



**GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY
ODISHA, GUNUPUR**

(Established Vide Odisha Act 23 of 2018, Included by UGC, New Delhi)

Gunupur - 765 022, Dist.- Rayagada, Odisha, INDIA

www.giet.edu

SEMESTER WISE COURSES STRUCTURE

MECHANICAL ENGINEERING

ACADEMIC REGULATION -2025



29/05/2025
Date of BoS Approval

Department of Mechanical Engineering

Chairman BoS

Regulation -2025



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Gunupur - 765 022, Dist.- Rayagada, Odisha, INDIA

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DEPARTMENT OF MECHANICAL ENGINEERING

VISION

To develop globally competent Mechanical Engineers with innovation and research culture leading to entrepreneurship and successful in advanced fields of Engineering and Technology towards a societal change.

MISSION

- M1:** To impart quality education by experimental learning to enhance their professional skills.
- M2:** To provide state-of-the-art facilities and training programs to the faculty, staff and student with latest technology.
- M3:** To provide research and intellectual resources to address contemporary and complex problems of industry and research.
- M4:** To develop linkages with reputed R&D organizations and educational institutions in India for excellence in teaching, research and consultancy practices.

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DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM OUTCOMES

- PO1 (Engineering Knowledge):** Apply the knowledge of mathematics, natural sciences, computing, engineering fundamentals, and specialised engineering concepts to solve complex engineering problems effectively.
- PO2 (Problem Analysis):** Identify, formulate, investigate, and analyse complex engineering problems using appropriate theoretical and practical approaches, and reach well-supported conclusions considering the holistic nature of the problem.
- PO3 (Design/Development of Solutions):** Design innovative and sustainable solutions for complex engineering problems, and develop systems, components, or processes that meet specified requirements while considering public health, safety, cultural, societal, and environmental factors.
- PO4 (Conduct Investigations of Complex Problems):** Conduct investigations of complex engineering problems using research-based knowledge and methodologies, including experimental design, data collection, analysis, interpretation, and synthesis of information to draw valid conclusions.
- PO5 (Engineering Tool Usage):** Select, create, and apply appropriate modern engineering techniques, computational methods, resources, and IT tools, including modelling and simulation, while understanding their capabilities and limitations in solving complex engineering problems.
- PO6 (The Engineer and the World):** Analyse and evaluate the societal, environmental, economic, legal, health, safety, and cultural implications of engineering solutions, and promote sustainable development in professional engineering practice.
- PO7 (Ethics):** Apply ethical principles, professional responsibilities, human values, diversity, and inclusion in engineering practice, while complying with relevant national and international laws, standards, and regulations.
- PO8 (Individual and Collaborative Team Work):** Function effectively as an individual, and as a member or leader of diverse, multidisciplinary, and multicultural teams to accomplish common engineering goals.
- PO9 (Communication):** Communicate effectively and inclusively with the engineering community and society through technical reports, design documentation, presentations, and discussions, while considering cultural, language, and learning differences.
- PO10 (Project Management and Finance):** Apply engineering management principles, financial planning, and economic decision-making to manage engineering projects effectively as an individual, team member, or team leader in multidisciplinary environments.
- PO11 (Life-Long Learning):** Recognise the need for independent and lifelong learning, continuously enhance professional knowledge and skills, adapt to emerging technologies, and apply critical thinking to address evolving engineering challenges.



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Washington Accord Knowledge and Attitude Profiles (WKs)

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

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Structure of Undergraduate Engineering Program

SL. NO.	COURSE WORK - SUBJECTS AREA	Course Category Code	CREDITS / SEMESTER								TOTAL CREDITS
			I	II	III	IV	V	VI	VII	VII I	
1	Basic Science Courses	BS	6	6	3						15
2	Value Education Course	VEC	2								2
3	Engineering Science Courses including workshop, drawing, basics of electrical mechanical/computer etc.	ES	10	9	4	3					26
4	Ability Enhancement Courses	AEC	3	2	1	1					7
5	Humanities and Social Sciences including Management Courses	HSM		3	2	2			2	2	11
6	Indian Knowledge System	IKS			1						1
7	Mandatory Course	MC	0								0
8	Co-curricular Activities Course	CCA		1							1
9	Audit Course	AU				0					0
10	Professional Core Courses	PC			11	15	15	11			52
11	Professional Elective Courses relevant to chosen specialization / branch	PE					3	6	6	3	18
12	Open subjects - Electives from other technical and/or emerging Subjects	OE						2	2		4
13	Multidisciplinary Minor	MDM							3	3	6
14	Employment Enhancement Course	EEC (PROJECT, SEMINAR, SUMMER INT)					1	4	2	6	13
15	Research Methodology	RM					2				2
16	Vocational and Skill Courses	VSEC				2					2
	TOTAL		21	21	22	23	21	23	15	14	160



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1st Semester [First Year]
B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	BSC	25FYBS11001	Applied Mathematics-I	2	1	0	3	10	30	60	100
2	BSC	25FYBS10003	Applied Physics	2	0	0	2	10	30	60	100
3	ESC	25FYES10001	Basic Electrical and Electronics Engineering	2	1	0	3	10	30	60	100
4	ESC	25FYES11003	Programming for Problem Solving	2	0	0	2	10	30	60	100
5	AEC	25FYAE11001	English for Technical Writing	2	0	0	2	10	30	60	100
6	VEC	25FYVA10001	Environmental Sciences	2	0	0	2	10	30	60	100
7	BSC	25FYBS10103	Applied Physics Laboratory	0	0	2	1	60	-	40	100
8	ESC	25FYES10101	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	60	-	40	100
9	ESC	25FYES11103	Programming for Problem Solving Laboratory	0	0	4	2	60	-	40	100
10	AEC	25FYAE11101	English for Technical Writing Laboratory	0	0	2	1	60	-	40	100
11	ESC	25FYES10106	Engineering Graphics and Design	1	0	2	2	60	-	40	100
12	MC	25FYMC11101	*Induction Program (UHV-I)	0	0	0	0	-	-	-	-
Total:				13	2	12	21	360	180	560	1100



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2nd Semester [First Year]
B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	BSC	25FYBS12002	Applied Mathematics-II	2	1	0	3	10	30	60	100
2	BSC	25FYBS10004	Applied Chemistry	2	0	0	2	10	30	60	100
3	ESC	25FYES10002	Elements of Mechanical Engineering	2	1	0	3	10	30	60	100
4	ESC	25FYES12004	Data Structures and Algorithms	2	0	0	2	10	30	60	100
5	AEC	25FYAE12002	Effective Technical Communication	2	0	0	2	10	30	60	100
6	HSMC	25FYHS10001	Understanding Harmony and Ethical Human Conduct	2	1	0	3	10	30	60	100
7	BSC	25FYBS10104	Applied Chemistry Laboratory	0	0	2	1	60	-	40	100
8	ESC	25FYES12104	Data Structures and Algorithms Laboratory	0	0	4	2	60	-	40	100
9	ESC	25FYES10107	Workshop/Manufacturing Practices	1	0	2	2	60	-	40	100
10	CCA	25FYCC11101	Sports and Yoga or NSS/NCC	2	0	0	1				0
Total:				15	3	8	21	240	180	480	900



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3rd Semester [Second Year]
B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	BSC	25MEBS23001	Applied Mathematics	2	1	0	3	10	30	60	100
2	PCC	25MEPC23001	Engineering Thermodynamics	3	0	0	3	10	30	60	100
3	PCC	25MEPC23002	Mechanics of Solids	3	0	0	3	10	30	60	100
4	PCC	25MEPC23003	Engineering Materials and Metallurgy	3	0	0	3	10	30	60	100
5	ESC	25MEES23001	Fundamentals of PYTHON	3	0	0	3	10	30	60	100
6	HSMC	25MEHS20001	Organizational Behaviour	2	0	0	2	10	30	60	100
7	PCC	25MEPC23102	Mechanics of Solids Laboratory	0	0	2	1	40	-	60	100
8	PCC	25MEPC23103	Material Science Laboratory	0	0	2	1	40	-	60	100
9	ESC	25MEES23101	Fundamentals of PYTHON Laboratory	0	0	2	1	40	-	60	100
10	AEC	25MEAE23104	Language Proficiency and Communication Laboratory	0	0	2	1	40	-	60	100
11	IKS	25MEIK23101	Indian Knowledge Systems	-	-	-	1	-	-	-	-
Total:				16	1	8	22	220	180	600	1000

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4th Semester [Second Year]
B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	PCC	25MEPC24001	Fluid Mechanics and Hydraulic Machines	3	0	0	3	10	30	60	100
2	PCC	25MEPC24002	Manufacturing Technology	3	0	0	3	10	30	60	100
3	PCC	25MEPC24003	Kinematics of Machinery	3	0	0	3	10	30	60	100
4	PCC	25MEPC24004	Quality Control and Reliability	3	0	0	3	10	30	60	100
5	ESC	25MEES24001	Introduction to Machine Learning	3	0	0	3	10	30	60	100
6	HSMC	25MEHS20002	Engineering Economics	2	0	0	2	10	30	60	100
7	PCC	25MEPC24101	Fluid Mechanics and Hydraulic Machines Laboratory	0	0	2	1	40	-	60	100
8	PCC	25MEPC24102	Manufacturing Technology Laboratory	0	0	2	1	40	-	60	100
9	ESC	25MEPC24103	Kinematics of Machinery Laboratory	0	0	2	1	40	-	60	100
10	AEC	25MEAE24101	Workplace Communication and Presentation Laboratory	0	0	2	1	40	-	60	100
11	VSEC	25MEVS24101	Micro Project (Skill Development Project and Hands on Training)	0	0	4	2	-	-	100	100
12	AU	25MEAUE24001	Constitution of India/ Essence of Indian Knowledge Tradition	2	0	0	0	-	-	-	-
Total:				19	0	12	23	220	180	700	1100



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5th Semester [Third Year] B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	PCC	25MEPC35001	Dynamics of Machinery	3	0	0	3	10	30	60	100
2	PCC	25MEPC35004	Advanced Manufacturing Technology	3	0	0	3	10	30	60	100
3	PCC	25MEPC35003	Heat Transfer	3	0	0	3	10	30	60	100
4	PCC	25MEPC35002	Design of Machine Elements	3	0	0	3	10	30	60	100
5	PEC	25MEPE35001 25MEPE35002 25MEPE35003 25MEPE35004 25MEPE35005	1. Composite Materials 2. Optimization in Engineering 3. Advanced Mechanics of Solids 4. Advanced Fluid Mechanics 5 Theory of Innovative Design	3	0	0	3	10	30	60	100
6	RM	25MERM35001	Research Methodology	2	0	0	2	10	30	60	100
7	PCC	25MEPC35101	Dynamics of Machinery Laboratory	0	0	2	1	60	-	40	100
8	PCC	25MEPC35102	Design of Machine Elements Laboratory	0	0	2	1	60	-	40	100
9	PCC	25MEPC35103	Heat Transfer Laboratory	0	0	2	1	60	-	40	100
10	EEC	25MEEE35101	Summer Internship-I	-	-	-	1	60	-	40	100
Total:				17	0	6	21	300	180	520	1000



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6th Semester [Third Year]

B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	PCC	25MEPC36001	Refrigeration and Air Conditioning	3	0	0	3	10	30	60	100
2	PCC	25MEPC36002	Design of Machine Components	3	0	0	3	10	30	60	100
3	PCC	25MEPC36003	Mechanical Measurement and Metrology	3	0	0	3	10	30	60	100
4	PEC	25MEPE36011 25MEPE36012 25MEPE36013 25MEPE36014	1. CAD / CAM 2. Mechanical System Modeling and Control 3. Automotive Technology 4. Industrial Automation	3	0	0	3	10	30	60	100
5	PEC	25MEPE36021 25MEPE36022 25MEPE36023 25MEPE36024	1. Design and Analysis of Heat Exchanger 2. Production & Operation Management 3. Non-Destructive Evaluation and Testing 4. Condition Monitoring and Predictive Maintenance	3	0	0	3	10	30	60	100
6	OEC	25MEOE36011 25MEOE36012 25MEOE36013 25MEOE36014	1. Supply chain and Logistic Management 2. Database Management System (DBMS) For Smart Manufacturing Industry 3. Intelligent Waste Management Technics 4. Industrial Material Handling Equipments	2	0	0	2	10	30	60	100



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7	PCC	25MEPC36101	Thermal Engineering Laboratory	0	0	2	1	60	-	40	100
8	PCC	25MEPC36102	Design of Machine Components Laboratory	0	0	2	1	60	-	40	100
9	EEC	25MEEE36101	Mini Project	0	0	8	4	-	-	100	100
Total:				17	0	12	23	180	180	540	900

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7th Semester [Fourth Year]

B. Tech in Mechanical Engineering

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				L	T	P		C. A.	M. S.	E. S.	Total
1	PEC	25MEPE47011	1. Finite Element Methods								
		25MEPE47012	2. Power Plant Engineering	3	0	0	3	10	30	60	100
		25MEPE47013	3. Advanced Welding Technology								
		25MEPE47014	4. Industrial Tribology								
2	PEC	25MEPE47021	1. Computational Fluid Dynamics								
		25MEPE47022	2. Additive Manufacturing	3	0	0	3	10	30	60	100
		25MEPE47023	3. Mechanical Vibrations								
		25MEPE47024	4. Hydraulic and Pneumatic Systems								
3	MDM	25MEMM47011	1. AI in Engineering Applications								
		25MEMM47012	2. Robotics and Robotic Process Automation	3	0	0	3	10	30	60	100
		25MEMM47013	3. Sustainable and Green Engineering								
		25MEMM47014	4. Industrial Internet of Things (IIOT)								
4	OEC	25MEOE47011	1. Product Development and R&D Management								
		25MEOE47012	2. Material Characterization Techniques	2	0	0	2	10	30	60	100
		25MEOE47013	3. Data Analytics Techniques								
		25MEOE47014	4. Semiconductor Technology								
5	HSMC	25MEMC47101	Entrepreneurship and Start-ups	2	0	0	2	10	30	60	100
6	EEC	25MEEC47101	Technical Seminar	0	0	2	1	-	-	100	100
7	EEC	25MEEE47102	Summer Internship-II	-	-	-	1	60	-	40	100
Total:				13	0	2	15	110	150	440	700



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8th Semester [Fourth Year]
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				L	T	P		C. A.	M. S.	E. S.	Total
1	PE	25MEPE48011	1. Reverse Engineering	3	0	0	3	10	30	60	100
		25MEPE48012	2. Smart Materials and Application								
		25MEPE48013	3. Machine Tool Design								
		25MEPE48014	4. Laser Technology and Micromachining								
2	MDM	25MEMM48011	1. Drone Technology	3	0	0	3	10	30	60	100
		25MEMM48012	2. Industrial Safety								
		25MEMM48013	3. Project Management								
		25MEMM48014	4. Hybrid Automobiles								
3	HSM	25MEHS48001	Intellectual Property Rights (IPR)	2	0	0	2	10	30	60	100
4	EEC	25MEEC48101	Capstone/Major Project	0	0	12	6	-	-	100	100
Total:				8	0	12	14	30	90	280	400

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- PO10 (Project Management and Finance):** Apply engineering management principles, financial planning, and economic decision-making to manage engineering projects effectively as an individual, team member, or team leader in multidisciplinary environments.
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- ❖ **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 inclusive attitudes.



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DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO1:** Graduates of the program will have a successful career in mechanical engineering by imparting Mechanical Engineering concepts and practical knowledge.
- PEO2:** Graduates of the program will pursue higher education and research in the field of mechanical engineering.
- PEO3:** Graduates of the program will exhibit Scientific and Engineering expertise and perform as a Professional Entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1:** Ability to apply principles of mechanics, mechanical design, fluid mechanics, thermal systems, and manufacturing Technology to effectively analyze and solve engineering problems.
- PSO2:** Utilize engineering tools and advanced computing techniques for analysis, simulation, and product development in mechanical engineering applications.
- PSO3:** Apply the knowledge of Mechanical Engineering in multidisciplinary activities to solve real-world problems towards Sustainable Development Goals (SDGs).

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SEMESTER WISE COURSES(AR-2025)

Structure of Undergraduate Engineering Program

SL. NO.	COURSE WORK - SUBJECTS AREA	Course Category Code	CREDITS / SEMESTER								TOTAL CREDITS
			I	II	III	IV	V	VI	VII	VII I	
1	Basic Science Courses	BS	6	6	3						15
2	Value Education Course	VEC	2								2
3	Engineering Science Courses including workshop, drawing, basics of electrical mechanical/computer etc.	ES	10	9	4	3					26
4	Ability Enhancement Courses	AEC	3	2	1	1					7
5	Humanities and Social Sciences including Management Courses	HSM		3	2	2			2	2	11
6	Indian Knowledge System	IKS			1						1
7	Mandatory Course	MC	0								0
8	Co-curricular Activities Course	CCA		1							1
9	Audit Course	AU				0					0
10	Professional Core Courses	PC			11	15	15	11			52
11	Professional Elective Courses relevant to chosen specialization / branch	PE					3	6	6	3	18
12	Open subjects - Electives from other technical and/or emerging Subjects	OE						2	2		4
13	Multidisciplinary Minor	MDM							3	3	6
14	Employment Enhancement Course	EEC (PROJECT, SEMINAR, SUMMER INT)					1	4	2	6	13
15	Research Methodology	RM					2				2
16	Vocational and Skill Courses	VSEC				2					2
	TOTAL		21	21	22	23	21	23	15	14	160



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DEPARTMENT OF MECHANICAL ENGINEERING

AR-25

3rd Semester [Second Year]
B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	BSC	25MEBS23001	Applied Mathematics - III	2	1	0	3	10	30	60	100
2	PCC	25MEPC23001	Engineering Thermodynamics	3	0	0	3	10	30	60	100
3	PCC	25MEPC23002	Mechanics of Solids	3	0	0	3	10	30	60	100
4	PCC	25MEPC23003	Engineering Materials and Metallurgy	3	0	0	3	10	30	60	100
5	ESC	25MEES23001	Fundamentals of PYTHON	3	0	0	3	10	30	60	100
6	HSMC	25MEHS20001 / 25MEHS20002	Organizational Behaviour / Engineering Economics	2	0	0	2	10	30	60	100
7	PCC	25MEPC23102	Mechanics of Solids Laboratory	0	0	2	1	40	-	60	100
8	PCC	25MEPC23103	Material Science Laboratory	0	0	2	1	40	-	60	100
9	ESC	25MEES23101	Fundamentals of PYTHON Laboratory	0	0	2	1	40	-	60	100
10	AEC	25MEAE23104	Language Proficiency and Communication Laboratory	0	0	2	1	40	-	60	100
11	IKS	25MEIK23101	Indian Knowledge Systems	-	-	-	1	-	-	-	-
Total:				16	1	8	22	220	180	600	1000



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AR-2025

3rd SEMESTER

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEBS23001	APPLIED MATHEMATICS - III	2	1	0	3
Pre -Requisite: Integral Calculus, Probability, Statistics					
Course Educational Objectives					
CEO1	To test the nature of complex function.				
CEO2	To identify the different methods for complex integration.				
CEO3	To analyze error by using different methods.				
CEO4	To know about different types of probability distributions.				
SYLLABUS					
UNIT-1 PARTIAL DIFFERENTIAL EQUATIONS (09 Hours)					
Origin of Partial differential equations, Formation of Partial differential equations, linear partial differential equation of first order: Lagrange's linear differential equation, Non-Linear partial differential equation of first order using standard types and Charpit's method. Higher-order Homogeneous Linear Partial Differential Equations with Constant Coefficients.					
UNIT-2 NUMERICAL METHODS (09 Hours)					
Solution of algebraic and transcendental equations by using fixed point iteration method and Newton-Raphson's method, Regular-Falsi method Newton's Forward and Backward Difference Interpolation, Newton divided Difference interpolation formula, Lagrange's					
UNIT- 3 NUMERICAL DIFFERENTIATION AND INTEGRATION (09 Hours)					
Numerical integration: The trapezoidal rule, The Simpsons (1/3rd, 3/8th) rules, Solution of Ordinary differential equation - Euler's method, Modified Euler's method, Runge-Kutta methods.					
UNIT- 4 PROBABILITY AND RANDOM VARIABLES (09 Hours)					
Definition of probability, Addition theorem of probability with examples, Multiplication theorem of probability with illustrate examples. Conditional probability, Baye's theorem, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson and distributions.					
UNIT-5 STATISTICS (09 Hours)					
Correlation and Regression analysis, Fitting of a Straight line by the least square method. Random sampling, Estimation of Parameters (maximum likely hood method), Confidence intervals, Testing of hypothesis, hypothesis (small sample tests –t, F and chi-square test).					



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Course Outcomes: Upon successful completion of this course, students should be able to:														
CO1	Solving the first-order linear and non-linear PDEs.													
CO2	Explain algebraic and transcendental equations using iteration, Interpolation using Newton's and Lagrange's methods.													
CO3	Apply numerical techniques to solve ordinary differential equations.													
CO4	Use the foundational probability concepts including conditional probability and Bayes' theorem; discrete probability distributions.													
CO5	Perform correlation and regression analysis, fit data using least squares method, estimate parameters using maximum likelihood, and conduct hypothesis.													
CO6	Combine methods from PDEs, numerical analysis, probability, and statistics to solve real-world mathematical problems encountered in science and engineering.													
Teaching Methods: Chalk & Board, PPT														
Reference Books:														
01. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition, Willey														
02. Numerical Methods by Jain and Iyengar.														
03. Higher Engineering Mathematics by B S Grewal: Khanna Publishers, New Delhi.														
04. Higher Engineering Mathematics by B. V. Ramana, McGraw Hills Education														
05. Numerical Methods by Dutta and Jena.														
CO-PO & PSO Mapping														
PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO6	2	3	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	2.3	3	-	-	-	-	-	-	-	-	-	-	-	-

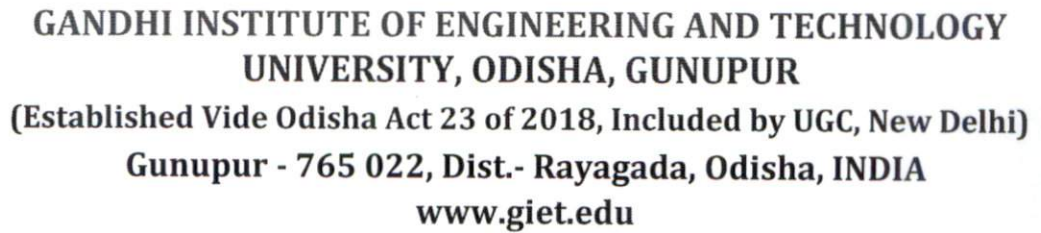
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AR-2025
3rd Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC23001	ENGINEERING THERMODYNAMICS	3	0	0	3
Pre -Requisite: Elements of Mechanical Engineering, Mathematics, Physics, Chemistry					
Course Educational Objectives					
CEO1	Students can explain the different systems such as IC Engines, Steam & Gas power plant, Refrigeration system.				
CEO2	Students can evaluate and improve the performance and efficiency of thermal engineering systems.				
CEO3	Students can understand the basics of properties of pure substance like steam and its conditions.				
CEO4	Students can analyze the availability, available energy and unavailable energy for open and closed systems				
SYLLABUS					
UNIT:1		(8 Hours)			
Entropy: Entropy as a property, Clausius inequality, Principle of increase of entropy, entropy change for an open and closed system. Change of entropy for an Ideal gas and pure substance, concept of entropy generation. Availability: Available and unavailable energy, Quality of energy, Availability for non-flow and flow process, Irreversibility, Second law efficiency.					
UNIT:2		(8 Hours)			
Pure substance: Properties of pure substance, P-v, T-s, h-s diagram for steam, Steam properties, Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy & entropy, Mollier Diagram. Non-flow and vapour flow problems.					
UNIT:3		(10 Hours)			
Vapour Power Cycles: The Carnot vapor power cycle and its limitations, Rankine cycle, means of increasing the Rankine cycle efficiency, reheat cycle, regenerative feed heating cycle, cogeneration (Back pressure and Pass-out turbines), binary vapour power cycles.					
UNIT:4		(12 Hours)			
Gas Power Cycles: Air standard cycles- Otto, Diesel, Dual Combustion and Brayton cycles, The Brayton cycle with non-isentropic flow in compressors and turbines, The Brayton cycle with regeneration, reheating and intercooling. Refrigeration cycles: Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), Working principle of VCRS and VARS (Aqua Ammonia).					
UNIT:5		(7 Hours)			
Reciprocating Air Compressors: Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance calculation of reciprocating compressors.					



CO1	Understand the energy availability and entropy relations to determine the efficiency and performance of thermodynamic systems.
CO2	Determine the properties of pure substances using steam tables and the Mollier diagram.
CO3	Analyze vapor power cycles and methods to enhance their efficiency.
CO4	Evaluate various air standard cycles.
CO5	Explain the principles of various refrigeration cycles.
CO6	Analyze the performance of single-stage and multi-stage reciprocating air compressors.

1. Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 7th Edition, Tata McGraw Hill, 2016.
2. Rogers Gordon and Mayhew Yon, Engineering Thermodynamics, Pearson Education Ltd, 4th Edition.
3. Nag.P.K., "Engineering Thermodynamics", 4th Edition, Tata McGraw-Hill, New Delhi, 2008.
4. Rathakrishnan. E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice-Hall of India Pvt. Ltd, 2006.
5. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2012.
6. Ballaney P.L., Applied Thermodynamics, Khanna Publishers
7. Ramalingam, Steam Tables in SI Units , Scitech publication.

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	3	-	2
CO4	3	3	1	-	-	-	-	-	-	-	-	3	-	2
CO5	2	2	-	-	-	-	-	-	-	-	-	3	-	1
CO6	2	2	2	-	-	-	-	-	-	-	-	3	-	1
Avg.	2.67	2.50	1.5	-	-	-	-	-	-	-	-	3	-	1.4

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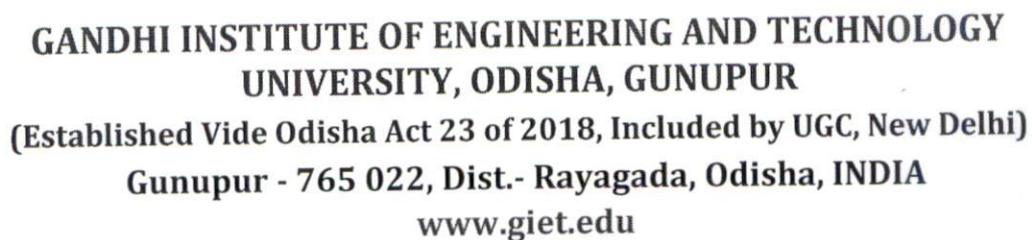
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SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC23002	MECHANICS OF SOLIDS	3	0	0	3
Pre -Requisite: Basic mathematics and Engineering Mechanics					
Course Educational Objectives					
CEO1	Apply the fundamental principles of stress, strain, and material behavior to analyze mechanical and structural components subjected to various loading conditions.				
CEO2	Analyze and design structural elements such as beams, shafts, and pressure vessels considering strength, stiffness, and safety requirements.				
CEO3	Solve real-world engineering problems involving deformation, bending, torsion, and thermal effects using appropriate analytical methods.				
CEO4	Demonstrate the ability to apply solid mechanics concepts in multidisciplinary engineering applications and pursue higher studies or professional development.				
SYLLABUS					
UNIT:1		(12 Hours)			
Stress-Strain & Material Behavior: Concept of stress and strain (axial loading), Hooke's law and elastic constants, Stress-strain diagram (ductile & brittle materials), Working stress and factor of safety, Principles of St. Venant and superposition, Shear stress and complementary shear stress Compound bars (axial loading), Statically indeterminate members, Relationship among elastic constants, Strain energy, resilience, and impact loading, Thermal stresses in composite bars.					
UNIT:2		(9 Hours)			
Biaxial Stress: Plane stress and principal stresses, Mohr's circle for plane stress, Principal strain, Strain gauges and strain rosette. Thin Cylinders: Hoop and longitudinal stresses, Strain in thin cylinders, Wire winding of thin cylinders.					
UNIT:3		(8 Hours)			
Shear Force & Bending Moment: Types of loads and supports, Support reactions, Shear force and bending moment, Relationship between S.F. and B.M., Point of contraflexure, SFD and BMD for standard cases.					
UNIT:4		(9 Hours)			
Bending of Beams: Theory of simple bending, Bending stress, Shear stresses in beams, Distribution of shearing stress over a rectangular section, triangular section, I- section and T- section. Deflection of Beams: Differential equation of elastic curve, Slope and deflection by integration method.					
UNIT:5		(7 Hours)			
Torsion of Shafts: Torsion equation, Solid and hollow shafts, Shear stress distribution, Power transmission, Strain energy in torsion, Strength of shafts in combined bending and twisting.					



Course Outcomes: <i>Upon successful completion of this course, students should be able to:</i>	
CO1	Apply fundamental concepts of stress, strain, and elastic behavior to analyze simple and compound members.
CO2	Analyze strain energy, impact loading, and thermal stresses in structural members.
CO3	Determine principal stresses using Mohr's circle and apply them to pressure vessels and strain measurements.
CO4	Construct shear force and bending moment diagrams for beams under various loading conditions.
CO5	Evaluate bending stresses, shear stresses, and deflection in beams.
CO6	Analyze torsion in shafts and evaluate strength under combined loading conditions.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/ Virtual Lab

Reference Books:

1. Bansal, R.K., A Textbook of Strength of Materials, Laxmi Publications, 4th Ed.
2. Timoshenko, S.P. & Young, D.H., Elements of Strength of Materials, East-West Press, 5th Ed.
3. Rattan, S.S., Strength of Materials, McGraw Hill Education, 2nd Ed.
4. Beer, F.P. et al., Mechanics of Materials, McGraw Hill, 8th Ed.
5. Hibbeler, R.C., Mechanics of Materials, Pearson, 11th Ed.

CO-PO & PSO Mapping														
PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	1	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	1	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	1	-	-	-	-	-	-	-	3	-	-
CO6	3	3	3	-	-	-	-	-	-	-	-	3	-	-
Avg.	3	3	2.2	1	-	-	-	-	-	-	-	3	-	-

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SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC23003	ENGINEERING MATERIALS AND METALLURGY	3	0	0	3

Pre -Requisite: Solid physics

Course Educational Objectives

CEO1	To familiarize with the concept crystal structures, bonding of solids and their influence on properties of materials.
CEO2	To acquaint with the construction of phase diagrams and describe the phase relationship with variables i.e. chemical composition, pressure, temperature etc.
CEO3	To develop a fundamental understanding of the relationships between Composition-Structure-property –performance and processing of material.
CEO4	To develop an understanding of the processes occurring in metals during heating that influences the microstructure and properties.

SYLLABUS

UNIT:1

[10Hours]

Mechanical behavior:

Classification of Engineering Materials, Characteristic property of metals, Stress- Strain diagram showing ductile and brittle behavior of materials, bonding in solids, ionic, covalent and metallic bond. Crystal systems, atomic packing efficiency, crystallographic planes and directions, voids and crystal imperfections in common crystal systems. Solidification of pure metal, Homogeneous and heterogeneous nucleation processes, cooling curve, concept of super cooling.

Concept of plastic deformation of metals: Mechanism: Slip and twinning; CRSS, factors affecting CRSS, yield point phenomena, Work hardening, concept of hot work and cold work, Recovery recrystallization and grain growth.

UNIT 2:

[10 Hours]

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valence factor, crystal structure factor and chemical affinity factor; order-disorder transformation. Binary phase diagrams a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d) Eutectoid system and (e) Peritectoid system. (f) Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization. Iron-cementite and iron-graphite phase diagrams

UNIT 3:

[11 Hours]

Equilibrium cooling behaviour of hypo, eutectoid, hyper eutectoid steels. microstructure and properties of different alloys. Heat treatment of steels, i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; Concept of T.T.T diagram, factor affecting hardenability. Alloy steels: Stainless steel, tool steel, HSS, high strength low alloy steel, heat treatment, properties, microstructure and applications. Types of cast irons, their microstructures and typical uses.



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UNIT 4:

[08 Hours]

Optical properties of Materials: Scattering, Refraction, Atomic Theory of optical properties. Lasers: Construction and working on Ruby Laser and Helium-Neon Laser, Optical fibers- Principle, structure, application of optical fibres. Plastic:- Thermosetting and thermoplastics. Ceramics: Types, structure, Mechanical properties, application.

UNIT 5:

[07 Hours]

Composite materials: Definition, classification, type of matrix materials and reinforcements, advantages and application of composites.

Metal Matrix Composites: Reinforcement materials, types, characteristics and selection, base metals selection. Need for MMC's and its application.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Appreciate the necessity of engineering materials, and its applications in various fields.
CO2	Identify possible cause of failure mechanisms of Engineering Materials and alloy formation.
CO3	Demonstrate the knowledge of nucleation, Crystal growth, Solid solution and Phase diagrams.
CO4	Appreciate the significance and applications of Various heat treatment processes.
CO5	Understand the properties and potentialities of various materials available and material selection procedures.
CO6	Acquire the Knowledge of composite materials and their production process as well as applications.

Teaching Methods: Chalk& Talk, PPT, Video Lectures, Demonstrative models

REFERENCE BOOK:

1. Avner Sydney, Introduction to physical metallurgy
2. Callister W., Fundamentals of Materials Science and Engineering
3. Dieter, Mechanical Metallurgy, Tata MacGraw Hill
4. Lakhtin Y., Engineering Physical Metallurgy and Heat Treatment, Mir Publisher, Moscow.
5. Singh Vijayendra, Physical Metallurgy
6. Materials Science and Engineering V.Raghavan PHI 2002

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	2	2	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	1	-
CO6	2	-	-	-	-	-	-	-	-	-	-	3	1	-
Avg.	2.5	2.5	2	2	-	-	-	-	-	-	-	1.8	1.33	-



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SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEES23001	FUNDAMENTALS OF PYTHON	3	0	0	3
Pre-requisite: Basic Programming knowledge for Problem Solving.					
Course Educational Objectives					
CEO1	To provide students with a strong foundation in Python programming concepts, syntax, data types, operators, and control structures for developing engineering applications.				
CEO2	To develop problem-solving skills by applying functions, modules, object-oriented programming, and exception handling techniques in Python.				
CEO3	To enable students to design, develop, and debug Python programs using modern programming practices and apply them to computational and engineering problems.				
CEO4	To integrate Python programming techniques for modeling, simulation, automation, and analysis of engineering systems, thereby enhancing computational proficiency and lifelong learning skills.				
SYLLABUS					
UNIT I - Introduction to Python Programming (08 Hours)					
Introduction: Installation; Features of Python; First Python Program: Interactive Mode Programming, Script Mode Programming; Identifiers, Reserved Words, Lines and Indentation, Multi-Line Statements, Quotation & Comments; Assigning Values to Variables, Multiple Assignment					
UNIT II - Python Data Types and Operators (09 Hours)					
Standard Data Types: - Numbers, Strings, Lists, Tuples, Dictionaries, Data Type Conversion Operators: Arithmetic operators, Comparison operators, Assignment operators, Logical operators , Membership operators, Identity operators					
UNIT III - Control Statements and Program Flow (10 Hours)					
Decision Making: if statement, if-else statement, elif statement, Looping Statements: for loop, and while loop. Loop Control: break, continue, pass, Applications: - Repeated engineering calculations, Iterative problem solving					
UNIT IV- Functions and Modules in Python (10 Hours)					
Functions: Introduction to functions, creating user-defined functions, Function arguments, Return values. Types of Functions: Built-in functions, User-defined functions, Modules: Introduction to modules, importing modules, Using math module.					
UNIT V - Object-Oriented Programming and Exception Handling (10 Hours)					
Object-Oriented Programming Basics: Class and object, Constructor, Methods, Variables in class, Basic inheritance concept Exception Handling: Introduction to exceptions, try and except blocks, Handling common errors: Zero Division Error, Value Error, Type Error, Applications: Simple classes for mechanical components, Error handling in engineering programs.					



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Course Outcomes: Upon successful completion of this course, students should be able to:	
CO1	Understand Python syntax, installation process, identifiers, variables, comments, and basic programming concepts.
CO2	Apply Python data types, operators, and control statements to solve computational problems.
CO3	Develop modular Python programs using functions, function arguments, return values, and modules.
CO4	Implement object-oriented programming concepts including classes, objects, constructors, inheritance, and exception handling.
CO5	Design and develop Python programs for engineering applications using appropriate programming constructs and debugging techniques.
CO6	Analyze and solve engineering and computational problems using Python programming principles and best programming practices.

Teaching Methods: Chalk & Board/ PPT/Video Lectures

REFERENCE BOOK:

1. Martin C. Brown, Python: The Complete Reference, 4th Edition, McGraw Hill, 2018, ISBN: 9789387572942
2. Jake VanderPlas, Python Data Science Handbook, 2nd Edition, O'Reilly Media, 2023, ISBN: 9781785281969
3. Michał Jaworski, Tarek Ziadé, Expert Python Programming, 4th Edition, Packt Publishing, 2021, ISBN-13: 9781801071109
4. David Beazley, Python Essential Reference, 5th Edition, Pearson / Addison-Wesley, 2021, ISBN: 9780134173276
5. Ivan Idris, NumPy Beginner's Guide, 3rd Edition, Packt Publishing, 2015, ISBN: 9781785281969
6. Sandro Tosi, Matplotlib for Python Developers, 1st Edition, Packt Publishing, 2005, ISBN: 9788184049336

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	–	2	–	–	–	1	1	–	2	2	–
CO2	3	3	2	1	2	–	–	–	1	1	–	3	2	–
CO3	3	3	3	2	2	–	–	–	1	1	–	3	2	–
CO4	3	3	3	2	2	–	–	1	1	1	–	3	2	–
CO5	3	3	3	3	3	–	–	–	1	1	1	3	3	–
CO6	2	3	3	3	3	–	–	–	1	1	1	3	3	–
Avg.	2.83	2.83	2.50	2.2	2.33	–	–	1.00	1.00	1.00	1.00	2.83	2.33	–

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SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEHS20001	ORGANIZATIONAL BEHAVIOUR	2	0	0	2
Pre - Basic Management Principles					
Course Educational Objectives					
CEO1	To develop a fundamental understanding of the concepts, evolution, scope, significance, and applications of Organizational Behaviour in contemporary organizations.				
CEO2	To familiarize students with the influence of individual behaviour, including attitude, personality, perception, emotional intelligence, and motivation, on employee performance and organizational effectiveness.				
CEO3	To enable students to understand group behaviour, team dynamics, leadership approaches, organizational culture, and change management practices for improving organizational performance.				
CEO4	To develop analytical and problem-solving skills for applying Organizational Behaviour concepts and theories to real-world managerial and workplace challenges in engineering and technology organizations.				
SYLLABUS					
UNIT:1		[06 Hours]			
Fundamentals of OB: Definition, scope and importance of OB, Evolution of OB Limitations of OB, Emotional Intelligence: Meaning, Components, Importance in Organizations, Daniel Goleman's Five Components of Emotional Intelligence.					
UNIT:2		[06 Hours]			
Attitude: Components of attitude; Job attitude, Barriers to changing attitudes. Personality: Definition and importance of Personality for performance, Trait theory, The Myers-Briggs Type Indicator and The Big Five personality model, personality and job – fit theory.					
UNIT:3		[08 Hours]			
Perception: Meaning and concept of perception, Perceptual process social perception (stereotyping and halo effect). Motivation: Definition & Concept of Motivation, The Content Theories of motivation (Maslow's Need Hierarchy & Herzberg's Two Factor Model Theory), The Process Theories (Vroom's expectancy, Equity Theory of Work Motivation					
UNIT:4		[7 Hours]			
Foundations of Group Behavior: The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five — Stage Model of Group Development. Leadership: Concept of Leadership, Styles of Leadership, Trait Approach, Contingency Leadership Approach, Contemporary Leadership Approaches: Transformational, Transactional Leadership.					



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UNIT:5

[8 Hours]

Organizational Culture: Meaning & Definition of Organizational Culture, Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture & Formal vs. Informal Culture)

Organizational Change: Meaning, Definition & Nature of Organizational Change Implementing Organizational Change: Resistance to Change, how to overcome the Resistance to Change, Kurt Lewin's-Three step model, Kotter's Eight-Step plan for Implementing Change

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Explain the fundamental concepts, evolution, scope, significance, and applications of Organizational Behaviour in modern organizations.
CO2	Examine the influence of attitude, personality, and emotional intelligence on individual behaviour and workplace performance.
CO3	Analyse the role of perception and motivation theories in enhancing employee performance, satisfaction, and organizational effectiveness.
CO4	Demonstrate an understanding of group behaviour, team dynamics, and various leadership approaches for improving organizational performance.
CO5	Evaluate the impact of organizational culture and change management practices on organizational adaptability and effectiveness.
CO6	Apply Organizational Behaviour concepts and theories to analyse and propose solutions for real-world workplace and managerial issues in engineering and technology organizations.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Organizational Behavior – Stephen P. Robbins & Timothy A. Judge, 19th Edition, Pearson Education Limited, 2023.
2. Organizational Behavior – Fred Luthans, 13th Edition, McGraw-Hill Education, 2015
3. Organizational Behaviour – K. Aswathappa, 13th Edition, Himalaya Publishing House Pvt. Ltd., 2023;
4. Organizational Behavior – Uma Sekaran, 2nd Edition, Tata McGraw-Hill Education; , 2004
5. Organizational Behavior – S. S. Khanka, Revised Edition, S. Chand Publishing, ublication: 2018

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO2	-	2	-	-	2	3	3	2	-	-	-	-	-	-
CO3	-	3	-	-	-	2	2	-	-	-	-	-	-	-
CO4	-	2	-	-	2	2	3	3	2	-	-	-	-	-
CO5	-	2	2	-	3	2	2	2	3	-	-	-	-	-
CO6	-	3	2	2	2	2	2	3	2	3	-	-	-	-
Avg.	2	2.4	2	2	1.50	2.25	2.4	2.5	2.33	2.5	2	-	-	-



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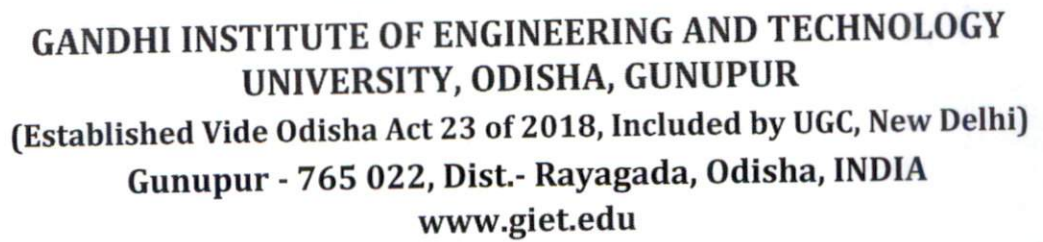
SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEHS20002	ENGINEERING ECONOMICS	2	0	0	2
Pre -Requisite: Students should possess fundamental analytical and quantitative reasoning skills, along with basic familiarity with mathematical and economic principles, to effectively engage with engineering decision-making contexts.					
Course Educational Objectives					
CEO1	To apply economic concepts to support engineering decision-making.				
CEO2	To evaluate project feasibility using cost analysis and investment appraisal.				
CEO3	To analyse financial and economic data for engineering projects.				
CEO4	To understand the impact of macroeconomic factors on engineering and society.				
SYLLABUS					
UNIT 1: Fundamentals of Microeconomics and Market Dynamics (7 hrs)					
Meaning, Nature, Scope of Engineering Economics, Law of Demand and its exceptions, concept of Elasticity of demand, Law of supply and its exception, Elasticity of supply Determination of market equilibrium (Simple numerical problems to be solved).					
UNIT 02: Production Economics and Cost–Volume–Profit Analysis (5 hrs)					
Law of variable proportion, Law of returns to scale, Break Even Analysis - Linear approach (Simple numerical problems to be solved)					
UNIT 03: Time Value of Money and Engineering Project Evaluation (7 hrs)					
Time value of money – Application of interest formulas, Cash flow diagrams, Present worth method, Future worth method, Annual worth method, Internal rate of return method					
UNIT 04: Public Project Evaluation and Depreciation (6 hrs)					
Cost benefit analysis for public projects, Depreciation-Depreciation of capital assert, causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method).					
UNIT 05: Overview of Banking and National Income (5 hrs)					
Functions of commercial bank, Functions of Central Bank. National Income - Concepts of national income & Method of measuring national income.					
Course Outcomes: Upon successful completion of this course, students should be able to:					
CO1	Explain the fundamental concepts of Engineering Economics, including the laws of demand and supply, elasticity, and market equilibrium.				
CO2	Analyse production behaviour using the laws of variable proportion and returns to scale, and perform break-even (Cost–Volume–Profit) analysis to support managerial decisions.				
CO3	Apply the principles of the time value of money, cash flow analysis, and engineering economic evaluation techniques (Present Worth, Future Worth, Annual Worth, and Internal Rate of Return) to evaluate investment alternatives.				
CO4	Evaluate public projects using cost–benefit analysis and compute depreciation using different depreciation methods for engineering assets.				



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SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC23102	MECHANICS OF SOLIDS LABORATORY	0	0	2	1
Pre -Requisite: Basic mathematics and Engineering Mechanics					
Course Educational Objectives					
CEO1	Apply principles of mechanics of solids to experimentally determine material properties and validate theoretical concepts.				
CEO2	Use standard testing equipment such as Universal Testing Machine, hardness testers, and strain measurement devices for material characterization.				
CEO3	Analyze experimental data and interpret results related to strength, deformation, fatigue, and failure of materials.				
CEO4	Demonstrate professional skills in conducting experiments, teamwork, and reporting for engineering applications.				
SYLLABUS					
List of Experiment: (Minimum 8 Experiments)					
1. Determination of tensile strength of materials by Universal Testing Machine					
2. Determination of compressive strength of materials by Universal Testing Machine					
3. Determination of bending strength of materials by Universal Testing Machine					
4. Double shear test in Universal Testing Machine					
5. Determination of Impact strength of material (Charpy and Izod)					
6. Determination of Hardness strength of materials (Brinell, Rockwell and Vickers)					
7. Determination of Rigidity modulus of material					
8. Determination of Fatigue strength of material					
9. Estimation of Spring Constant under Tension and Compression.					
10. Strain measurement using Strain Gauge.					
11. Stress measurement using strain rosette.					
Course Outcomes: Upon successful completion of this course, students should be able to:					
CO1	Conduct tensile, compressive, and bending tests to determine mechanical properties of materials.				
CO2	Evaluate shear strength, impact strength, and hardness using standard testing methods.				
CO3	Determine material properties such as modulus of rigidity, spring constant, and fatigue strength.				
CO4	Measure strain and stress using strain gauges and strain rosettes.				
CO5	Analyze experimental data and compare results with theoretical predictions.				
CO6	Prepare technical reports and demonstrate safe and effective laboratory practices.				
Teaching Methods: Chalk& Board/ PPT/Video Lectures/ Virtual Lab					
Reference Books:					
1. Bansal, R.K., A Textbook of Strength of Materials, Laxmi Publications, 4th Ed.					
2. Timoshenko, S.P. & Young, D.H., Elements of Strength of Materials, East-West Press, 5th Ed.					
3. Rattan, S.S., Strength of Materials, McGraw Hill Education, 2nd Ed.					
4. Beer, F.P. et al., Mechanics of Materials, McGraw Hill, 8th Ed.					
5. Hibbeler, R.C., Mechanics of Materials, Pearson, 11th Ed.					



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SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEPC23103	MATERIAL SCIENCE LABORATORY	0	0	2	1

Pre -Requisite: Solid physics

Course Educational Objectives

CEO1	Project an introductory view of the field of materials science within the framework of science and engineering disciplines.
CEO2	Provide a smooth link between the basic knowledge of science and engineering courses.
CEO3	Better prepare would-be materials engineers on ways to tackle day-to-day materials problems in professional engineering careers.
CEO4	Able to operate as effective engineers or scientists in metallurgical and materials industries or related fields.

LIST OF EXPERIMENTS

List of Experiment: (Minimum 8 Experiments)

1. Preparation of crystal models SC, BCC, FCC, CPH crystals
2. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low Carbon steels, high Carbon steels.
4. Study of Iron-Carbon Phase diagram.
5. Study of the Micro Structures of White cast iron, Grey Cast Irons, Malleable cast iron, Nodular cast iron etc.
6. Study of the Micro Structures of Non-Ferrous alloys, Brass, Bronze, aluminum alloys.
7. Study of the Micro structures of Heat treated steels Annealed Normalized, Hardened.
8. Hardeneability of steels by Jominy End Quench Test.
9. To find out the hardness of various treated and untreated steels.
10. Standard test Methods for Estimation of Grain Size.

Course Outcomes: Upon successful completion of this course, students should be

CO1	Identify the types of crystal models and micro structures.
CO2	Understand the properties of steel and cast iron with its phase diagram..
CO3	Classify steels and cast iron based on microstructure.
CO4	Evaluate the grain size, hardness and hardeneability of various treated and untreated steels.
CO5	Understanding heat treatment procedures and the change of properties.
CO6	Ability to select metals and alloys for industrial applications.

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2			3						2		3	1	
CO2	3											1	1	
CO3	2			2						2		2	2	
CO4	2			3								2	2	
CO5	2			2						2		1		
CO6	2			2						2		2	2	
Avg.	2.16			2.4						2		1.8	1.6	



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SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEES23101	FUNDAMENTALS OF PYTHON LABORATORY	0	0	2	1
Pre -Requisite: Basic Programming knowledge for Problem Solving.					
Course Educational Objectives					
CEO1	To provide students with a strong foundation in Python programming concepts, syntax, data types, operators, and control structures for developing engineering applications.				
CEO2	To develop problem-solving skills by applying functions, modules, object-oriented programming, and exception handling techniques in Python.				
CEO3	To enable students to design, develop, and debug Python programs using modern programming practices and apply them to computational and engineering problems.				
CEO4	To integrate Python programming techniques for modeling, simulation, automation, and analysis of engineering systems, thereby enhancing computational proficiency and lifelong learning skills.				
LIST OF ASSIGNMENT					
ASSIGNMENT-1 Python Basics and Input / Output					
1. WAP to print "Hello World".					
2. WAP to print the keywords.					
3. WAP to enter two integers from the keyboard and perform all the arithmetic operations on them.					
4. WAP to enter a temperature in Fahrenheit and convert it into Celsius.					
5.WAP to convert distance in meters to Kilometers.					
6.WAP to enter time in minutes and print it in hour and minute format.					
7. WAP to enter an integer number and find out its binary, octal and hexadecimal equivalents.					
8. WAP to enter three sides of a tringle. Find out the area of the tringle.					
ASSIGNMENT-2 Python Basics and Input / Output					
1.Calculate Stress (Formula: Stress = Force / Area)					
2.Calculate Kinetic Energy (Formula: $KE = \frac{1}{2}mv^2$)					
3. Calculate Power (Formula: Power = Work / Time)					
4. Calculate Density (Formula: Density = Mass / Volume)					
5. Calculate Molarity (Formula: Molarity = Moles / Volume)					
6. Calculate pH Value ($pH = -\log_{10}(H)$)					
7. Heat Transfer Calculation (Formula: $Q = mC_p\Delta T$)					
ASSIGNMENT-3 Data Types and Operators					
1. Find largest among three pressure readings.					
2. Find smallest among three temperature readings.					
3. Check even or odd.					
4. Check leap year.					
5. Calculate electricity bill.					
6. Calculate machine efficiency percentage.					
ASSIGNMENT-4 Decision Making					
1. Check lifting limit.					
2. Determine acidic/neutral/basic from pH.					
3. Calculate employee bonus.					
4. Check positive/negative/zero.					
5. Find largest among four values.					
6. Calculate purchase discount.					



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ASSIGNMENT-5 Loops

1. Print first N natural numbers.
2. Display multiplication table.
3. Find sum of first N numbers.
4. Find factorial.
5. Generate Fibonacci series.

Assignment 6: Lists, Tuples and Dictionaries

1. Average machine temperatures.
2. Find max and min in list.
3. Search material in list.
4. Count occurrences.
5. Store pressure readings in tuple

Assignment 7: Functions and Modules

1. Function for area of circle.
2. Function for volume of cube.
3. Function for machine efficiency.
4. Function for fuel consumption.
5. Function to find largest of three.

Assignment 8: Object-Oriented Programming

1. Student class.
2. Employee class.
3. Machine class.
4. Material class.
5. Cylinder class

Assignment 9: Exception Handling

1. Handle file opening errors.
2. Handle Index Error.
3. Handle Key Error.
4. Handle Value Error.
5. Engineering calculator with exception handling.

ASSIGNMENT 10: CASE-STUDIES

CASE STUDY 1:

Bank Account Management System:

- Deposit money
- Withdraw money
- Check balance
- Prevent overdrawn using exception handling

CASE STUDY 2:

Electricity Bill Calculator

- Input units consumed
- Calculate bill based on slab rates
- Display total bill

CASE STUDY-3

Attendance Management System

- Add student names
- Mark attendance
- Calculate attendance percentage



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- Display absentees

CASE STUDY-4

Simple ATM Simulator

- PIN verification
- Balance inquiry
- Deposit
- Withdraw
- Exit menu

CASE STUDY-5

Number Guessing Game

- Generate random number
- User guesses until correct
- Count attempts

Course Outcomes: Upon successful completion of this course, students should be

CO1	Understand Python syntax, installation process, identifiers, variables, comments, and basic programming concepts.
CO2	Apply Python data types, operators, and control statements to solve computational problems.
CO3	Develop modular Python programs using functions, function arguments, return values, and modules.
CO4	Implement object-oriented programming concepts including classes, objects, constructors, inheritance, and exception handling.
CO5	Design and develop Python programs for engineering applications using appropriate programming constructs and debugging techniques.
CO6	Analyze and solve engineering and computational problems using Python programming principles and best programming practices.

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	–	2	–	–	–	1	1	–	2	2	–
CO2	3	3	2	1	2	–	–	–	1	1	–	3	2	–
CO3	3	3	3	2	2	–	–	–	1	1	–	3	2	–
CO4	3	3	3	2	2	–	–	1	1	1	–	3	2	–
CO5	3	3	3	3	3	–	–	–	1	1	1	3	3	–
CO6	2	3	3	3	3	–	–	–	1	1	1	3	3	–
Avg.	2.83	2.83	2.50	2.2	2.33	–	–	1.00	1.00	1.00	1.00	2.83	2.33	–

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SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEAE23104	LANGUAGE PROFICIENCY AND COMMUNICATION LABORATORY	0	0	2	1

Pre -Requisite: Basic understanding of English grammar, vocabulary, and everyday communication skills.

Course Educational Objectives

CEO1	Enhance LRSW skills in English language for effective communication.
CEO2	Develop fluency and clearly through interactive activities.
CEO3	Improve professional and technical communication required academic and work place context.
CEO4	Foster confident in public speaking, group discussion and presentation.

SYLLABUS

Unit 1: Resume, Cover Letter & LinkedIn Profile Building (3 Hours)

Activity 1: Tailored Resume Writing

- Create job-specific resumes using Industry templates.

Activity 2: Crafting Cover Letters

- Focus on structure, tone, and personalization.

Activity 3: LinkedIn masterclass

- Build a LinkedIn profile with sections: summary, skills, experience, and headline.

Unit 2: Mastering Group Discussions (GDs) (3 Hours)

Activity 1: Understanding GD Structures & Assessment Rubric

- Understand the flow and evaluation process of GDs.

Activity 2: Practice Sessions on Tech Topics

- Topics: AI, Sustainable Energy, IoT, etc.

Activity 3: Peer Feedback & Reflection

- Self and group evaluation based on clarity, logic, and fluency.

Unit 3: Corporate Etiquette & Workplace Communication (3 Hours)

Activity 1: Understanding Corporate Culture

- Email etiquette, punctuality, netiquette, attire, grooming.

Activity 2: Small Talk & Conversational English

- Situational conversations: office pantry, team intro, client visit.

Activity 3: Managing Conflicts at Workplace

- Role-plays and assertive communication strategies.

Unit 4: Interview Skills: Face to Face & Online (3 Hours)

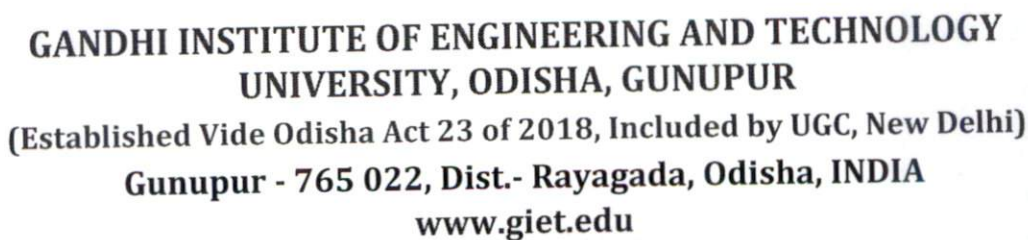
Activity 1: Personal Interview (PI) Preparation

- Common questions, STAR technique (Situation, Task, Action, Result). Activity 2: Mock HR and Technical Interviews

- Peer and faculty evaluation with rubrics.

Activity 3: Video Interview Techniques

- Camera presence, tone modulation, virtual background.



(3 Hours)

- Explore cultural dos & don'ts with examples.

- Email drafting and calendar setting exercises.

Course Outcomes: Upon successful completion of this course, students should be able to:	
CO1	Demonstrate the ability to draft professional documents like circulars, notices, resumes, and cover letters.
CO2	Participate effectively in group discussions, debates, and job interviews.
CO3	Deliver structured presentations and meeting-based activities using visualaids.
CO4	Apply vocabulary skills through CALL, ESL tools, and context-based tasks.
CO5	Develop self-awareness and critical thinking through SWOT analysis and company profiling.
CO6	Practice summarizing and content writing for various formats with clarity and coherence.

1. Professional communication at work, Joseph L.Chesebro
2. The Art of ex-planation, Ros Atkins
3. Words that work, Dr. Frank Luntz
4. Decoding communication, Girish Jain, Manzoor Moiden

CO-PO & PSO Mapping														
PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	-	-	1	-	-	-	2	-	2	-	-	-
CO2	1	2	2	-	1	-	-	2	3	2	2	-	-	-
CO3	2	2		1	-	-	-	-	1	-	2	-	-	-
CO4	2	2	2	-	1	-	-	2	3	2	2	-	-	-
CO5	1	1	-	1	3	-	-	-	2	1	3	-	-	-
CO6	2	2	2	1	1	-	1	1	3	1	2	-	-	-
Avg.	1.7	1.8	2.0	1.0	1.4	-	1.0	1.7	2.3	1.5	2.2	-	-	-

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DEPARTMENT OF MECHANICAL ENGINEERING

4th Semester [Second Year]

B. Tech in Mechanical Engineering

Sl. No.	Course Category	Course Code	Course Title	Hours per week			Credits	Marks for various Exams			
				L	T	P		C. A.	M. S.	E. S.	Total
1	PCC	25MEPC24001	Fluid Mechanics and Hydraulic Machines	3	0	0	3	10	30	60	100
2	PCC	25MEPC24002	Manufacturing Technology	3	0	0	3	10	30	60	100
3	PCC	25MEPC24003	Kinematics of Machinery	3	0	0	3	10	30	60	100
4	PCC	25MEPC24004	Quality Control and Reliability	3	0	0	3	10	30	60	100
5	ESC	25MEES24001	Introduction to Machine Learning	3	0	0	3	10	30	60	100
6	HSMC	25MEHS20002 / 25MEHS20001	Engineering Economics / Organizational Behaviour	2	0	0	2	10	30	60	100
7	PCC	25MEPC24101	Fluid Mechanics and Hydraulic Machines Laboratory	0	0	2	1	40	-	60	100
8	PCC	25MEPC24102	Manufacturing Technology Laboratory	0	0	2	1	40	-	60	100
9	ESC	25MEPC24103	Kinematics of Machinery Laboratory	0	0	2	1	40	-	60	100
10	AEC	25MEAE24101	Workplace Communication and Presentation Laboratory	0	0	2	1	40	-	60	100
11	VSEC	25MEVS24101	Micro Project (Skill Development Project and Hands on Training)	0	0	4	2	-	-	100	100
12	AU	25MEAU24001	Constitution of India/ Essence of Indian Knowledge Tradition	2	0	0	0	-	-	-	-
Total:				19	0	12	23	220	180	700	1100



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AR-2025 (Batch-2025)
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC24001	FLUID MECHANICS & HYDRAULICS MACHINES	3	0	0	3
Pre -Requisite: Physics, Thermodynamics, Mechanics, Mathematics					
Course Educational Objectives					
CEO1	To know the concept of fluid and its properties, manometer, hydrostatic forces acting on different surfaces and also problem solving techniques.				
CEO2	To relate the basic laws of fluids, flow patterns, viscous flow through pipes and their corresponding problems.				
CEO3	To analyze the hydrodynamic forces acting on vanes and their performance evaluation				
CEO4	To evaluate of the importance, function and performance characteristics of hydro machinery				
SYLLABUS					
UNIT:1 (12 Hours)					
Scope of fluid mechanics and its development as a science, Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.					
Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer, and its classification.					
Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.					
UNIT:2 (8 Hours)					
Fluid kinematics: Introduction, description of fluid flow, classification of fluid flow. Reynolds number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net					
UNIT:3 (8 Hours)					
Fluid dynamics: Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orifice meter, pitot tube.					
Flow through pipes: Major and minor energy losses, hydraulic gradient and total energy lines, pipes in series and parallel, equivalent pipes, Flow through nozzles.					
UNIT: 4 (9 Hours)					
Impact of Jet: Flat, inclined and curved plates with stationary and moving case.					
Hydraulic turbines: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine. Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.					



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Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation

UNIT:5 (8 Hours)

Centrifugal Pump: Constructional features, vane shape, velocity triangles, Efficiencies, Pump Characteristic, NPSH and Cavitation. Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Explain various fluid properties and behavior of fluid in static and dynamic mode..
CO2	Apply basic fundamental theorems governing fluid flows i.e., continuity, energy and momentum and flow through pipes.
CO3	Exposed to the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.
CO4	Analyze fully developed laminar and turbulent pipe flows and also apply mathematical definitions and equations in fluid flow.
CO5	Analyze theory of impact of jet and apply the same for hydraulic turbine.
CO6	Evaluate performance of centrifugal pumps and other hydraulic machines.

Teaching Methods: Chalk & Talk/ PPT/Video Lectures/Demonstration

REFERENCE BOOK:

1. M. White Frank, Fluid Mechanics
2. Cimbala John, CengelYunus, Fluid Mechanics
3. Chakraborty S, Introduction To Fluid Mechanics And Fluid Machines
4. Modi & Seth, Fluid Mechanics and Hydraulic Machines
5. M. White Frank, Fluid Mechanics
6. Cimbala John, CengelYunus, Fluid Mechanics
7. Chakraborty S, Introduction To Fluid Mechanics And Fluid Machines
8. Modi& Seth, Fluid Mechanics and Hydraulic Machines
9. Jain A.K., Fluid Mechanics and Fluid Machines, Khanna Publishers
10. Som S.K. and Biswas G., Introduction to Fluid Mechanics and Fluid Machines, TMH
11. Bansal Dr. R K Fluid Mechanics and Hydraulic Machines, Laxmi Publication

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2	1	1
CO6	3	3	-	-	-	-	-	-	-	-	-	2	1	2
Avg.	2.83	2.83	-	-	-	-	-	-	-	-	-	2.00	1.33	1.50



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AR-2025 (Batch-2025)
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC24002	MANUFACTURING TECHNOLOGY	3	0	0	3
Pre -Requisite: Physics, Thermodynamics, Mechanics, Mathematics					
Course Educational Objectives					
CEO1	To study basic definitions associated with casting terminology, its classification and various steps involved in it.				
CEO2	To understand the application of the different joining techniques, and be able to select an appropriate technique according to a specific requirement.				
CEO3	To understand the fundamentals of metal working process.				
CEO4	To give the basic concept of the powder metallurgy processing and also the theory and technology of powder production, consolidation and sintering.				
SYLLABUS					
UNIT:1		[10			
Hours]					
Metal Casting Processes: sand mold making procedure. Patterns: Pattern materials, pattern allowances, types of pattern. Molding materials: Molding sand composition, sand preparation, sand properties and testing, Sand molding processes. Cores: Types of cores, core prints, chaplets, and chills. Design of Gating systems: Melting practice: Cupola furnace, solidification, defects in castings and their remedies, Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, continuous casting, Advantages and limitations.					
UNIT:2		[10 Hours]			
Welding Process: Principles of welding, brazing and soldering, Classification of Welding Processes, gas welding and cutting process, equipment. Arc welding power source and consumables. Resistance welding: Principle and equipments, resistance spot welding, resistance seam welding, electro slag welding, forge welding. Modern welding methods like plasma arc, laser beam, Electron beam, Ultrasonic, Explosive and friction welding. Destructive and Non destructive testing of casting and welding.					
UNIT:3		[10 Hours]			
Bulk Deformation Processes: Hot working and cold working of metals .Forging processes: Open, closed die forging, types of forging, Cold forging and Hot forging. Rolling of metals: Types of Rolling, Flat strip rolling, shape rolling operations, Defects in rolled parts. Principle of rod and wire drawing, Tube drawing. Principles of Extrusion, Types, Hot and Cold extrusion.					
UNIT:4		[08 Hours]			
Sheet metal operations: Sheet metal characteristics: Press tools operations, shearing action, drawing dies, spinning, bending, embossing and coining.Stretch forming operations:Hydro forming – Rubber pad forming.					



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UNIT:5

(7 Hours)

Powder Metallurgy: Powder manufacturing, compaction and sintering processes. Advantages and applications of Powder Metallurgy. Brief introduction to explosive forming, coating and deposition methods. Plastics: Introduction, Raw material for plastics, Properties of plastics, types, Thermosetting plastics, Thermoplastics, Moulding compounds.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Select materials, types and allowances of patterns used in casting and analyze the components of moulds.
CO2	Design core, core print and gating system in metal casting processes
CO3	Analyze and access the importance of welding processes in manufacturing.
CO4	Differentiate various metal forming processes such as Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes
CO5	Design different sheet metal working processes
CO6	Understand the application, advantages and limitations of powder metallurgy Technique and processing of Plastics.

Teaching Methods: Chalk & Board/ PPT/Video Lectures/Lecture by Industry Expert

REFERENCE BOOK:

1. Rao P.N., Manufacturing Technology-Foundry, Forming and Welding, Tata McGraw Hill,
2. Ghosh A; Mallik A.K, Manufacturing Science, Affiliated East-West Press Pvt. Ltd., New Delhi
3. Sinha K.P., Goel D.B., Foundry Technology, Roorkee Publishing House.
4. Little Richard L., Welding and Welding Technology, Tata McGraw Hill Ltd.
5. Rosenthal, Principle of Metal casting, Tata McGraw Hill, New Delhi

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	1	-	-	-	-	-	-	-	-	-	2	1	2
CO2	1	2	2	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO4	1	2	2	-	-	-	-	-	-	-	-	1	2	2
CO5	1	2	2	-	-	-	-	-	-	-	-	2	2	-
CO6	3	-	-	-	-	-	-	-	-	-	-	1	1	1
Avg.	2	1.8	2	-	-	-	-	-	-	-	-	1.5	1.6	1.7

[Handwritten signatures and initials are present below the table, including: Pande, Lh, NK Rout, MS, CKR, and others.]



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC24003	KINEMATICS OF MACHINERY	3	0	0	3
Pre -Requisite: Basic of Mechanics (Statics) topics like: Equilibrium of forces, Free body diagram, friction and D'Alemberts principle.					
Course Educational Objectives					
CEO1	To obtain an idea of Mechanisms, basic of methodology of machines				
CEO2	Apply knowledge to the selection of proper techniques and processes for velocity and acceleration using graphical techniques				
CEO3	To develop skills for designing and analyzing linkages, cams, gears and other mechanisms				
CEO4	To provide a foundation for the study of machine design				
SYLLABUS					
UNIT:1		(11 Hours.)			
Basics of Mechanisms					
Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, Mechanism, and structure, Classification of mechanisms, Equivalent Mechanisms, Four - Link (bar) Mechanism.					
Inversion of mechanism, Inversions of Four bar chain, single and double slider crank chains.					
Plane Motion of Body: Instantaneous centre, Notation, Number of I - Centres, Kennedy's theorem, Locating I - Centres, Angular velocity by I - Centre Method.					
UNIT:2		(10 Hours)			
Velocity and Acceleration Analysis of Mechanisms (Graphical Method)					
Velocity Analysis: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Four Link Mechanism, Angular Velocity of Links, Velocity of Rubbing, Slider - Crank Mechanism, Crank and Slotted Lever Mechanism.					
Acceleration Analysis: Four-Link Mechanism, slider -Crank Mechanism Angular acceleration of Links, Acceleration of Intermediate and offset points, Coriolis acceleration component, Crank and slotted lever Mechanism.					
UNIT:3		(8 Hours)			
Kinematics of Cam Mechanisms					
Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes, Graphical synthesis of cam profile					
UNIT:4		(10 Hours)			
Gears and Gear Trains					
Gears: Introduction, Classification, Terminology, Law of Gearing, Interferences, methods of avoiding interferences, path of contact, arc of contact.					
Gear Trains: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Trains. Tabular and Algebraic Methods					



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UNIT:5

(6 Hours)

Steering Mechanisms: Conditions for correct steering Davis Steering gear, Ackermans steering gear velocity ratio.

Hooke's Joint: Single and double Hookes joint Universal coupling application problems.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Understand the principles of kinematic pairs, chains and their classification, DOF, inversions, equivalent chains and planar mechanisms.
CO2	Explain the concept of inversion in kinematic chains and its significance in generating different mechanisms from a basic configuration.
CO3	Apply and analyze the concept of mechanism to interpret and examine the velocity and acceleration of different linkages in mechanisms
CO4	Analyze cam & follower motion to design cams profiles for specified followers motion
CO5	Evaluate gear tooth geometry and analyze the gear trains speed ratio to select appropriate gears for the required applications.
CO6	Analyze and apply steering mechanisms and Hooke's joints to ensure correct motion transmission and solve related mechanical problems.

Teaching Methods: Chalk & Board/ PPT/Video Lectures/Lecture by Industry Expert

REFERENCE BOOK:

1. Rattan S.S., Theory of Machines, Tata McGraw Hill Publishers.
2. Ghosh and Mallik, Theory of Mechanisms and Machines
3. Ghosh and Mallik, Theory of Mechanisms and Machines
4. Khurmi R. S. and Gupta J K, Theory of Machines, S.Chand
5. Singh Sadhu, Theory of Machines, Pearson.
6. Shigley, Theory of Machines, Oxford

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	1	1
CO2	3	2	-	-	-	-	-	-	-	-	-	3	1	1
CO3	3	3	2	2	-	-	-	-	-	-	-	3	2	1
CO4	3	3	3	2	-	-	-	-	-	-	-	3	2	2
CO5	3	3	3	2	-	-	-	-	-	-	-	3	2	2
CO6	3	2	2	2	-	-	-	-	-	-	-	3	2	2
Avg.	3	2.5	2.5	2	-	-	-	-	-	-	-	3	1.66	1.5



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC24004	QUALITY CONTROL AND RELIABILITY	3	0	0	3

Pre -Requisite:

Course Educational Objectives

CEO1	Develop a strong foundation in quality control principles, statistical quality control techniques, process monitoring and process capability analysis for improving manufacturing quality.
CEO2	Apply quality engineering tools, acceptance sampling techniques and problem-solving methodologies such as SPC, Six Sigma, and DMAIC to analyze and improve industrial processes.
CEO3	Acquire the knowledge of reliability engineering concepts, reliability modeling, failure analysis, and maintenance strategies for enhancing system performance and dependability.
CEO4	Utilize modern quality and reliability tools, standards, and emerging technologies to design, evaluate, and improve sustainable manufacturing systems in the context of Industry 4.0.

SYLLABUS

UNIT:1 Introduction to Quality Control and Statistical Foundations (08 Hours)

Concept of Quality, Evolution of Quality, Quality Dimensions, Quality of Design and Quality of Conformance, Quality Planning, Quality Assurance, Quality Control, Total Quality Management (TQM), Cost of Quality.

Introduction to Statistical Quality Control (SQC), Sources of Variation, Chance and Assignable Causes, Frequency Distribution, Measures of Central Tendency and Dispersion, Normal Distribution, Introduction to Quality Improvement Tools.

UNIT:2 Statistical Process Control and Process Capability (10 Hours)

Principles of Statistical Process Control (SPC), Control Charts for Variables ($\bar{X}$ -chart, R-chart, S-chart), Control Charts for Attributes (p-chart, np-chart, c-chart, u-chart), Construction and Interpretation of Control Charts, Process Stability Analysis.

Process Capability Studies, Process Capability Indices (Cp, Cpk, Pp, Ppk), Process Performance Analysis, Six Sigma Fundamentals, DMAIC Methodology, Applications of SPC in Manufacturing Processes.

UNIT:3 Acceptance Sampling and Quality Engineering Tools (09 Hours)

Principles of Acceptance Sampling, Single, Double and Multiple Sampling Plans, Operating Characteristic (OC) Curve, Average Outgoing Quality (AOQ), Average Sample Number (ASN), Producer's Risk and Consumer's Risk.

Seven Basic Quality Tools, Pareto Analysis, Cause-and-Effect Diagram, Check Sheets, Histograms, Flow Charts. Introduction to Failure Mode and Effects Analysis (FMEA), Quality Function Deployment (QFD), and Design of Experiments (DOE).



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UNIT:4 Reliability Engineering and System Reliability Analysis

(09 Hours)

Basic Concepts of Reliability, Failure Mechanisms and Failure Modes, Reliability Functions, Failure Rate, Hazard Rate, Mean Time Between Failures (MTBF), Mean Time To Repair (MTTR), Maintainability and Availability.

Probability Distributions in Reliability Analysis: Exponential, Weibull and Normal Distributions. Reliability of Series, Parallel and Mixed Systems, System Reliability Modeling, Reliability Prediction and Reliability Testing.

UNIT:5 Quality and Reliability Applications

(09 Hours)

Reliability Improvement Techniques, Fault Tree Analysis (FTA), Reliability-Centered Maintenance (RCM), Total Productive Maintenance (TPM).

Quality Standards and Certification (ISO 9001), Introduction to Lean Manufacturing and Six Sigma Applications, Quality and Reliability in Industry 4.0, Applications of Artificial Intelligence and Machine Learning in Quality Monitoring and Predictive maintenance, Case Studies in Manufacturing Applications.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Explain the fundamental concepts of quality control, statistical quality control (SQC), process variation, and basic quality improvement tools used in manufacturing systems.
CO2	Apply statistical process control techniques, control charts, and process capability analysis for monitoring and improving process performance.
CO3	Analyze acceptance sampling methods, quality engineering tools, and Six Sigma methodologies to identify and solve quality-related problems in engineering applications.
CO4	Evaluate reliability characteristics of components and systems using reliability models, failure analysis, and maintainability concepts.
CO5	Apply advanced quality and reliability tools such as FMEA, FTA, TPM, and reliability-centered maintenance for improving system performance and operational effectiveness.
CO6	Design quality and reliability-based solutions integrating modern tools and emerging technologies for sustainable manufacturing and Industry 4.0 applications.

Teaching Methods: Chalk & Board/ PPT/Video Lectures

Reference Books:

1. Douglas's. Montgomery, "Introduction to Statistical quality control", 7th edition, John Wiley 2013.
2. A. Mitra, Fundamentals of Quality Control and Improvement, Pearson Education, 2nd ed. 2005.
3. John's. Oakland. "Statistical process control", 5th edition, Elsevier, 2005
4. Connor, P.D.T.O., "Practical Reliability Engineering", John Wiley, 1993
5. Grant, Eugene .L "Statistical Quality Control", McGraw-Hill, 1996



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CO-PO & PSO Mapping														
PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	1	-	-	-	-	-	2	1	-	1	2
CO2	3	3	-	2	1	-	1	-	-	1	1	-	2	2
CO3	3	3	-	2	1	-	1	-	-	1	1	-	2	1
CO4	2	3	2	1	-	-	-	-	-	-	1	-	2	1
CO5	2	2	2	1	-	1	-	-	-	-	1	-	2	1
CO6	2	2	1	1	1	2	2	-	-	1	1	-	1	1
Avg.	2.5	2.5	1.67	1.33	1	1.5	1.33	-	-	1.25	1	-	1.67	1.33



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AR-2025

4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEES24001	INTRODUCTION TO MACHINE LEARNING	3	0	0	3
Pre -Requisite: Applied Statistics, Python Programming, Fundamentals of Artificial Intelligence, Basic Mathematics and Linear Algebra , Fundamentals of Data Structures and Algorithms					
Course Educational Objectives					
CEO1	To provide students with fundamental knowledge of machine learning concepts, learning paradigms, and data-driven model development techniques.				
CEO2	To develop students' ability to design, implement, and evaluate supervised and unsupervised machine learning algorithms for real-world applications.				
CEO3	To enable students to apply advanced machine learning methods, ensemble techniques, and model optimization approaches for solving complex data analytics problems.				
SYLLABUS					
UNIT:1 (10 hours)					
Introduction: Overview of machine Learning, Related Areas and applications, Foundations of Learning: Components of learning, learning vs design, Types of learning Models: supervised, Unsupervised, Reinforcement, Semi-supervised. Steps of ML, Training vs Testing, overfitting, underfitting, bias and variance, learning curve.					
UNIT:2 (10 Hours)					
Supervised Learning: Introduction to Regression: Regression Vs Classification, Linear regression, single and multivariate regression; Metrics for assessing regression (Mean Squared Error, Root Mean Squared Error, Mean Absolute Error, R -Squared, Adjusted R-Squared), Logistic Regression, Regularization (L1/L2 basics). Classification Performance Measures: Confusion Matrix, Accuracy Metrics, Precision, Recall, F1-score, Receiver Operator Characteristic (ROC) Curve, Case study on various classification applications					
UNIT:3 (10 Hours)					
Decision Trees: Introduction to Decision Trees, Algorithm for Decision Tree Construction: ID3, C4.5, CART, Truncation and Pruning .K-Nearest Neighbours, Multi-Collinearity, Naïve Bayes Classifiers					
UNIT:4 (8 Hours)					
Unsupervised Learning: Introduction to clustering, K-means clustering, Clustering around medoids, Hierarchical Clustering, Silhouettes, K-d Trees					
UNIT V - (8 Hours)					
Ensemble Methods :Introduction to Ensemble methods, Bagging, Committee Machines and Stacking, Boosting - Gradient Boosting, Adaptive Boosting, Random Forests-Multi-class Classification. Introduction of XGBoost					



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Course Outcomes: *Upon successful completion of this course, students should be able to:*

CO1	Comprehend the importance of types of learnings in model development
CO2	Apply machine learning libraries and frameworks to build and implement regression and classification models.
CO3	Design and optimize advanced machine learning models, such as Decision Trees and Support Vector Machines, for diverse problem domains.
CO4	Analyze and apply unsupervised learning methods, such as clustering algorithms and dimensionality reduction techniques, to organize and interpret data.
CO5	Develop robust machine learning solutions using ensemble techniques, such as bagging, boosting, and Random Forests, for complex applications.
CO6	Integrate machine learning techniques into end-to-end workflows for addressing domain-specific challenges with practical, scalable solutions.

Teaching Methods: Chalk & Board/ PPT/Video Lectures

Text Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, MIT Press, 2014
Stephen Marsland, "Machine Learning - An Algorithmic Perspective" 2nd Edition, CRC Press, 2015.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AML Book Publishers, 2012.

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	-	3	2	3	-	-	-	-	-	-	3	3	-
CO3	3	3	-	3	3	-	-	-	-	-	-	3	3	-
CO4	2	-	3	-	3	-	-	-	-	-	-	3	3	-
CO5	-	-	-	3	-	-	-	-	-	-	-	3	3	-
CO6	-	3	-	-	-	-	-	-	-	-	-	3	3	-
Avg.	2.75	3	3	2.66	3	-	-	-	-	-	-	3	3	-

(Signatures of Faculty Members)



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEHS20002	ENGINEERING ECONOMICS	2	0	0	2
Pre -Requisite: Students should possess fundamental analytical and quantitative reasoning skills, along with basic familiarity with mathematical and economic principles, to effectively engage with engineering decision-making contexts.					
Course Educational Objectives					
CEO1	To apply economic concepts to support engineering decision-making.				
CEO2	To evaluate project feasibility using cost analysis and investment appraisal.				
CEO3	To analyse financial and economic data for engineering projects.				
CEO4	To understand the impact of macroeconomic factors on engineering and society.				
SYLLABUS					
UNIT 1: Fundamentals of Microeconomics and Market Dynamics (7 hrs)					
Meaning, Nature, Scope of Engineering Economics, Law of Demand and its exceptions, concept of Elasticity of demand, Law of supply and its exception, Elasticity of supply Determination of market equilibrium (Simple numerical problems to be solved).					
UNIT 02: Production Economics and Cost–Volume–Profit Analysis (5 hrs)					
Law of variable proportion, Law of returns to scale, Break Even Analysis - Linear approach (Simple numerical problems to be solved)					
UNIT 03: Time Value of Money and Engineering Project Evaluation (7 hrs)					
Time value of money – Application of interest formulas, Cash flow diagrams, Present worth method, Future worth method, Annual worth method, Internal rate of return method					
UNIT 04: Public Project Evaluation and Depreciation (6 hrs)					
Cost benefit analysis for public projects, Depreciation-Depreciation of capital assert, causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method).					
UNIT 05: Overview of Banking and National Income (5 hrs)					
Functions of commercial bank, Functions of Central Bank. National Income - Concepts of national income & Method of measuring national income.					
Course Outcomes: Upon successful completion of this course, students should be able to:					
CO1	Explain the fundamental concepts of Engineering Economics, including the laws of demand and supply, elasticity, and market equilibrium.				
CO2	Analyse production behaviour using the laws of variable proportion and returns to scale, and perform break-even (Cost–Volume–Profit) analysis to support managerial decisions.				
CO3	Apply the principles of the time value of money, cash flow analysis, and engineering economic evaluation techniques (Present Worth, Future Worth, Annual Worth, and Internal Rate of Return) to evaluate investment alternatives.				
CO4	Evaluate public projects using cost–benefit analysis and compute depreciation using different depreciation methods for engineering assets.				



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CO5	Explain the functions of commercial and central banks, and interpret the concepts and measurement of national income in the context of economic development.
CO6	Interpret economic and financial information and recommend appropriate engineering economic decisions using relevant analytical techniques.

Teaching Methods: Chalk& Talk, PPT, Video Lectures, Case studies

TEXT BOOK(s):

1. Vengedasalam, Deviga. Madhavan, Karunagaran, Principles of Economics, Oxford University Press.
2. R. Paneer Seelvan, "Engineering Economics", PHI
3. Ahuja, H.L., "Principles of Micro Economics", S.Chand & Company Ltd
4. Paul, R.R., Money, Banking and International Trade, Kalyni Publishers.
5. Riggs, J.L., Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
6. Park, Chan.S, "Fundamental of Engineering Economics", Pearson.
7. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
8. Thuesen, G.J., Fabrycky. Engineering Economy, PHI.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	1	-	-	-	-	-	-	-	-
CO2	2	3	-	2	1	-	-	-	-	-	2	-	-	-
CO3	2	3	-	2	2	-	-	-	-	-	3	-	-	-
CO4	2	2	-	3	-	3	2	-	-	-	2	-	-	-
CO5	2	1	-	-	-	2	-	2	-	-	1	-	-	-
CO6	2	3	-	2	2	2	1	2	1	2	3	-	-	-
Avg.	2.17	2.3	-	2.3	1.7	2	1.5	2	1	2	2.2	-	-	-





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AR-2025
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEHS20001	ORGANIZATIONAL BEHAVIOUR	2	0	0	2
Pre - Basic Management Principles					
Course Educational Objectives					
CEO1	To develop a fundamental understanding of the concepts, evolution, scope, significance, and applications of Organizational Behaviour in contemporary organizations.				
CEO2	To familiarize students with the influence of individual behaviour, including attitude, personality, perception, emotional intelligence, and motivation, on employee performance and organizational effectiveness.				
CEO3	To enable students to understand group behaviour, team dynamics, leadership approaches, organizational culture, and change management practices for improving organizational performance.				
CEO4	To develop analytical and problem-solving skills for applying Organizational Behaviour concepts and theories to real-world managerial and workplace challenges in engineering and technology organizations.				
SYLLABUS					
UNIT:1		[06 Hours]			
Fundamentals of OB: Definition, scope and importance of OB, Evolution of OB Limitations of OB, Emotional Intelligence: Meaning, Components, Importance in Organizations, Daniel Goleman's Five Components of Emotional Intelligence.					
UNIT:2		[06 Hours]			
Attitude: Components of attitude; Job attitude, Barriers to changing attitudes. Personality: Definition and importance of Personality for performance, Trait theory, The Myers-Briggs Type Indicator and The Big Five personality model, personality and job – fit theory.					
UNIT:3		[08 Hours]			
Perception: Meaning and concept of perception, Perceptual process social perception (stereotyping and halo effect). Motivation: Definition & Concept of Motivation, The Content Theories of motivation (Maslow's Need Hierarchy & Herzberg's Two Factor Model Theory), The Process Theories (Vroom's expectancy, Equity Theory of Work Motivation					
UNIT:4		[7 Hours]			
Foundations of Group Behavior: The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five — Stage Model of Group Development. Leadership: Concept of Leadership, Styles of Leadership, Trait Approach, Contingency Leadership Approach, Contemporary Leadership Approaches: Transformational, Transactional Leadership.					



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UNIT:5

[8 Hours]

Organizational Culture: Meaning & Definition of Organizational Culture, Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture & Formal vs. Informal Culture)

Organizational Change: Meaning, Definition & Nature of Organizational Change Implementing Organizational Change: Resistance to Change, how to overcome the Resistance to Change, Kurt Lewin's-Three step model, Kotter's Eight-Step plan for Implementing Change

Course Outcomes: *Upon successful completion of this course, students should be able to:*

CO1	Explain the fundamental concepts, evolution, scope, significance, and applications of Organizational Behaviour in modern organizations.
CO2	Examine the influence of attitude, personality, and emotional intelligence on individual behaviour and workplace performance.
CO3	Analyse the role of perception and motivation theories in enhancing employee performance, satisfaction, and organizational effectiveness.
CO4	Demonstrate an understanding of group behaviour, team dynamics, and various leadership approaches for improving organizational performance.
CO5	Evaluate the impact of organizational culture and change management practices on organizational adaptability and effectiveness.
CO6	Apply Organizational Behaviour concepts and theories to analyse and propose solutions for real-world workplace and managerial issues in engineering and technology organizations.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Organizational Behavior – Stephen P. Robbins & Timothy A. Judge, 19th Edition, Pearson Education Limited, 2023.
2. Organizational Behavior – Fred Luthans, 13th Edition, McGraw-Hill Education, 2015
3. Organizational Behaviour – K. Aswathappa, 13th Edition, Himalaya Publishing House Pvt. Ltd., 2023;
4. Organizational Behavior – Uma Sekaran, 2nd Edition, Tata McGraw-Hill Education; , 2004
5. Organizational Behavior – S. S. Khanka, Revised Edition, S. Chand Publishing, ublication: 2018

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11			
CO1	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO2	-	2	-	-	2	3	3	2	-	-	-	-	-	-
CO3	-	3	-	-	-	2	2	-	-	-	-	-	-	-
CO4	-	2	-	-	2	2	3	3	2	-	-	-	-	-
CO5	-	2	2	-	3	2	2	2	3	-	-	-	-	-
CO6	-	3	2	2	2	2	2	3	2	3	-	-	-	-
Avg.	2	2.4	2	2	1.50	2.25	2.4	2.5	2.33	2.5	2	-	-	-



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEPC24101	FLUID MECHANICS AND HYDRAULICS MACHINES LABORATORY	0	0	2	1
Pre -Requisite: Mathematics, Fluid Mechanics and Hydraulic Machines					
Course Educational Objectives					
CEO1	To know the concept of fluid and its properties, manometer, hydrostatic forces acting on different surfaces and also problem solving techniques.				
CEO2	To relate the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.				
CEO3	To analyze the hydrodynamic forces acting on vanes and their performance evaluation.				
CEO4	To evaluate of the importance, function and performance characteristics of hydro machinery.				
LIST OF EXPERIMENTS					
List of Experiment: (Minimum 8 Experiments) 1. Determination of Metacentric Height and application to stability of floating bodies. 2. Determination of Cv and Cd of Orifices. 3. Experiments on impact of Jets 4. Experiments on performance of Pelton Turbine 5. Experiments on performance of Francis Turbine 6. Experiments on performance of Kaplan Turbine 7. Experiments on performance of centrifugal pump 8. Experiments on performance of reciprocating pump 9. Experiments on Reynold's Apparatus 10. Experiments on Flow through pipes 11. Verifications of Bernoulli's equation					
Course Outcomes: Upon successful completion of this course, students should be able to:					
CO1	Explain the principles of fluid statics, fluid flow, and hydraulic machines through laboratory experiments.				
CO2	Determine fluid properties and flow characteristics such as coefficient of velocity (Cv), coefficient of discharge (Cd), and Reynolds number using standard experimental setups.				
CO3	Analyze the performance characteristics of hydraulic turbines (Pelton, Francis, Kaplan) under varying operating conditions.				
CO4	Evaluate the performance of pumps (centrifugal and reciprocating) and interpret their characteristic curves.				
CO5	Investigate fluid flow behavior in pipes and verify fundamental laws such as Bernoulli's equation through experimental observations.				
CO6	Assess the stability of floating bodies and the impact of fluid jets for engineering applications.				



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CO-PO & PSO Mapping														
PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	3	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	3	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	2	-	-	-	-	-	-	-	1	-	-
CO4	2	3	-	3	-	-	-	-	-	-	-	1	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	2	-	-
CO6	3	2	-	2	-	-	-	-	-	-	-	2	-	-
Avg.	2.5	2.5	-	2.5	-	-	-	-	-	-	-	1.67	-	-



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEPC24102	MANUFACTURING TECHNOLOGY LABORATORY	0	0	2	1

Pre -Requisite:

Course Educational Objectives

CEO1	Examine the principles associated with basic operations involving the casting ,forming and welding of engineering materials
CEO2	Interpret the advantages and limitations of each process and its influence on the properties of the material in the finished component
CEO3	To know the basic processes used in performing forming and welding operations on engineering materials
CEO4	Formulate practical design methods to materials working techniques

LIST OF EXPERIMENTS

List of Experiment: (Minimum 6 Experiments)

- 1.Determination of grain size, clay content, permeability and green compressive strength of Molding sand. (2 to 3 experiments)
- 2.Foundry Practices
3. Preparation of a wood pattern.
- 4.Determination of strength of brazed and solder joints
- 5.Practice and preparation of job in TIG/MIG welding
6. Practice and preparation of job in sheet metal using processes like forming and deep drawing.
- 7.Demonstration of different rolling mills
- 8.Demonstration of Extrusion processes

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1	Utilize and determination of Sand properties testing for the molding sands.
CO2	Understand the Pattern design and making, casting drawing
CO3	Fabricate joints using GTAW and GMAW
CO4	To plan and create jobs by using Brazing and soldering
CO5	Understand and preparation of job using forming and deep drawing on sheet metal
CO6	Demonstrate practical understanding of extrusion and rolling operation.

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	3	2	-
CO2	3	2	-	-	2	-	-	-	-	-	-	3	2	-
CO3	3	2	-	-	3	-	-	-	-	-	-	3	3	-
CO4	2	2	-	-	2	-	-	-	-	-	-	2	2	-
CO5	3	2	-	-	3	-	-	-	-	-	-	3	3	-
CO6	3	2	-	-	3	-	-	-	-	-	-	3	3	-
Avg.	2.8	2	-	-	2.5	-	-	-	-	-	-	2.8	2.5	-



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AR-2025
4th Semester [Second Year]

SUBJECT CODE	TITLE OF THE SUBJECT	L	T	P	C
25MEPC24103	KINEMATICS OF MACHINERY LABORATORY	0	0	2	1
Pre Requisite: Physics , Mechanics, Theory of Machine					
Course Educational Objectives					
CEO1	To understand the concept of machines, mechanisms and elated terminologies				
CEO2	Discriminate mobility (number of degrees-of-freedom). Enumeration of rigid links and types of joints within mechanisms. To make the students become familiar and understanding of the most commonly used mechanisms (4-bar, 6-bar linkages, and cams).				
CEO3	To understand the Principles and working of various straight line motion mechanisms				
CEO4	To develop and analyze cam profiles for different mechanisms.				
LIST OF EXPERIMENTS					
List Of Experiments: (Minimum 8 no. of Experiments)					
1. Design of any one working model related to Kinematics of Mechanisms i.e., unit I and unit II.					
2. Radius of Gyration of compound pendulum					
3. Radius of Gyration of Connecting Rod.					
3. Study of simple /compound/Reverted Gear trains					
4. Experiment on Cam Analysis Apparatus.					
5. Experiment on Coriolis component of acceleration.					
7.Experiment on Journal Bearing Apparatus					
8. Study of interference and undercutting for gear drives.					
9.Experiment on Epicyclic gear train					
Course Outcomes: Upon successful completion of this course, students should be able to:					
CO1	Apply the principles of kinematic pairs and linkages to design and fabricate a working mechanism demonstrating relative motion between links.				
CO2	Determine the radius of gyration and moment of inertia of mechanical components such as compound pendulum and connecting rod using experimental methods.				
CO3	Analyze the motion and speed ratios of simple, compound, reverted, and epicyclic gear trains and their practical applications in mechanical systems.				
CO4	Interpret the motion characteristics of followers for different cam profiles using a cam analysis apparatus.				
CO5	Investigate the Coriolis component of acceleration in rotating systems and understand its implications in mechanism analysis.				
CO6	Examine the working of journal bearings and gear drives to study friction, pressure distribution, interference, and undercutting phenomena.				



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CO-PO & PSO Mapping														
COs	PROGRAMME OUTCOMES											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	2	2	2	-	-	-	1	-	-	3	2	2
CO2	3	3	2	2	2	-	-	-	1	-	-	3	2	1
CO3	3	3	2	2	2	-	-	-	1	-	-	3	2	2
CO4	3	2	3	2	2	-	-	-	1	-	-	3	2	2
CO5	3	3	3	2	2	-	-	-	1	-	-	3	2	2
CO6	3	3	2	2	2	-	-	-	1	-	-	3	2	2
Avg.	2.83	2.66	2.5	2	2	-	-	-	1	-	-	3	2	1.83

Handwritten signatures and initials are present below the table, including:

- Panda* (multiple instances)
- SK*
- Chak*
- NK Rout*
- Sahu*
- Pratap*
- Patel*
- Patel*
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AR-2025
4th Semester [Second Year]

SUBJECT CODE	COURSE TITLE	L	T	P	C
25MEAE24101	WORKPLACE COMMUNICATION AND PRESENTATION LABORATORY	0	0	2	1
Pre -Requisite: Basic understanding of English communication skills, including reading, writing, listening, and speaking, along with familiarity with digital tools like MS PowerPoint and email.					
Course Educational Objectives					
CEO1	Equip students with effective workplace communication skills (verbal, non-verbal, and written).				
CEO2	Build confidence in professional speaking, presentations, and group interactions.				
CEO3	Develop the ability to prepare essential business documents.				
CEO4	Enhance teamwork and interpersonal communication skills.				
SYLLABUS					
Unit 1: Business Writing – Memos, Minutes & Reports		(3 Hours)			
- Activity 1: Writing Internal Memos & Notices Focus: format, brevity, clarity. - Activity 2: Minutes of Meeting Practice Simulation of meetings, real-time note-taking. - Activity 3: Technical & Project Report Writing Introduction, Objectives, Methodology, Results					
Unit 2: Client Communication & Status Updates		(3 Hours)			
- Activity 1: Project Update Emails Structuring professional updates to clients/managers. - Activity 2: Handling Client Calls & Demos Simulated client role-plays for clarity and Persuasion. - Activity 3: Writing Follow-ups and Feedback Mails					
Unit 3: Workplace Problem-Solving & Decision Making		(3 Hours)			
- Activity 1: Analytical Thinking Games Team puzzles and case analysis. - Activity 2: Written Recommendation Reports Choose between solutions, justify decisions in writing. - Activity 3: Email Escalation & Diplomacy Draft escalations with polite and firm tone.					
Unit 4: Presentation Skills & Data Visualization		(3 Hours)			
- Activity 1: PowerPoint Design Principles Colour, font, charts, and clarity tips. - Activity 2: Tech Presentations with Data Use Excel/Power BI for simple visuals. - Activity 3: PechaKucha / Ignite Style Presentations 20 slides × 20 seconds – Time-limited delivery.					



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Unit 5: Ethics, Empathy, and Inclusive Communication

(3 Hours)

- Activity 1: Ethical Scenarios Discussion
Plagiarism, transparency, workplace bias.
- Activity 2: Empathy in Emails and Meetings
Language to support mental health, diversity.
- Activity 3: Communication for CSR and Sustainability
Write & present CSR campaign proposals.

Course Outcomes: Upon successful completion of this course, students should be

CO1	Improve active listening and comprehension through exposure to motivational videos, TED talks, and famous speeches.
CO2	Enhance oral fluency, pronunciation, and delivery skills through JAM, storytelling, recitation, and oral presentation.
CO3	Develop reading skills with focus on articulation, intonation, and speed using stories, news articles, poems, and prose.
CO4	Strengthen writing abilities through story writing, précis writing, and article writing by organizing ideas logically.
CO5	Build confidence and self-awareness through self-evaluation and reflection-based activities using ICT tools.
CO6	Demonstrate effective use of digital tools and multimedia in communication tasks like PPT presentation and self-evaluation.

Reference Books:

1. Corporate Communication, a guide to theory and practice, Joep Cornelissen
2. Communicating at work, Tony Alessanora, PHD Phil hunsakar
3. The well-spoken thesaurus, tom heehler

CO-PO & PSO Mapping

PROGRAMME OUTCOMES												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	-	-	2	-	-	-	3	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	3	-	-	-	2	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	-	-	3	3	-	-	-	-	-
CO5	-	-	2	2	2	-	-	2	3	-	-	-	-	-
CO6	-	-	-	-	3	2	-	-	2	-	2	-	-	-
Avg.	2.7	-	2.0	2.0	2.3	2.0	-	2.5	2.7	-	2.0	-	-	-

