st	2020

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Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY, BUDHGAON, SANGLI. 416304

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad

Department of Mechanical Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwards)

S.Y. B.Tech Semester IV Mechanical Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0MEPCC251	Fluid Mechanics	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC252	Applied Thermodynamics	3	1	0	4	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC253	Strength of Materials	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEPCC254	Manufacturing Processes	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEMDM255	MDM - II	3	0	0	3	ISE1	10	40*	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0MEOE256	Open Elective-1	2	0	0	2	ISE	50	20	-	-	50
0MEVEC257	Universal Human Values	2	0	0	2	ISE	50	20	-	-	50
0MEAEC258	Soft Skills	0	0	2	1	ISE	25	10	-	-	25
0MEPCC259	Fluid Mechanics Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEVSEC260	Manufacturing Processes Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0MEPCC261	Strength of Materials Lab	0	0	2	1	ISE	-	-	25	10	25
TOTAL		**19**	**1**	**8**	**24**	**TOTAL MARKS**					**850**
Total Contact Hours Per Week		**28**									

Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	15	-	3	2	1	1	-	-	2	-	-	-	-	-	24
Cumulative	16	19	26	-	6	2	4	4	2	2	4	-	1	-	-	1	87

Multidisciplinary Minor offered by Mechanical Engineering		Open Elective-1 offered by Mechanical Engineering	
Course Code	Course Name	Course Code	Course Name
0MEMDM255	Robotics	0MEOE256	Industrial Safety

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0MEPCC251 FLUID MECHANICS

Course Details:

Course Code and Course Title	**0MEPCC251** **Fluid Mechanics**			
Semester:	IV			
Prerequisites	Engineering Physics Engineering Mathematics			
Teaching Scheme: -	**Lecture**		**Tutorial**	**Practical**
Lecture/Tutorial/Practical	3		-	-
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Determine fluid properties and statics for pressure distribution, buoyancy, and stability for static fluid systems.	2
CO2	Explain fluid motion using kinematics concepts for engineering applications.	2
CO3	Apply fundamental fluid dynamics equations to solve flow measurement problems for fluid engineering systems.	3
CO4	Apply concepts of viscous flow and pipe flow to determine flow behaviour and head losses for piping systems.	3
CO5	Apply boundary layer concepts to estimate drag and lift forces for marine and fluid engineering applications.	3

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Properties of Fluids and Fluid Statics:** Definition of Fluid, Properties of Fluids (Numericals), Types of Fluids, Surface Tension, Capillarity, Vapour Pressure **Fluid Statics:** Pascal's Law, Hydrostatic Law of Pressure, Total Pressure and Centre of Pressure, Buoyancy, Conditions of Equilibrium of Floating and Submerged bodies, Metacentre.	7
Unit 2	**Fluid Kinematics:** Methods of Describing Fluid Motion, Types of Fluid Flow, Rate of Flow (Numericals), Continuity Equation, Continuity Equation in Three Dimensions, Velocity and Acceleration (Numericals).	6
Unit 3	**Fluid Dynamics:** Equations of motion, Euler's Equation of Motion, Bernoulli's Equation, Assumptions, Applications of Bernoulli's Equation – Venturimeter, Orificemeter, Hydraulic Coefficients, Flow over Rectangular and Triangular Notch (Numerical on whole topic).	7
Unit 4	**Viscous Flow:**	5

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	Flow of viscous fluid through circular pipe (Numericals), Flow of viscous fluid between two parallel plates (Numericals), Reynold's Experiment.	
Unit 5	**Flow through pipes:** Darcy-Weisbach Equation (Numericals), Loss of energy in pipe due to friction, Chezy's formula (Numericals), Minor energy losses, HGL and TGL, Flow through siphon, Flow through pipes in series (Numericals), flow through pipes in parallel, Equivalent pipe, Flow through branched pipes.	8
Unit 6	**Boundary Layer Theory and External Flow:** Concept of Boundary Layer, Laminar Boundary Layer, Turbulent Boundary Layer, Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness, Force exerted by flowing fluid on a stationary body, Drag, Lift, Expression for Drag and Lift (Numericals).	6
	Total Hrs.	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	A Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications, New Delhi	10th	2018
2	Hydraulics and Fluid Mechanics (Including Hydraulic Machines)	P. N. Modi, S. M. Seth R. K. Gupta	Standard Book House, New Delhi	22nd	2019
3	Hydraulics, Fluid Mechanics and Fluid Machines	S. Ramamrutham	Dhanpat Rai Publishing Company, New Delhi	Revised Edition	2017

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fluid Mechanics	F. M. White	McGraw Hill Education	8th	2016
2	Fluid Mechanics: Fundamentals and Applications	Y. A. Çengel & J. M. Cimbala	McGraw Hill Education	4th	2018
3	Fluid Mechanics	V. L. Streeter, E. B. Wylie K. W. Bedford	McGraw Hill Education	10th	2017

Useful Links

1) NPTEL – Fluid Mechanics
   https://nptel.ac.in/courses/112105183
2) Learn Chem E (Concept Videos & Visualizations)
   https://www.learncheme.com
3) YouTube – NPTEL / IIT Lectures (Fluid Mechanics Playlist)
   https://www.youtube.com

Dr. M. L. Harugade
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

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0MEPCC252 APPLIED THERMODYNAMICS

Course Details:

Course Code and Course Title	**0MEPCC252** **Applied Thermodynamics**			
Semester:	IV			
Prerequisites	Thermodynamics			
Teaching Scheme: -	**Lecture**		**Tutorial**	**Practical**
Lecture/Tutorial/Practical	3		1	-
Credit	**04**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Explain the basic concepts and principles of thermodynamics to study the behaviour of thermal systems.	2
CO2	Apply the laws and principles of thermodynamics to study the characteristics of thermal systems.	3
CO3	Examine the boilers, steam turbines, condensers, and compressors to determine their operating performance.	4
CO4	Analyze the steam and gas power cycles to determine performance characteristics.	4

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Fuels and Combustion:** Introduction, Types of fuels, combustion reaction equations for hydrocarbon fuel, minimum air required for combustion and excess air supplied, calorific values of fuel, calorimeters, flue gas analysis using Orsat's Apparatus. (Descriptive treatment only)	4
Unit 2	**Steam Power plant cycles:** Rankine cycle, Modified Rankine Cycle (Reheat, Regenerative) (Numerical treatment), Reheat-Regenerative cycle, Combined Gas-Steam power cycle, (Descriptive treatment only). **Gas Power cycles:** Ideal and actual Brayton cycle, (Numerical treatment), Methods to Improve Efficiency- Intercooling, Reheating, and Regenerating. Air standard cycles: Otto, Diesel, Dual (Descriptive treatment only)	8
Unit 3	**Steam Generators:** Classification of Boilers, Fire tube and Water tube boiler, Boiler Mountings and Accessories. (Descriptive treatment only) **Boiler Draught:** Classification of draught, natural & artificial draught, efficiency of the chimney, draught losses etc. (Descriptive treatment only) **Boiler Performance:** Equivalent evaporation, boiler efficiency, boiler trial and heat balance	7

Dr. M. L. Harugade
H.O.D.

Dr. K. K. Randyaji
Dean Academics

Dr. S. S. Mohite
Director

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	(Numerical treatment), Introduction to IBR.	
Unit 4	**Steam Nozzles and Turbines:** Types of Nozzles, steam flow through nozzles, discharge through isentropic nozzle, steam flow through actual nozzle considering friction, (Numerical treatment), super saturated flow. **Steam Turbines:** Working principles, classification, Impulse Turbine & Impulse-Reaction Turbine: - Velocity diagrams, Performance, Degree of Reaction (Numerical treatment), Compounding methods (Descriptive treatment only)	9
Unit 5	**Steam Condensers and Cooling Towers:** Functions of a Condenser, Elements of a steam condensing plant, types, thermodynamic analysis of condensers, efficiencies (Numerical treatment). **Cooling towers:** Classification, Natural draft and Mechanical draft cooling towers (Descriptive treatment only)	6
Unit 6	**Compressors:** Classification, Reciprocating Compressors: construction, work input, minimizing compression work, Isentropic and Isothermal efficiency, effect of clearance, volumetric efficiency, multi-staging with Intercooler, FAD (Free Air Delivery), (Descriptive treatment only) Rotary Compressors: Classification, Introduction to Roots blower, vane type, Centrifugal, and Axial flow compressors (Descriptive treatment only)	5
	Total Hrs.	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Thermal Engineering	Mahesh M. Rathore	McGraw Hill, Education, New Delhi	1st 14th Reprint	2010
2	Thermal Engineering	R. K. Rajput	Laxmi Publications	10th	2015
3	A Textbook of Thermal Engineering	R. S. Khurmi, J. K. Gupta	S. Chand Publications.	15th	2013
4	A Course in Thermal Engineering	Domkundwar	Dhanpat Rai Publications	6th	2008
5	Steam Tables with Mollier Diagram	R. S. Khurmi	S. Chand Publications.	9th Reprint	2025

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Applied Thermodynamics	T. D. Eastop, A. McConkey	Addison Wesley Longman. Publications	5th	1993
2	Thermodynamics: An Engineering Approach	Y. A. Çengel, Michael A. Boles	McGraw Hill Education	10th	2023
3	A Course in Thermal	P. L. Ballaney	Khanna Publications	24th	2012

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H.O.D.

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Director

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	Engineering				
4	Basic and Applied Thermodynamics	P. K. Nag	McGraw Hill Education	3rd	2017
5	Fundamentals of Engineering Thermodynamics	Moran, M.J. Shapiro, H.N.	Wiley Publications	9th	2018

Useful Links:

1. NPTEL – Applied Thermodynamics, IIT Guwahati – Prof. Niranjan Sahoo, and Prof. Pranab Kumar Mondal
   https://nptel.ac.in/courses/112103307
2. NPTEL – Steam and Gas Power Systems, IIT Roorkee – Prof. Ravi Kumar,
   https://nptel.ac.in/courses/112107216
3. TLV – Online Steam properties calculator
   https://toolbox.tlv.com/global/TI/calculator/superheated-steam-table.html
4. Engineering Toolbox (Properties & Simple Calculations)
   https://www.engineeringtoolbox.com
5. NPTEL – Steam Power Engineering, IIT Guwahati – Prof. Vinayak N. Kulkarni,
   https://nptel.ac.in/courses/112103277

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H.O.D.

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0MEPCC253 STRENGTH OF MATERIAL

Course Details:

Course Code and Course Title	**0MEPCC253** **Strength of Material**			
Semester:	III			
Prerequisites	Engineering Mechanics			
Teaching Scheme: - **Lecture/Tutorial/Practical**	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Explain stress, strain, elastic constants, and thermal stresses for engineering materials under different loading conditions.	2
CO2	Apply concepts of stress analysis to calculate principal stresses and strain energy under different loading conditions.	3
CO3	Analyze shear force and bending moment in beams under various loading and support conditions.	4
CO4	Determine bending stress, shear stress, slope, and deflection in beams of different cross-sections using appropriate theories and methods.	4
CO5	Estimate the strength and stability of shafts, columns, and struts using torsion and column theories for engineering applications.	5

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Simple Stresses and Strains:** Introduction, Mechanical properties of materials, stress, strain, Stress strain curve, Hooke's law, Modulus of elasticity, analysis of bars of varying section, composite section, Thermal stress, Elongation of a bar due to self-weight, Hoop stress, Elastic constant, Poisson's ratio, volumetric stress and strain, bulk modulus, shear modulus, relationship between elastic constants. (Numerical)	6
Unit 2	**Principal Stresses and Strains:** Introduction, Principal planes and principal stresses, analytical method for the stresses on oblique planes, Graphical method for stress on oblique plane i.e. Mohr's circle method. (Numerical) **Strain Energy, Resilience and Combined Stresses:** Introduction of Strain energy, resilience, proof resilience, Strain energy stored in the body gradually applied load, suddenly applied load, impact loading and due to shear stress. (Numerical)	6
Unit 3	**Shear Force and Bending Moment Diagram:** Introduction, types of loads, types of beams, Shear force and Bending	7

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H.O.D.

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Dean Academics

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Director

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	moment diagram for verity of beam on various support conditions (Cantilever, simply supported, overhang) and loading condition (Point load, UDL, UVL, inclined loading), Shear force and Bending moment for Couples. (Numerical)	
Unit 4	**Stresses in Beams:** Introduction, pure bending, bending stress, neutral axis and Moment of inertia of different sections, section modulus, bending stress symmetrical section and unsymmetrical section. (Numerical) Shear stress, shear stress at a section, distribution shear stress for different geometrical sections-rectangular, solid circular, I-section, other sections design for flexure and shear. (Numerical)	6
Unit 5	**Deflection of Beams:** Introduction, relation between slope, deflection and radius of curvature, deflection and slope of the beam with uniform bending moment, eccentric loading, UDL, Macaulay's method. (Numerical)	6
Unit 6	**Torsion:** Introduction, derivation of torsion, Torque transmitted, Power transmitted, Polar moment of inertia, Polar modulus, Strength of shaft and torsional rigidity, composite shafts, Strain energy due to Torsion. (Numerical) **Columns and Struts:** Introduction, Concept of short and long Columns, Euler's columns theory, effective length (Equivalent) of a column, limitations of Euler's formula (slenderness ratio), Rankine's formulae. (Numerical)	8
	Total Hrs.	**39**

Textbooks:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Strength of Materials	S. Ramamrutham R. Narayanan	Dhanpat Rai and Sons, New Delhi	20th	2025
2	A Textbook of Strength of Materials	R.K. Bansal	Laxmi Publications	7th	2024
3	Strength of Materials	R.S. Khurmi N. Khurmi	S. Chand Publishing	26th	2022
4	A Textbook of Strength of Materials (Mechanics of Solids)	R.K. Rajput	S. Chand Publishing	8th	2025
5	Strength of Materials	S. Sadhu Singh	Khanna Publishers	11th	2021

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Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Elements of Strength of Materials	S. Timoshenko D.H. Young	East-West Press	5th	2017
2	Strength of Materials	F.L. Singer Andrew Pytel	Harper & Row Publishers	4th	1987
3	Mechanics of Materials	Ferdinand P. Beer, E. Russell Johnston Jr., John DeWolf David Mazurek	McGraw-Hill Education	8th	2020
4	Mechanics of Materials	James M. Gere Barry J. Goodno	Cengage Learning	9th	2018
5	Introduction to Mechanics of Solids	E.P. Popov	Prentice Hall of India	2nd	2015 Reprint

Useful links /Web Resources:

1. NPTEL – Strength of Materials (IIT Course)
   https://nptel.ac.in/courses/105105108
2. Strength of Materials – IIT Madras (NOC Course)
   https://onlinecourses.nptel.ac.in/noc24_me78/preview
3. MIT Open Course Ware
   https://ocw.mit.edu
4. Khan Academy
   https://www.khanacademy.org
5. Learn Engineering
   https://www.youtube.com/c/LearnEngineering

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H.O.D.

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0MEPCC254 MANUFACTURING PROCESSES

Course Details:

Course Code and Course Title	**0MEPCC254** **Manufacturing Processes**			
Semester:	IV			
Prerequisites	Material Science and Metallurgy			
Teaching Scheme: -	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	3	--	--	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Describe fundamentals of casting processes, pattern materials, moulding sand properties and gating systems for basic manufacturing understanding.	2
CO2	Explain various casting processes, casting defects and product design considerations for selection of suitable casting methods.	2
CO3	Apply rolling, forging, extrusion and drawing processes for suitable metal forming operations and defect identification.	3
CO4	Analyse welding processes, welding joints and advanced welding techniques for appropriate industrial joining applications.	4
CO5	Examine machine tool operations, machining parameters and indexing methods for machining and production requirements.	4

Course Contents		
Unit No.	**Contents**	**Hrs**
Unit 1	**Fundamentals of Casting:** Introduction to Casting Process, Various aspects of Casting, Pattern: Types of Patterns, Pattern Materials, Pattern allowance, Moulding Sand: Composition, Properties of moulding sand, Gating System design, Aspiration effect, Riser Design, Solidification of metals and alloys	06
Unit 2	**Types of Casting Processes:** **Expandable Mould Casting:** Sand Casting, Shell Moulding, Investment Casting **Permanent Mould Castings:** Die Casting- Hot Chamber die casting & Cold Chamber Die Casting Process, Centrifugal Casting- True Centrifugal Casting, Semi Centrifugal Casting, Centrifuge Casting, Continuous Casting, Cost Analysis of casting, Casting Defects Product Design Consideration in casting	06
Unit 3	**Metal Forming Processes-I:** **Rolling:** Introduction, Principal of Rolling, Types of rolling, Rolling Mills,	06

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	Rolling Defects **Forging:** Definition, Advantages of forging over casting, Types of forging, Forging operations, Forging Equipment: Hammers, Presses (Mechanical, Hydraulic), forging Defects	
Unit 4	**Metal Forming Processes-II:** **Extrusion:** Definition, Working Principle, types of Extrusion, Extrusion Equipment- Hydraulic press, Mechanical Press, Extrusion Dies and container, Extrusion Defects **Drawing:** Definition, working Principle, Types of drawing- Wire Drawing, Bar drawing, Tube drawing. Drawing Equipment: Drawing Bench & Dies, Drawing Defects	06
Unit 5	**Metal Joining Processes:** **Welding:** Introduction, Classification of welding Processes, Welding Joints, Various Welding Processes, Arc Welding- Consumable Electrode and Non-Consumable Electrode. **Advanced welding Processes:** Friction Welding, Resistance Welding, Ultrasonic Welding, Electron beam Welding (EBW), Laser Beam Welding (LBW), Plasma Arc Welding (PAW), **Brazing and Soldering:** Principles and mechanisms of brazing and soldering, Fluxes and filler materials, brazing and soldering advantages, limitations, applications.	08
Unit 6	**Introduction to Machine Tools:** **Lathe Machine:** Parts, Types, Lathe operations, Cutting parameters: Speed, Feed, Depth of cut **Drilling Machine:** Types, Drilling Operations: Drilling, Reaming, Tapping, Counter boring **Milling Machines:** Types, Milling Operations: Plain, Face, Slot, End Milling, Indexing methods (Simple Indexing)	07
	Total Hours	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Manufacturing Engineering & Technology	Serope Kalpakjain Steven R. Schmid	Addison Wesley Longman (Singapore) Pte. India Ltd	6th	2009
2	Manufacturing Technology	R. K. Rajput	Laxmi Publications Ltd., New Delhi	1st	2007

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	(Manufacturing Processes)				
3	Production Technology (Manufacturing Processes)	P. C. Sharma	S. Chand & Company Ltd., New Delhi	10th	2011

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Modern Manufacturing: Materials, Processes, & Systems	Mikell P. Groover	John Wiley and Sons, New Jersey	7th	2021
2	Materials and Processes in Manufacturing	Paul DeGarmo, J. T. Black, and Ronald A. Kohser	Wiley	14th	2025

Useful links /Web Resources:

1. NPTEL – Manufacturing Processes – Casting & Joining - https://onlinecourses.nptel.ac.in/noc22_me100/course?&force_user=true

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0MEMDM255 ROBOTICS

Course Details:

Course Code and Course Title	**0MEMDM255 Robotics**			
Semester:	IV			
Prerequisites	Basic Electrical and Electronics Engineering			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Understand terminologies related to robotics	2
CO2	Identify gripper, sensor and actuator of a robot	2
CO3	Select and evaluate appropriate robots and end effectors for specific industrial and automation applications.	3
CO4	Identify and choose suitable sensors and sensing systems based on the requirements of robotic applications.	3
CO5	Apply fundamental concepts of robot kinematics, mathematical modeling, and programming for the analysis and control of robotic systems.	3

Course Content		
Unit No.	**Contains**	**Hrs.**
Unit 1	**Fundamentals of Robotics:** Historical development of Robotics, Definitions of Industrial Robot, Type and Classification of Robots, Asimov's laws of robotics, Robot configurations, Robot Components, Robot Degrees of Freedom, Work volume and work envelope, Robot Joints and symbols, Robot Coordinates, Robot Reference Frames, Resolution, accuracy and precision of Robot, Work cell control.	7
Unit 2	**Robot Drive Systems:** Pneumatic Drives, Hydraulic Drives, Mechanical Drives, Electrical Drives- D.C. Servo Motors, Stepper Motors, A.C. Servo Motors, BLDC-Salient Features, Applications and Comparison of all these Drives,	6
Unit 3	**End Effectors:** Grippers, Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Advance Grippers, Selection and Design Considerations	7
Unit 4	**Robot Sensors:** Transducers and sensors, Sensors in robotics, Principles and applications of the following types of sensors- Proximity Sensors, Photo Electric Sensors,	6

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	Position sensors – Piezo Electric Sensor, LVDT, Resolvers, Encoders – Absolute and Incremental: - Optical, Magnetic, Capacitive, pneumatic Position Sensors, Range Sensors- Range Finders, Laser Range Meters, Touch Sensors, Force and torque sensors, Safety Sensor: Light Curtain, Laser Area Scanner, Safety Switches, Machine vision	
Unit 5	**Mathematical Modeling of a robot:** General Mathematical Preliminaries on Vectors & Matrices, Link Equations and relationships, Direct Kinematics, Co-ordinate and vector transformation using matrices, Rotation matrix, Inverse Transformations, Composite Rotation matrix, Homogenous Transformations, Robotic Manipulator Joint Co-ordinate System, inverse kinematics of two joints, DH Parameters	7
Unit 6	**Fundamentals of Robot Programming and Applications:** Introduction to Robotic Programming, On-line and off-line programming, programming examples. Various Teaching Methods, Survey of Robot Level Programming Languages, A Robot Program as a Path in Space, Motion Interpolation, various Textual Robot Languages,	6
	Total Hrs.	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Robotics	S. K Saha	Tata McGraw-Hill Education	1st	2014
2	Fundamentals of Robotics	Dilip Kumar Pratihar	Narosa Publishing House	1st	2019
3	Robotics and Control	R. K. Mittal, I. J. Nagrath	Tata McGraw-Hill Publishing Co. Ltd., New Delhi	1st	2003
4	Industrial Robotics	Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, Ashish Dutta	McGraw-Hill Education (India) Pvt. Ltd	2nd	2012

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Robotics analysis and control	S. B. Niku	Wiley Publication	2nd	2015
2	Automation, Production system and CIM	Mikell P. Groover	PHI Learning Pvt. Ltd., New Delhi	2nd	2012
3	Introduction to Robotics: Mechanics and Control	John Craig	Pearson Education	3rd	2009

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H.O.D.

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Director

0MEOE256 INDUSTRIAL SAFETY (Open Elective- I)

Course Details:

Course Code and Course Title	**0MEOE256** **Industrial Safety**		
Semester:	IV		
Prerequisites	Workshop Practices -I Lab		
Teaching Scheme: -	**Lecture**	**Tutorial**	**Practical**
Lecture/Tutorial/Practical	2	-	-
Credit	**02**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	-

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**BL**
CO1	Explain safety standards, objectives of safety management, and provisions of the Factories Act – 1948 in industrial environments.	2
CO2	Identify workplace hazards and risks, and apply preventive measures related to machinery, electrical systems, and technical equipment.	3
CO3	Analyse safety practices in construction activities including scaffolding, excavation, material handling equipment, and fall protection systems.	4
CO4	Demonstrate first aid procedures, CPR techniques, and emergency response actions for industrial accidents.	3

Course Contents		
Unit No.	**Contents**	**Hrs**
Unit 1	**Introduction to Safety Standards**: Importance of Safety, objectives of safety management, Planning of Industrial Safety, Steps to Improve Industrial Safety, EHS system in the workplaces	05
Unit 2	**Factories Act – 1948**: Introduction, objectives, important definitions like factory, worker and occupier Health provisions such as cleanliness, ventilation, lighting and sanitation. Basic safety provisions including machine safety, fire precautions and hazardous processes. Welfare facilities like first aid, canteen and rest rooms. Working hours and employment rules for women and young persons. Accident reporting, occupational diseases and penalties.	08
Unit 3	**Safety, Health and Technical Equipment:** Causes of accidents, risks in all workplaces, Preventive actions, technical equipment, lifting equipment, vehicles, safety requirements for machinery, tools and equipment, electricity and its risks, welding, boilers and pressure vessels, good housekeeping.	07
Unit 4	**Working Safety and First Aid in Mechanical Engineering:** Safety in scaffolding, ladders, stairways, excavation and trenching;	06

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H.O.D.

Dr. K. K. Pandyaji
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	material handling equipment: cranes and forklifts; fall protection systems: guardrails, safety nets, harness systems; confined space safety. Principles of first aid; CPR techniques; treatment for electric shock, burns, fractures, bleeding; first aid kit contents; emergency response system.	
	Total Hours	**26**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Health, Safety and Environment (NSQF Level 4 – Trade Theory)	National Instructional Media Institute	Directorate General of Training, Government of India, Chennai	1st	2022
2	Industrial Safety	Dr. E. Gnanasekaran	Suchitra Publications, Chennai	2nd	2019

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Safety Management: 21st Century Perspectives of Asia	J. Maiti & P. K. Ray (Eds.)	Springer	1st	2018
2	The Factories Act, 1948	Government of India	Government of India, New Delhi	Latest Amended Edition	2020
3	Introduction to Health and Safety at Work	P. Hughes & E. Ferrett	Routledge	6th	2016
4	Industrial Safety Manual	Institution of Safety Engineers (India)	Institution of Safety Engineers (India)	3rd	2021
5	Safety, Health and Working Conditions	Joint Industrial Safety Council	Joint Industrial Safety Council, Stockholm	2nd	1987
6	Industrial Safety, Health and Environment Management Systems	R. K. Jain & Sunil S. Rao	Khanna Publishers	4th	2023

Useful links /Web Resources:

1. https://youtu.be/USGuag1Jids
2. https://youtu.be/VhuZ6M7a8N8
3. https://youtu.be/n7oUOUCIblg
4. NPTEL https://nptel.ac.in/courses/110/105/110105094/

Dr. M. L. Harugade
H.O.D.

Dr. K. K. Pandyaji
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0MEVEC257 UNIVERSAL HUMAN VALUES (UHV)

Course Details:

Course Code & Course Title	**0MEVEC257** **Universal Human Values (UHV)**		
Semester	IV		
Prerequisites	Student Induction Program (SIP)		
Teaching Scheme	**Lecture**	**Tutorial**	**Practical**
	2	--	--
Credit	**2**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	--	--

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**BL**
CO1	Develop the ability to self-explore and verify value-based living through natural acceptance having right understanding and harmonious relationships as foundational to resolving personal, familial, and societal problems sustainably.	2
CO2	Apply the understanding of respect as right evaluation to address societal conflicts and contribute to value-based education.	3
CO3	Recognize the interconnectedness of natural orders and propose responsible human participation to ensure mutual fulfilment in existence.	3
CO4	Apply value-based understanding to their domain expertise to propose sustainable solutions for societal and ecological mutual fulfilment.	3

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Value Education:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations,	6
Unit 2	**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 Lecture, Understanding Harmony in the Self, Harmony of the Self with the Body Lecture, Programme to ensure self-regulation and Health	6
Unit 3	**Harmony in the Family – the Basic Unit of Human Interaction:** 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in Society, Vision for the Universal Human Order	6
Unit 4	**Understanding Harmony in the Nature:** Interconnectedness, self-regulation and Mutual Fulfilment among the Four	6

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	Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	
	Total Hours	24

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	Excel Books	2nd	2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	Excel Books	2nd	2019
3	Human Values	A. N. Tripathi	New Age International Publishers, New Delhi	3rd	2004

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Jeevan Vidya: Ek Parichaya	A. Nagaraj	Jeevan Vidya Prakashan, Amarkantak	--	1999
2	The Story of Stuff	Annie Leonard	Free Press Publishers	--	2010
3	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	Navjivan Publishing House	--	1948
4	Small is Beautiful	E. F. Schumacher	Harper Collins / Penguin Publishers	--	1993
5	Slow is Beautiful	Cecile Andrews	Penguin Random House Publishers	--	2023

Dr. M. L. Harugade
H.O.D.

Dr. K. R. Pandyaji
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Director

0MEAEC258 SOFT SKILLS

Preamble:

The Soft Skills Laboratory course is designed to develop essential communication, interpersonal, and professional competencies required for academic success and employability. The course provides hands-on practice in verbal and non-verbal communication, active listening, professional writing, group discussions, presentations, teamwork, leadership, and interview skills through interactive activities, role-plays, and mock sessions.

It also emphasizes time management, goal setting, workplace etiquette, professional ethics, and human values to prepare students for effective participation in professional and organizational environments. The laboratory-oriented approach enables students to enhance confidence, collaboration, decision-making, and overall personality development for career readiness.

Course Details:

Course Code and Course Title	**0MEAEC258** **Soft Skills**		
Semester:	IV		
Prerequisites	Professional Communication Skills		
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	25 Marks	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**BL**
CO1	Demonstrate effective verbal and non-verbal communication skills for professional interaction.	2
CO2	Apply active listening, resume writing, and email etiquette skills for workplace communication.	3
CO3	Participate in group discussions and presentations to communicate ideas with clarity and confidence.	3
CO4	Analyze team dynamics, leadership roles, and time-management strategies for collaborative problem-solving.	4
CO5	Exhibit professional ethics, workplace etiquette, and human values for responsible professional conduct.	3

Course Contents	
Expt. No.	**List of Experiment (A minimum of eight experiments must be completed.)**
1	Self-Introduction & Ice-Breaking • Students present a structured self-introduction • Focus: confidence, clarity, body language
2	Verbal Communication Skills • Activities on tone, pitch, and articulation

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	• Practice structured speaking
3	Non-Verbal Communication • Body language, gestures, posture, eye contact, Role-play exercises
4	Active Listening Skills • Listening exercises and response-based tasks • Note-taking practice
5	Resume Writing • Drafting a professional resume for Mechanical Engineering students • Peer review and improvement
6	Email Writing & Professional Communication • Writing formal emails (job application, queries) • Common mistakes and etiquette
7	Group Discussion (GD) Practice • Basic GD techniques and rules • Practice on general topics • Advanced GD with evaluation • Analytical and technical topics
8	Presentation Skills • Basics of presentation design (PPT structure) • Deliver short presentations • Advanced delivery techniques • Use of visual aids and storytelling
9	Team Building Activity • Group tasks and problem-solving exercises • Reflection on team roles
10	Leadership Skills Development • Case studies and role-play • Decision-making exercises
11	Time Management & Goal Setting • Prioritization techniques (to-do lists, planners) • Personal goal-setting exercise
12	Interview Skills (Mock Interviews) • HR and technical mock interviews, Feedback and improvement
13	Workplace Etiquette & Professional Ethics • Corporate behavior, dress code, ethics • Case-based discussion

Dr. M. L. Harugade
H.O.D.

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0MEPCC259 FLUID MECHANICS LAB

Preamble:

The Fluid Mechanics Laboratory course is designed to provide students with practical exposure to the fundamental principles of fluid behavior and flow analysis. This laboratory complements theoretical knowledge by enabling students to perform experiments related to fluid properties, fluid statics, fluid kinematics, and fluid dynamics using standard laboratory equipment and measuring instruments.

In this course, students investigate the behaviour of fluids under various flow conditions through experiments on Bernoulli's theorem, flow measurement devices, pipe flow, impact of jet, and hydraulic machines. The course emphasizes analytical skills, experimental observation, data interpretation, and systematic problem-solving approaches.

Students learn to measure fluid flow parameters, evaluate losses in piping systems, and verify fundamental fluid mechanics principles through experimentation

Course Code	**0MEPCC259**		
Course Title	**Fluid Mechanics Lab**		
Semester	IV		
Prerequisites	Fluid Mechanics		
Teaching Scheme	**Lecture**	**Tutorial**	**Practical**
	--	--	2
Credit	**1**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	--	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**BL**
CO1	Identify equipment to perform experiments for the analysis of fluid flow behaviour.	2
CO2	Conduct experiments to verify fundamental principles of fluid mechanics for engineering applications.	3
CO3	Measure flow parameters using standard measuring instruments for fluid flow analysis.	3
CO4	Determine losses and flow characteristics to evaluate the performance of fluid systems.	4
CO5	Demonstrate ethical practices, safety awareness, while conducting fluid mechanics laboratory experiments and reporting results.	4

Course Contents		
List of Experiments (At least eight experiments are to be conducted and completed)		
Expt. No.	**Experiment**	**Hrs**
1.	Verification of Bernoulli's Theorem	2
2.	Measurement of Flow using Venturimeter	2
3.	Measurement of Flow using Orificemeter	2
4.	Measurement of Flow over Rectangular Notch	2

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5.	Measurement of Flow over V-Notch	2
6.	Calibration of Pressure Gauge using Dead Weight Pressure Gauge Tester	2
7.	Measurement of viscosity by Redwood Viscometer	2
8.	Reynold's Experiment	2
9.	Heleshaw's Apparatus	2
10.	Pipe Friction Apparatus	2
11.	Impact of Jet Apparatus	2
12.	Measurement of Minor Losses in Pipe Fittings	2
	Total Hours	**16**

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0MEVSEC260 MANUFACTURING PROCESSES LAB

Preamble:

The Manufacturing Process Laboratory is designed to provide students with practical knowledge and hands-on experience of fundamental manufacturing processes widely used in mechanical engineering industries. The laboratory complements theoretical learning by enabling students to perform and observe various manufacturing operations related to machining, pattern making, and casting. It helps students understand the principles of manufacturing, process parameters, tooling, equipment, material behavior and quality considerations involved in production activities.

Through laboratory experiments and workshop practices, students will develop technical proficiency, practical skills, process analysis capabilities, and problem-solving competencies essential for modern manufacturing applications. The course also fosters teamwork, precision, professional ethics, and adherence to safety standards, thereby preparing students for effective engineering practice in industrial and professional environments.

Course Code	**0MEVSEC260**		
Course Title	**Manufacturing Processes Lab**		
Semester	IV		
Prerequisites	Workshop Practice- I Lab		
Teaching Scheme	**Lecture**	**Tutorial**	**Practical**
	--	--	2
Credit	**1**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	--	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**BL**
CO1	Describe lathe machine parts, machining operations and cutting parameters for understanding basic machining practices.	2
CO2	Explain wooden pattern making, match plate patterns and mould box preparation for foundry process understanding.	2
CO3	Apply lathe machining operations such as facing, turning, taper turning, knurling and threading for preparation of machining jobs with dimensional accuracy.	3
CO4	Examine milling and casting operations, process parameters and machining practices for identification of suitable manufacturing methods and defects.	4
CO5	Utilize workshop resources and materials efficiently for sustainable manufacturing practices.	3

Course Contents		
List of Experiments (At least eight experiments are to be conducted and completed)		
Expt. No.	**Experiment**	**Hrs**
1.	Job on Lathe Machine involving following operations: a. Facing, b. Turning, c. Step turning,	8

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	d. Taper Turning, e. Knurling & Threading	
2.	Job on Simple Wooden Pattern- Match Plate Pattern	4
3.	Demonstration on Mould Box Preparation	2
4.	Demonstration on Spur Gear cutting using milling machine	2
	Total Hours	**16**

Useful links /Web Resources:

1. Workshop Practice Lab - https://www.youtube.com/playlist?list=PLBkXmG1TwgjqAiscIlp_zAYXK3r4vYZq7
2. https://www.youtube.com/playlist?list=PLGAtpD6fzzqQ-tuqMKgCtS_2KE2YbPWpC

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0MEPCC261 STRENGTH OF MATERIAL LAB

Preamble:

The Strength of Materials Laboratory provides practical understanding of the behavior of engineering materials under different loading conditions such as tension, compression, shear, impact, torsion, bending, and flexure. The laboratory helps students verify theoretical concepts through experiments on materials like mild steel, aluminium, cast iron, wood, and concrete.

The course develops skills in operating testing equipment, taking measurements, analyzing experimental data, and interpreting material properties while following standard laboratory safety and professional practices. It also enhances analytical, technical, and report-writing skills required for engineering applications.

On successful completion of the laboratory course, students will be able to evaluate the mechanical behavior of materials under different loading conditions and correlate experimental results with theoretical principles used in engineering design and analysis.

Course Code	**0MEPCC261**		
Course Title	**Strength of Material Lab**		
Semester	IV		
Prerequisites	Engineering Mechanics		
Teaching Scheme	**Lecture**	**Tutorial**	**Practical**
	--	--	2
Credit	**1**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	25 Marks	--	--

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	Perform various mechanical tests on engineering specimens using UTM according to standard laboratory procedures.	3
CO2	Measure strain and deflection in beam specimens using strain gauges and beam testing setups.	3
CO3	Determine mechanical properties of specimens from experimental data using standard testing methods.	4
CO4	Analyze stress–strain behavior of ductile and brittle materials under different loading conditions.	4
CO5	Follow ethical practices, laboratory safety rules and proper waste disposal procedures while conducting experiment.	3

Course Contents		
List of Experiments (At least eight experiments are to be conducted and completed)		
Expt. No.	**Experiment**	**Hrs**
1.	Tension test on mid steel/ aluminium/cast iron specimen.	2
2.	Compression test on concrete/ wood specimen.	2
3.	Shear test on mild steel/ aluminium (single and double shear tests).	2
4.	Charpy/Izod Impact Test on given specimen.	2

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5.	Torsion test on mid steel/ aluminium/cast iron specimen.	2
6.	Deflection test on mild steel/wooden beam specimen.	2
7.	Bending test on Ductile material like mild steel, aluminium (Determination of Young's modulus using simply supported beam set-up).	2
8.	Strain measurement involving strain gauges/ rosettes	2
9.	Flexural tests on brittle materials like wood, concrete, composites, and plastics	2
10.	Strain measurement in stress analysis by photo-elasticity	2
	Total Hours	**16**

Dr. M. L. Harugade
H.O.D.

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