SYLLABUS

(Academic Year 2025 -26)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕ ವರ್ಷ ೨೦೨೫–೨೬)

Bachelor Degree
In
Mechanical Engineering

III & IV Semester

Out Come Based Education
With
Choice Based Credit System

P.E.S. College of Engineering, Mandya - 571 401, Karnataka

[An Autonomous Institution affiliated to VTU, Belagavi,
Grant – in – Aid Institution (Government of Karnataka),
Accredited by NBA (All UG Programs), NAAC and Approved by AICTE, New Delhi]

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ
ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ
(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

: 08232- 220043, Fax : 08232 – 222075,Web : www.pescemandya.org

VISION

"PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals."

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

QUALITY POLICY

Highly committed in providing quality, concurrent technical education and continuously striving to meet expectations of stake holders.

CORE VALUES

Professionalism

Empathy

Synergy

Commitment

Ethics

About Department of Mechanical Engineering

The Department of Mechanical Engineering was established in the year 1962 during the origination of the institute. The department was granted academic autonomy in the year 2009. The department presently offers B.E in Mechanical Engineering. The present intake capacity of the department is 120. The department has a faculty-student ratio of 1:20. The department has well established laboratories to meet the academic requirement and skilled technical faculties to train the students. The department has its own library which has a collection of about 4600 reference books. The department is accredited with NBA for 3Years in 2023. The department regularly organizes industrial visits, technical talk by experts from industries and institutes in contemporary areas to bridge the gap between syllabi and current corporate developments. The students are encouraged to undergo industrial training as well as to take up industry oriented projects during their academic course. Mechanical Engineering Association (MEA), formed by the students and faculty of the department regularly organizes co-curricular and extracurricular activities for the students.

Department Vision

"Be a department well recognized for its ability to develop competent mechanical engineers capable of working in global environment"

Department Mission

The Mission of the Department of Mechanical Engineering is to:

- Provide quality education by competent faculty.
- Provide adequate infrastructure and learning ambience for the development of essential technical skills.
- Inculcate a sense of higher education and research orientation.
- Foster industry interaction.

Program Educational Objectives (PEOs)

The Department of Mechanical Engineering has formulated the following programme educational objectives for the under-graduate program in Mechanical Engineering:

The Mechanical Engineering graduates will be able to:

PEO1: Use the fundamentals of basic science, mathematics and mechanical engineering, to pursue their career as engineers as well as to lead and manage teams in global organizations.

PEO2: Pursue advanced education, research and development and engage in the process of life-long learning.

PEO3: Become entrepreneurs in a responsible, professional and ethical manner to serve the society.

Program Specific Outcomes (PSOs)

Engineering graduates should be able to:

PSO1: Apply conceptual knowledge with practical engagement that has real life problems by integrating different domains of mechanical engineering.

PSO2: Utilize the modern tools and emerging technologies with technical skills to design, develop and analyse mechanical systems through multidisciplinary approach.

Program Outcomes (POs)

Engineering Graduates will be able to:

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

Bachelor of Engineering – Mechanical Engineering (III –Semester)													
Sl. no	**Category**	**Course Code**	**Course Title**	**Bos**	**Hrs / Week**			**Credits**	**Examination Marks and Duration**				**Total Marks CIE +SEE**
					L	**T**	**P**		**Max. Marks CIE**	**Duration CIE**	**Max. Marks SEE**	**Duration SEE**	
1.	BSC	P24MA301A	Series, Transforms and Variations	Mat	2	2*	-	3	50	1.5	50	3	100
2.	PCC	P24ME302	Fundamentals of Engineering Mechanics		2	2	-	3	50	1.5	50	3	100
3.	PCC	P24ME303	Basic Thermodynamics		2	2	-	3	50	1.5	50	3	100
4.	PCC	P24ME304	Fluid Mechanics and Machinery		2	2	-	3	50	1.5	50	3	100
5.	PCC	P24ME305	Material Science & Metallurgy		2	2	-	3	50	1.5	50	3	100
6.	PCC	P24ME306	Manufacturing Process – I		2	2	-	3	50	1.5	50	3	100
7.	PCCL	P24MEL307	Computer Aided Machine Drawing		-	-	2	1	50	1.5	50	3	100
8.	PCCL	P24MEL308	Material Science and Metallurgy Laboratory		-	-	2	1	50	2	50	3	100
9.	PCCL	P24MEL309	Manufacturing Process-I Laboratory		-	-	2	1	50	2	50	3	100
10.	HMSC	P24HMSC310B	Employability Enhancement Course - III		1	-	-	1	50	1 (MCQ)	50	2 (MCQ)	100
11.	MAND	P24NSS311	National Service Scheme		-	-	-	-	50	1 (MCQ)	50	2 (MCQ)	PP/NP
		P24YOG311	Yoga										
		P24PED311	Physical Education										
12.	MAND		AICTE Activity points	(students have to earn 100 activity points between 0l to 08 semester)					Compulsory requirement for the award of a degree				
	TOTAL							**22**	550		550		1100
BRIDGE COURSE				**B.E [Lateral Entry Students]**									
13.	MAND	P24MADIP301	Basic Engineering Mathematics - I		2	2	-	-	100	3	-	-	100
14.	MAND	P24HDIP310	Additional Communicative English - I			2	-	-	100	3	-	-	100

Bachelor of Engineering – Mechanical Engineering (IV –Semester)													
Sl. no	**Category**	**Course Code**	**Course Title**	**Bos**	**Hrs / Week**			**Credits**	**Examination Marks and Duration**				**Total Marks CIE +SEE**
					L	**T**	**P**		**Max Marks CIE**	**Duration CIE**	**Max. Marks SEE**	**Duration SEE**	
1.	BSC	P24MA401A	Applied Mathematical Methods	Mat	2	2*	-	3	50	1.5	50	3	100
2.	PCC	P24ME402	Process and Testing of advanced materials		2	2	-	3	50	1.5	50	3	100
3.	PCC	P24ME403	Applied Thermodynamics		2	2	-	3	50	1.5	50	3	100
4.	PCC	P24ME404	Mechanics of Materials		2	2	-	3	50	1.5	50	3	100
5.	PCC	P24ME405	Mechanical Measurements and Metrology		2	2	-	3	50	1.5	50	3	100
6.	PCC	P24ME406	Manufacturing Process – II		2	2	-	3	50	1.5	50	3	100
7.	PCCL	P24MEL407	Mechanical Measurements and Metrology Laboratory		-	-	2	1	50	1.5	50	3	100
8.	PCCL	P24MEL408	Manufacturing Process – II Laboratory		-	-	2	1	50	2	50	3	100
9.	PCCL	P24MEL409	Fluid Measurement And Machinery Laboratory		-	-	2	1	50	2	50	3	100
10.	HMSC	P24HMSC410B	Employability enhancement course - IV		1	-	-	1	50	1 MCQ	50	2MCQ	100
11.	MAND	P24NSS411	National Service scheme		-	-	-	-	50	1 (MCQ)	50	2 (MCQ)	PP/NP
		P24YOG411	Yoga										
		P24PED411	Physical Education										
12.	MAND		AICTE Activity points	(students have to earn 100 activity points between 01 to 08 semester)					Compulsory requirement for the award of a degree				
	TOTAL							22	550		550		1100
BRIDGE COURSE				**B.E [Lateral Entry Students]**									
13.	MAND	P24MADIP401	Basic Engineering Mathematics - II		2	2	-	-	100	3	-	-	100
14.	MAND	P24HDIP410	Additional Communicative English - II			2	-	-	100	3	-	-	100

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: **SERIES, TRANSFORMS AND VARIATIONS**		
Course Code: **P24MA301A**	CIE Marks: **50**	CIE Weightage: **50**
Teaching hours/week (L:T:P:S) **04 (L:2, T:2)**	SEE Marks: **50**	SEE Weightage: **50**
Teaching hours of Pedagogy: 40	Exam Hours: 03	
Credits: 03		

Prerequisite:

Basic knowledge of Calculus

Course learning Objectives:

CLO1: **Understand** the concept of infinite series; learn and apply Fourier series to represent periodical physical phenomena in engineering analysis.
CLO2: To facilitate students to study, analyse and apply various transforms to solve engineering problems.

Unit 1	**Hrs: 8**

Infinite Series: Introduction, limit, convergence, divergence and oscillation of a series, Series of positive terms, **Tests for convergence** – Comparison test, Ratio test, Raabe's test, Cauchy's root test (All tests without proof). Alternating series and power series: center and radius of convergence – Problems.

Self-Study Content: Integral Test, Leibnitz's theorem – absolute and conditional convergence. Visualization by using SageMath.

Unit 2	**Hrs: 8**

Fourier Series: Introduction, periodic function, even and odd functions, Dirichlet's conditions, Euler's formula for Fourier series (no proof). Fourier series for functions of arbitrary period of the form 2L (all particular cases) – problems, analysis – Illustrative examples from engineering field. Practical harmonic analysis- Illustrative examples from engineering field.

Self-Study Content: Half Range Fourier series – Construction of Half range cosine and sine series and problems, Complex form of Fourier series, Visualization by using SageMath.

Unit 3	**Hrs: 8**

Laplace Transforms: Definition – Transforms of elementary functions. Properties of Laplace Transforms- linearity, change of scale, shifting, transform of derivative and integrals, transform of a function multiplied by t^n and division t (no proof) – Problems, transforms of periodic function, unit step function (All results without proof)-Problems only.
Inverse Laplace Transforms: Definition, evaluation using partial fraction method, convolution theorem (Statement Only).

Self-Study Content: Transform of unit impulse function. Solution of ODE by Laplace method, Visualization by using SageMath/MATLAB.

Unit4	**Hrs: 8**

Fourier Transforms:
Complex Fourier Transform: Infinite Fourier transforms and Inverse Fourier transforms.

Properties of Fourier Transforms- linearity Change of scale, shifting and modulation (no proof)- Problems, Fourier sine and cosine transforms and Inverse Fourier cosine and sine transforms with properties-Problems, Parseval's identities for Fourier Transform (no proof)-problems.	
Self-Study Content: Fourier integrals- Complex forms of Fourier integral. Convolution theorem. Visualization by (Fast) Fourier transform using SageMath/MATLAB.	
Unit 5	**Hrs: 08**
Calculus of Variations: Variation of a function and a functional, extremal of a functional. Variational problems – Euler's equation. Applications to standard variational problems including geodesics, minimal surface of revolution, hanging chain and brachistochrone problems.	
Self-Study Content: Boundary value problems – Rayleigh – Ritz method.	

Suggested Learning Resources:

Textbooks:

	Title	Author	Year & Edition **(Latest)**	Publisher
1.	Higher Engineering Mathematics	B. S. Grewal	44th Edition2018	Khanna Publishers, New Delhi
2.	Advanced Engineering Mathematics	E. Kreysizig	10th Ed. (Reprint) 2016.	John Wiley and sons

Reference Books:

1.	Higher Engineering Mathematics	V. Ramana	11th Ed.,	McGraw–Hill Education
2.	Advanced Engineering Mathematics	H. C. Taneja	Volume I & II	I. K. International Publishing House Pvt. Ltd., New Delhi.
3.	A textbook of Engineering Mathematics	N. P. Bali and Manish Goyal	Reprint, 2010	Laxmi Publications

Web links and Video Lectures (e-resources)

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. https://ocw.mit.edu/courses/18-03sc-differential-equations-fall-2011/
4. https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/
5. https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/differential-equations/first-order-differential-equations/
6. https://youtu.be/YzG0oCEglPA?si=hmWa7o0PeSVezbjA (Sequence and series)

7. https://youtu.be/E7WFvdnHkEg?si=zcd63K28oVhpCna8 and https://www.youtube.com/watch?v=1jWVBAPvUPw (Fourier series)
8. https://youtu.be/WvNdTuvucRM?si=-Kh_D75Np0hI1KrT (Laplace Transform)
9. https://www.youtube.com/watch?v=C1S87RyDrGM&t=2312s (Fourier Transform in SageMath Tools) and https://www.youtube.com/watch?v=Q7geMVz75So (FFT in Excel)

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)

1. Flip Class
2. Seminar/ poster Presentation
3. Individual Role play/Team Demonstration/ Collaborative Activity
4. Case study
5. Learn by Doing

COURSE OUT COMES: On completion of the course, student should be able to:

CO1: Understand the fundamental concepts of infinite series, transforms of functions.
CO2: Apply series and transform techniques to obtain series expansion, discrete and continuous transformation of various mathematical functions.
CO3: Analyze various signals using series expansions and differential, integral and difference equations using transforms.
CO4: Evaluate indefinite integrals, differential equations and difference equations subject to initial conditions using transforms and develop series for a discontinuous function.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	3										
CO3	3	2										
CO4	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Fundamentals of Engineering Mechanics		
Course Code: P24ME302	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 2:2:0	SEE Marks:100	SEE Weightage:50%
Teaching hours of Pedagogy:40 Hours	Exam Hours: 3 Hrs	
Credits:03		

Prerequisite:

- Basic understanding of Physics, and Mathematics concepts

Course learning Objectives:

- **CLO1:** Understand basic terms, laws and principles used in engineering mechanics.
- **CLO2:** Learn how to analyze force systems, draw free-body diagrams and apply equilibrium conditions.
- **CLO3:** Understand concepts of friction, centroid and moment of inertia and learn to calculate them for different shapes.
- **CLO4:** Learn how to find center of gravity and mass moment of inertia for individual and composite bodies.
- **CLO5:**Apply Newton's laws, D'Alembert's principle and energy methods to solve problems involving motion and forces.

Unit 1:	**Hrs:8**

Introduction to Engineering Mechanics: Classification of Engineering Mechanics, Basic Terminologies in Mechanics, Laws of Mechanics, Derived Laws, Units, Characteristics of a Force, System of Forces, Vectors, Dimensional Homogeneity, Idealisations in Mechanics, Accuracy of Calculations, Approaches to Solution, principle of transmissibility of forces, principle of superposition.

Resultant and Equilibrium of System of Coplanar Concurrent Forces: Composition of Two Force System, Resolution of Forces, General Method of Composition of Forces, Equilibrium of Bodies, Equilibrium of Connected Bodies, Problems for Exercise.

Self-Study Content: Resultant and Equilibrium of System of Coplanar Non-Concurrent Forces

Unit 2:	**Hrs:8**

Friction: Frictional Force, Laws of Friction, Angle of Friction, Angle of Repose and Cone of Friction, Wedges, Problems Involving Non-Concurrent Force Systems, Rope Friction, Problems for Exercise.

Virtual Work Method: Work Done by Forces and Moments, The Method, Sign Convention, Problems for Exercise.

Self-Study Content: Analysis of ladder friction.

Unit 3:	**Hrs:8**

Centroid and Moment of Inertia: Centre of Gravity, Centre of Gravity of a Flat Plate, Centroid, Difference Between Centre of Gravity and Centroid, Use of Axis of Symmetry, Determination of Centroid of Simple Figures from First Principle. **Moment of Inertia:** Polar Moment of Inertia, Radius of Gyration, Theorems of Moment of Inertia, Moment of Inertia from First Principles, Moment of Inertia of Standard Sections.

Self-Study Content: Theorem of Parallel & Perpendicular axis.

Unit4:	**Hrs:8**

Centre of Gravity and Mass Moment of Inertia: Centre of Gravity, Use of Symmetry, Centre of Gravity from First Principles, Centre of Gravity of Composite Bodies, Theorems of Pappus-Guldinus, Mass Moment of Inertia, Radius of Gyration, Determination of Mass Moment of Inertia from First Principles, Parallel Axis Theorem/Transfer Formula, Problems for Exercise.

D'Alembert's Principle: Newton's Second Law of Motion, D' Alembert's Principle, Problems for Exercise.	
Self-Study Content: Moment of Inertia of Composite Bodies	
Unit 5:	**Hrs:8**
Work Energy Method: Work, Work Done by a Varying Force, Energy, Power, Work Energy Equation for Translation, Motion of Connected Bodies, Work Done by a Spring, Problems for Exercise. **Introduction to Dynamics:** Basic Terms, General Principles in Dynamics, Types of Motion. **Circular Motion of Rigid Bodies:** Acceleration during circular motion, Angular motion, Relationship between angular motion and linear motion, uniform angular velocity, Problems for Exercise.	
Self-Study Content: Work done by torque	

Suggested Learning Resources:

Textbooks:

Sl.No.	Title	Author	Year & Edition	Publisher
1	Engineering Mechanics	S SBhavikatti, K.G. Rajashekarappa	3rd edition, 1998	New Age International Pvt.Ltd.
2	Engineering Mechanics	Dr. R K Bansal	4th edition, 2002	Laxmi Publications Pvt.Ltd.

Reference Books:

1.	Engineering Mechanics	R. S. Khurmi, N. khurmi	22nd Edition,2018	S. Chand Publishing
2.	Engineering Mechanics	R.C. Hibbeler	14th Edition, 2017	Pearson Education
3.	Engineering Mechanics	S.Timoshenko, D.H. Young , J.V. Rao , SukumarPati	5th Edition, 2017	McGraw Hill Education

Web links and Video Lectures (e-resources)

1.https://archive.nptel.ac.in/courses/112/106/112106286/- Topic Information

2.https://www.youtube.com/@edorealengineering6106

3.https://www.youtube.com/watch?v=wg8Xn1M3HgQ

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)

1. Students work in pairs to draw force polygons on graph paper to find resultants and check equilibrium visually.
2. Seminar/ poster Presentation
3. Students debate which method (D'Alembertvs Work-Energy) is more efficient for solving dynamic motion problems and justify using examples.

Course Articulation Matrix														
Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the basic laws of mechanics and vector principles to determine resultants and equilibrium in 2D force systems.	3												
CO2	**Solve** problems involving friction in various mechanical systems using equilibrium equations.	1	2											
CO3	**Calculate** the centroid and moment of inertia for simple and composite sections using standard methods.	1	2											
CO4	**Understand** the center of gravity and mass moment of inertia for different solid and composite bodies using basic theorems.		3											
CO5	**Apply** Newton's second law, D'Alembert's principle and work-energy equations to analyze the motion of particles and rigid bodies.	3	2											

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Basic Thermodynamics		
Course Code: P24ME303	CIE Marks:50	CIE Marks:50
Teaching hours/week (L:T:P) : 2:2:0	SEE Marks: 100	SEE Marks: 100
Teaching hours of Pedagogy: 40	Exam Hours: 3	
Credits:03		

Prerequisite:

A basic understanding of physics especially mechanics and energy concepts.

Course learning Objectives:

CLO1: Acquire knowledge of the fundamentals of thermodynamics and temperature scales.
CLO2: Determine heat, work, internal energy and enthalpy for flow and non-flow processes using First and Second law of thermodynamics.
CLO3: Determine changes in internal energy, enthalpy and entropy using T-dS relations for ideal gases.
CLO4: Identify the properties of substances on property diagrams and obtain the data from property tables.
CLO5: Apply concepts of thermodynamics in analyzing the thermal efficiencies of heat engines, Carnot cycles and the coefficients of performance for refrigerators.

Unit 1:	**Hrs:9**

Fundamental Concepts and Definitions: Definition of thermodynamics. Microscopic and Macroscopic approaches, Thermodynamic system, thermodynamic properties, State, path, process and cycle, quasi-static process, thermodynamic equilibrium, reversible and irreversible processes, Zeroth law of thermodynamics, scales of temperature, Numerical Problems. **Work and Heat:** Thermodynamic definition of work, sign convention, displacement work, displacement work done for different thermodynamic processes. Definition of heat and its sign convention. Comparison of work and heat. Numerical problems on work transfer.
Case Study: Application of Zeroth law of thermodynamics for temperature measurement.

Self-Study Content:Types of thermometers, concept of absolute scale of temperature, mechanical forms of work.

Unit 2:	**Hrs:8**

First Law of Thermodynamics: Statement, application of first law of thermodynamics to a system undergoing a cyclic process and a change of state, concept of energy, energy as a property of the system. First law applied to thermodynamic processes. Definition and significance of internal energy, enthalpy and specific heats. Numerical on systems undergoing closed process. **Steady flow process:** First law applied to a control volume, derivation of steady flow energy equation on unit mass and time basis.
Case Study: Application of steady flow energy equation on various mechanical devices,

Self-Study Content: Engineering application of SFEE, SFEE for unsteady flow process (Tank filling and Tank emptying).

Unit 3:	**Hrs:8**

Second Law of Thermodynamics: Thermal reservoir; Source and sink. Heat engine, heat pump and refrigerator. Efficiency and coefficient of performance. Kelvin–Planck and Clausius statements for Second law of thermodynamics and equivalence of the two Statements. Reversible and Irreversible processes. Carnot cycle, reversed Carnot cycle, Carnot theorem. Numerical problems on heat engines and heat pumps. **Entropy**: Definition, Clausius theorem, Clausius inequality, Principle of increase of entropy, T-dS relations, Numerical Problems.

Case Study: Examine the key factors that contribute to the irreversibility of real-world thermodynamic processes.

Self-Study Content: Available and unavailable energy, irreversibility. Concept of Energy.

Unit4: **Hrs:8**

Pure substances: Definition of pure substance, two-property rule, behaviour of pure substance (steam) with reference to T-v, P-Tand T-h diagrams. Definitions: Sub-cooled liquid, saturated liquid, mixture, saturated vapor, superheated vapor, triple point, critical point, sensible heat, latent heat and super heat. Properties of steam, quality of steam and its determination. Expressions for the change in internal energy, enthalpy, work, heat, entropy in various processes, Use of Mollier chart.

Case Study:Application of throttling calorimeter, separating and throttling calorimeter in the measurement of dryness fraction of steam

Self-Study Content:P-v-T surface, Bucket and Barrel calorimeter.

Unit 5: **Hrs:7**

Ideal and Real Gases: Concept of ideal gas, basic gas laws, characteristic gas equation, Avogadro's law and Universal gas constant, Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Numerical Problems.

Mixtures of Gases: Mole fraction and mass fraction, Partial pressure and Dalton's Law of partial pressure, Amagat's laws of partial volumes. Internal energy, enthalpy and specific heats of gas mixtures. Simple Numerical on gas mixtures.

Case Study: Application of gas law to determine the properties of gas mixtures

Self-Study Content: Relation between volumetric and gravimetric analysis.

Suggested Learning Resources:

Textbooks:

	Title	Author	Year & Edition (Latest)	Publisher
1.	Basic and Applied Thermodynamics	P.K.Nag	2017 2nd Edition	Tata McGraw Hill
2.	Thermodynamics– An Engineering Approach	Yunus A. Cengel, Michael A Boles	2017 8th Edition	Tata McGraw Hill
Reference Books:				
1.	Fundamentals of Classical Thermodynamics	G. J. Van Wylen, R. E. Sonntag, C. Borgnakke	1994 4th Edition	John Wiley & Sons
2.	Thermal Engineering	Mahesh. M. Rathore	2010 1st Edition	McGraw Hill Pvt Ltd.
3.	Engineering Thermodynamics	Spalding and Cole	1966 2nd Edition	Edward Arnold
4	Engineering Thermodynamics	R.K.Rajput	2011 3rd Edition	Laxmi Publications Pvt Ltd
5.	A course in Thermal Engineering	Domkundwar	2018 3rd Edition	DhanpatRai and Co

Web links and Video Lectures (e-resources)
1.https://archive.nptel.ac.in/courses/112/105/112105123/ 2. https://archive.nptel.ac.in/courses/112/105/112105123/ 3. https://archive.nptel.ac.in/courses/112/105/112105123/ 4. https://archive.nptel.ac.in/courses/112/105/112105123/

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Flip Class 2. Seminar/ poster Presentation 3. Individual Role play/Team Demonstration/ Collaborative Activity 4. Case study 5. Learn by Doing

Course Articulation Matrix														
Course Outcomes		**Program Outcomes**											**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the basic concepts of thermodynamics such as system, properties, state, cycles and equilibrium on different thermodynamic processes.	**3**												
CO2	**Apply** the fundamental concept and laws of thermodynamics on control mass and control volume.	**3**												
CO3	**Analyse** the performance of different thermodynamic processes and thermal systems such as Carnot cycle, heat engines, heat pumps, refrigerators and entropy by applying laws of thermodynamics.		**3**											
CO4	**Analyse** the properties of working substances and gas mixtures on property diagrams to study the irreversibility and feasibility of the process.		**3**											

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Fluid Mechanics and Machinery		
Course Code: P24ME304	CIE Marks:50	CIE Weightage: 50%
Teaching hours/week (L:T:P): 2:2:0	SEE Marks: 100	SEE Weightage: 50%
Teaching hours of Pedagogy: 40	Exam Hours: 3	
Credits:03		

Prerequisite:

A basic understanding of calculus and mechanics

Course learning Objectives:

CLO1: To understand the basic principles and equations of fluid mechanics and its applications to the various engineering fields involving fluid flow problems.
CLO2: To understand and apply the principles of fluid statics, fluid kinematics and dynamics.
CLO3: To determine flow rates, pressure changes, minor and major head losses for pipe flow.
CLO4: To understand the basic principles, governing equations and applications of turbo machines.
CLO5: To present an overall frame work for the fluid dynamic design and performance analysis of turbo machines.

Unit 1:	**Hrs:8**

Properties of fluids: Introduction, properties of fluids, viscosity, Newton's law of viscosity, surface tension, capillarity. **Fluid statics:** Pascal's law, fluid pressure at a point, pressure variation in a static fluid. Buoyancy, Buoyant force and centre of buoyancy (concept only).
Case Study: Application of hydrostatic law in pressure measurement using simple and differential manometers

Self-Study Content:: Bourdon's tube pressure gauge and bellows pressure gauge

Unit 2:	**Hrs:8**

Fluid kinematics: Types of fluid flow, continuity equation in three dimensions (Cartesian co-ordinate system only) and velocity and acceleration, velocity potential function, stream function. **Fluid Dynamics:** Euler's equation of motion, Bernoulli's equation for ideal and real fluids. **Fluid Flow measurements**: Venturimeter, Darcy and Chezy equations for loss of head due to friction in pipes, numerical problems
Case Study: Application of fluid kinetics to determine the velocity and acceleration of fluid flow.

Self-Study Content: Orifice meter, notches and weirs. Minor losses in flow through pipes.

Unit 3:	**Hrs:8**

Fundamentals of turbo machines: Parts of turbo machine, classification of turbomachines, Euler turbine equation and alternate form of Euler turbine equation and components of energy transfer. Degree of reaction, general expression for degree of reaction. Utilization factor, relation between utilization factor and degree of reaction., numerical problems.
Case Study: Determination of condition for maximum utilization in Impulse, reaction and 50% reaction turbines.

Self-Study Content: Velocity triangles for different values of degree of reaction

Unit4:	**Hrs:8**

Impulse turbine: Velocity triangles and power. Effect of friction and condition for maximum efficiency of Pelton turbines, numerical problems. **Reaction turbines:** Velocity triangles, power and efficiency of reaction turbines numerical problems. Runner shapes for different blade speeds, design parameters and design of reaction turbines (Francis and Kaplan turbines). Draft tube: types of draft tube and functions of draft tube.

Case Study: Application of fluid mechanics in the design of Pelton turbine.	
Self-Study Content:Unit quantities and their significance, performance curves of impulse and reaction turbines.	
Unit 5:	**Hrs:8**
Centrifugal Pumps: Introduction, working principle, parts, definition of manometric head, suction head, delivery head, static head, velocity diagram and work done, numerical problems, minimum starting speed, net positive suction head, priming. Multi-stage centrifugal pump for high head and high discharge, numerical problems. **Case Study:** Comparison of manometric, mechanical and overall efficiencies of centrifugal pump.	
Self-Study Content: Self-study component: Vapour pressure and cavitation, effects of cavitation and its control.	

Suggested Learning Resources:				
Textbooks:				
	Title	**Author**	**Year & Edition (Latest)**	**Publisher**
1.	Fluid Mechanics	K.W. Bedford, Victor Streeter, E. Benjamin Wylie	1997, 9th edition	Tata Mcgraw Hill Education Private Limited
2.	Fluid Mechanics and Hydraulic Machines	R. K. Bansal	2015, 9th edition	Laxmi publications Ltd
3.	Fundamentals of Turbomachinary	B K Venkanna	1st edition 2009	PHI Learning Pvt. Limited
4.	Principles of Turbo Machinery	D. G. Shepherd	17th edition 1956	Macmillan Company
Reference Books:				
1.	Fluid Mechanics And Hydraulics With Computer Applications	JagadishLal	2022 1st edition	Metropolitan Book Co. Pvt. Ltd
2.	Engineering Fluid Mechanics	K.L.Kumar	2009 8th edition	S Chand & Co Ltd
3.	Frank M.White	FluidMechanics	2011 7th edition	Tata Mcgraw Hill Education Private Limited
4.	Gas Turbines	V. Ganesan	2010 3rd Edition	Tata McGraw Hill Education Limited
5.	A Treatise on Turbo machines	G. Gopalakrishnan	2008 1st Edition,	Scitech Publications (India) Pvt. Ltd.

Web links and Video Lectures (e-resources)
1. https://www.youtube.com/watch?v=vXPtNNLEOUcandlist=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEmandindex=4 2. https://www.youtube.com/watch?v=lGL7Dp8xK_Uandlist=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEmandindex=13 3. https://www.youtube.com/watch?v=nmubCbgd_KMandlist=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiEandindex=2 4. https://www.youtube.com/watch?v=utOHXJvqI9oandlist=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiEandindex=12 5. https://www.youtube.com/watch?v=VQqiVVYuNksandlist=PLbMVogVj5nJQQp3QLuzbcHrt0XncZZTiEandindex=8
Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Flip Class 2. Seminar/ poster Presentation 3. Individual Role play/Team Demonstration/ Collaborative Activity 4. Case study 5. Learn by Doing

Course Articulation Matrix														
Course Outcomes		**Program Outcomes**											**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the mathematical knowledge of fluid mechanics to predict the behaviour of a fluid flow.	**3**												
CO2	**Apply** the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical engineering.	**3**												
CO3	**Analyse** fluid flow problems with the use of fluid properties and measurement of pressure in engineering applications.		**3**											
CO4	**Illustrate** the basic principles and operations of turbo-machines to appreciate the concept of velocity triangles for different values of reaction.	**3**												
CO5	**Apply** the basics of fluid mechanics for the design and analysis of pipe flows as well as fluid machinery.		**2**	**2**										

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Material Science and Metallurgy		
Course Code: P24ME305	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):2:2:0	SEE Marks:100	SEE Weightage:50%
Teaching hours of Pedagogy: 40	Exam Hours: 3Hrs	
Credits:03		

Prerequisite:

- Basic knowledge of Engineering Physics and Chemistry, particularly atomic structure and bonding.
- Understanding of Engineering Mechanics concepts such as stress-strain behaviour and simple loading conditions.

Course Learning Objectives:

CLO1: Material science and Metallurgy perceives materials behaviour and atomic characterization, interpret with the selection of materials for suitable applications.

CLO2: The course introduces basic knowledge over phase diagrams and also deals with behaviours, transformation of metals expose to different environment and heat treatment.

CLO3: Course also exposed to inculcate the knowledge over advanced materials and composite materials.

Unit 1:	**Hrs:8**

Structure of Crystalline Solids: Fundamental concepts of unit cell, space lattice, Bravais lattice, Unit cells for cubic structure and HCP, study of stacking of layers of atoms in cubic structures and HCP, Calculation of atomic radius, co-ordination number and atomic packing factors for different cubic structures. Crystal imperfections - point, line, surface and volume defects. Diffusion Mechanisms and Fick's laws of diffusion.

Self-Study Content: Crystal planes and Direction

Unit 2:	**Hrs:8**

Mechanical characteristics of metals: Tensile properties, true stress and true strain, Hardness, Rockwell, Vickers and Brinell hardness testing, plastic deformation - slip and twinning. Fracture type, stages in Cup and Cone fracture, fracture toughness, Griffith's criterion. Fatigue test, S-N curves, factors affecting fatigue life and protection methods. The creep curves, Mechanism of creep.

Self-Study Content: ASTM standards for different mechanical tests.

Unit 3:	**Hrs:8**

Phase Diagrams and Solid Solution: Solid solutions, Rules governing formation of solid solutions, Phase diagram- Basic terms, phase rule, cooling curves, construction of Phase diagrams, interpretation of equilibrium diagrams, Types of Phase diagrams, Lever rule. Iron Carbon Equilibrium Diagram: Phases in the Fe-C system, invariant reactions, critical temperatures, Microstructures of slowly cooled steels, effect of alloying elements on the Fe-C diagram. Construction of TTT diagram, TTT diagram for hypo and hyper eutectoid steels.

Self-Study Content: Continuous Cooling Transformation (CCT) diagram.

Unit4:	**Hrs:8**

Heat Treatment and Strengthening Method: Annealing and its types, normalizing, hardening, tempering, martempering, austempering, surface hardening: case hardening, carburizing, cyaniding, nitriding, Induction hardening, hardenabilty, Jominy end-quench test.

Self-Study Content: Age hardening of Al and Cu alloys

Unit 5:	Hrs:8
Composites: Classification, functions of matrix and reinforcement in composites, Rule of mixture, Polymer, metal and ceramic matrix composites, carbon- carbon composites, Applications of composites. **Advanced Materials**: Nanomaterials- Size-dependant properties, applications, Shape Memory Alloys (SMA)- Characteristics, applications, Metallic glasses: properties and applications.	
Self-Study Content: Cryogenic materials	
Suggested Learning Resources:	
Textbooks:	

SI No.	Title	Author	Year & Edition	Publisher
1.	Materials Science and Engineering – an Introduction	Willian D. Callister Jr.	2006, 6th Edition	John Wiley India Pvt.Ltd, New Delhi ISBN: 978-0471736967
2.	Essentials of Materials For Science and Engineering	Donald R. Askeland, Pradeep	2006, 2nd Edition,	CL Engineering ISBN: 978-0495244462.
Reference Books:				
1.	Introduction to Material Science for Engineering	James F. Shackel ford	**2006, 6thedition**	Pearson Prentice Hall, New Jersy,.
2.	Physical Metallurgy, Principles and Practices	V. Raghavan	2006, 2nd Edition	PHI, New Delhi ISBN: 978-8120330129.
3.	Foundations of Materials Science and Engineering	Smith	1997, 3rd Edition	McGraw Hill

Web links and Video Lectures (e-resources)

1. https://youtu.be/OTDVov_kw6A
2. https://www.digimat.in/nptel/courses/video/113104014/L20.html
3. https://youtu.be/I9fQ9KDk_uU
4. https://nptel.ac.in/courses/112104168
5. https://archive.nptel.ac.in/courses/113/104/113104074/

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)

1. Build and analyze crystal structure models using simple materials like balls and sticks to understand atomic arrangements.
2. Perform mechanical tests (tension, hardness, impact) and interpret real-time experimental data through group discussions.
3. Conduct microstructure observation after heat treatments and correlate grain structures with mechanical properties.
4. Analyze industrial case studies of material failures (fatigue, fracture, creep) and propose preventive strategies.
5. Organize mini-projects where students select, justify, and present suitable materials for given engineering applications.

Course Articulation Matrix														
Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Understand** the fundamental concepts of material science and metallurgy.	**3**												
CO2	**Apply** various heat treatment processes to ferrous and nonferrous metals.	**3**												
CO3	**Analyze** materials properties, composition and their phase transformation.	**3**	**3**											
CO4	I**dentify** and **Analyze** the advanced materials like composites and nano materials for engineering applications.	**3**		**2**										

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title:Manufacturing Process-I		
Course Code: P24ME306	CIE Marks:50	CIE Weightage: 50%
Teaching hours/week (L:T:P): 2:2:0	SEE Marks:100	SEE Weightage: 50%
Teaching hours of Pedagogy: 40	Exam Hours: 03Hrs.	
Credits:03		

Prerequisite:

- Engineering Physics , Engineering Drawing & Basic Engineering Materials

Course learning Objectives:

CLO1: To introduce the fundamental concepts of primary manufacturing processes such as casting, welding, and metal cutting.
CLO2: To develop understanding of process parameters, equipment, and tooling involved in various manufacturing techniques.
CLO3: To provide insight into special casting and welding methods and their industrial applications.
CLO4: To impart knowledge on the mechanics of metal cutting and tool life evaluation.
CLO5: To train students in hands-on manufacturing practices and improve their ability to work individually and as a team in a workshop environment.

Unit 1:	**Hrs:8**

Introduction to Casting: Concept of Manufacturing process, Casting process- Steps involved, advantages, limitations and applications of casting process. Patterns: Definition, Pattern materials, classification of patterns, Pattern allowances. Binder: Definition and types. Casting defects, causes and remedies.

Self-Study Content: Melting furnace classification.

Unit 2:	**Hrs:8**

Sand Moulding: Types of sand moulds, Ingredients of moulding sand and properties, core making, principles of gating: Elements of gating system, types of gates, gating ratio, Risers: types and functions. Special Moulding Process: CO_2moulding, Shell moulding, permanent mould casting, Pressure die casting, Squeeze Casting.

Self-Study Content: Stir casting and centrifugal casting.

Unit 3:	**Hrs:8**

Special types of welding: Resistance welding-principle, working principle, advantages, disadvantages and applications of the following types-Seam welding, Spot welding, Friction welding, Explosive welding. Metallurgical aspect in welding: Formation of different zones during welding, Heat Affected Zone (HAZ), Parameters affecting HAZ, Welding defects.

Self-Study Content: Weldability and friction stir welding.

Unit4:	**Hrs:8**

Theory of Metal Cutting: Introduction, Single point cutting tool nomenclature, geometry, orthogonal and oblique cutting, Mechanism of chip formation, Types of chips Cutting tool materials: HSS, Carbides, Coated carbides, CBN and Ceramics. Heat generation in metal cutting, factors affecting heat generation. Tool Wear: Causes and types, effects of cutting parameters on tool life, tool failure criteria, Taylor's tool life equation, simple problems on tool life evaluation.

Self-Study Content: Cutting Fluids: Desired properties, types and selection.

Unit 5:	Hrs:8
Machine Tools and Mechanisms: Constructional feature of turret lathe, Turret lathe indexing mechanism, Shaping Machine-classification of shaping machine, Shaper mechanism -Crank and slotted lever quick return mechanism and hydraulic driving mechanism, Planing Machine-classification of planer - Planer mechanism -open and cross belt drive mechanism.	
Self-Study Content: Milling machine and grinding machine.	

Suggested Learning Resources:

Textbooks:

Sl. No.	Title	Author	Year & Edition	Publisher
1.	Manufacturing Engineering and Technology	Serope Kalpakjian and Steven R. Schmid	2002, 4th Edition	Pearson Education Asia
2.	Manufacturing Process-I	Dr. K. Radhakrishna	2006, 5th Edition	Sapna Book House

Reference Books:

1.	Manufacturing and Technology: Foundry, Forming and Welding	P. N. Rao	2013, 2nd Edition	Tata McGraw Hill
2.	Process and Materials of Manufacturing	Roy A. Lindberg	1998, 4th Edition	Prentice Hall

Web links and Video Lectures (e-resources)

1. http://efoundry.iitb.ac.in/Academy/index.jsp
2. http://nptel.ac.in/courses/112107145/
3. http://www.elcoweld.com/files/editor/downloads/elmi/AWP1.pdf
4. https://youtu.be/YtksJ12suFM
5. https://youtu.be/yPpyyABaqcw
6. https://youtu.be/MD-PDz4EQAg
7. http://nptel.ac.in/courses/112105126

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning

1. Flip Class
2. Seminar/ poster Presentation
3. Individual Role play/Team Demonstration/ Collaborative Activity
4. Case study
5. Learn by Doing

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the fundamental concepts of primary manufacturing processes such as casting, welding, and machining.	**3**	**2**	**1**								**2**		
CO2	**Identify and explain** the real-time industrial applications of special casting, welding, and machining processes.	**2**	**2**	**2**								**3**		
CO3	**Analyze** the causes and remedies of casting and welding defects using process knowledge and microstructural evaluation.	**2**	**3**	**2**	**2**									
CO4	**Evaluate** cutting parameters and tool life in metal cutting operations using appropriate theories and equations.	**3**	**3**	**2**	**2**	**2**						**3**		

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Computer Aided Machine Drawing		
Course Code: P24MEL307	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage: 50%
Teaching hours of Pedagogy:24	Exam Hours: 3	
Credits:01		

Prerequisite:

- Knowledge of 2D drawing, orthographic projections, sectional views, dimensioning, tolerances
- Basic knowledge of tools like Solid edege, and SolidWorks

Course learning Objectives:

CLO1: Empower the students with drafting skills and strengthen their ability to draw, read and interpret machine parts.
CLO2: Assemble the machine parts using computer software and implementing the standards, codes and norms.

Part A	**Hrs:16**

Section and Development of Solids: Sections of Pyramids, Prisms, Cone and Cylinder resting only on their bases. True shape of sections, Development of lateral surfaces.
Orthographic Views: Conversion of isometric views into orthographic projections of simple machine parts. (Bureau of Indian standards conventions are to be followed for the drawings).
Thread Forms and Fasteners: Thread terminology, sectional view of threads. ISO Metric (Internal and External), BSW (Internal and External), square and ACME threads. Hexagonal, squareheaded bolt and nut with washer (assembly).

Self-Study Content: Cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

Part B	**Hrs:14**

Assembly Drawings
Solids of Protrusion, Assembly drawing of following machine parts (3D parts to be created and assemble and then generating 2D drawing with required views, including part drawing).
1. Screw Jack
2. I.C. Engine Connecting Rod
3. Plummer Block
4. Machine Vice

Self-Study Content: Lever Safety Valve, Reading of Industrial drawings.

Suggested Learning Resources:

Textbooks:

1.	Machine Drawing	N.D. Bhat and V.M. Panchal	46th Edition, 2011	Charotar Publishing House
2	Machine Drawing	K.R. Gopala Krishna	Revised and enlarged edition,2017	Subhash Publication

Reference Books:

1.	Machine Drawing	N.Siddeshwar, P. Kannaiah and V.V.S. Sastri	2nd Edition ,2010	Tata Mc. Graw Hill
2	Machine Drawing	Tryambaka Murthy	2nd Edition, 2008	CBS Publications

Web links and Video Lectures (e-resources)
1. https://www.youtube.com/watch?v=-_qz8_sbhwY 2. https://www.youtube.com/watch?v=zO8coRhrJM0 3. https://www.youtube.com/watch?v=-_qz8_sbhwY 4. https://www.youtube.com/watch?v=zO8coRhrJM0 5. https://www.youtube.com/watch?v=4hhJ0OSKVYgandlist=PLQLDlNb9_TXAbUK_H4JyZnhv9MW3nhG 6. https://www.youtube.com/watch?v=boyN1l3fA6gandlist=PLQL-DlNb9_TVqG1Zrw-9F-S0LItg3T5fD 7. https://www.youtube.com/watch?v=yKl_FiUdAu4andlist=PLQL-DlNb9_TUHs8CUXYw-Lna-Gp4rTu9g

Case study
1. Identify the engineering drawings symbols using GD and T. 2. Practice of reading real Industry/Engineering Drawing. 3. Assembly drawing of fuel injector, knuckle joint, cotter joint and riveted joints. 4. Preparing Bill of Materials for mechanical system.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the concepts of engineering drawing to develop mechanical components.	**3**		**2**										
CO2	**Apply** the concepts of section of solids to analyse cut section of machine components	**3**	**3**											
CO3	**Develop** the mechanical components in 2D and 3D environment and assemble the same.			**3**										
CO4	**Create** the components of mechanical systems using modern CAD tool.			**3**		**3**						**1**	**1**	
CO5	**Communicate** effectively through sketching and drawing.										**3**			

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Material Science and Metallurgy Laboratory		
Course Code: P24MEL308	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):0-0-2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:24 Hrs.	Exam Hours: 2 Hrs.	
Credits:01		

Course learning Objectives:

To learn how to characterize and determine the basic mechanical properties and behaviours of engineering materials and to introduce variety of material testing equipment and techniques.

Course content

PART-A **08 Hrs**

Experiment-1 Rockwell Hardness test.
Experiment-2 Brinell Hardness test
Experiment-3 Vickers Hardness test.
Experiment -4 Preparation of specimen for metallographic examination

PART-B **10 Hrs**

Experiment-5 Tension test using a UTM.

Experiment-6 Izod and Charpy Impact test.

Experiment-7 Shear test using UTM

Experiment-8 Bending Test using UTM.

Experiment-9 Heat treatment: Annealing, Normalizing, Hardening and Tempering of Ferrous alloys and study their hardness.

Reference Books

1. William D. Callister and David G. Rethwisch, "**Materials Science and Engineering"** Wiley India Pvt. Ltd, 9th edition, 2014, ISBN: 978-1118319222.
2. Sidney Avner, "I**ntroduction to Physical Metallurgy"** Tata McGraw Hill EducationPrivate Ltd., 2nd edition, 1997, ISBN: 978-0074630068.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Conduct hardness, tensile, impact, shear, and bending tests on engineering materials and evaluate their mechanical properties.	**3**	**2**											
CO2	Prepare metallographic specimens and analyze microstructures to correlate with material properties.	**3**	**2**											
CO3	Apply suitable heat treatment processes to ferrous alloys and assess their influence on hardness and microstructure.	**3**	**3**											
CO4	Demonstrate proficiency in using material testing equipment, data interpretation, and technical reporting.	**3**		**2**	**2**						**3**			

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Manufacturing Process-I Laboratory		
Course Code: P24MEL309	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):0-0-2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:24 Hrs.	Exam Hours: 2 Hrs.	
Credits:01		

Course learning Objectives:

- Acquire basic knowledge about casting, welding and metal cutting theory which is relevant to manufacturing of engineering components.
- Give comprehensive insight regarding the mechanical equipment and operations involvedto fulfill various applications.

Course content

PART-A **08 Hrs**

Experiment-1 Compression, shear and permeability tests on green sand specimen.
Experiment-2 Sieve analysis to find grain fineness number of base sands.
Experiment-3 Use of foundry tools and other equipments.
Experiment -4 Preparation of moulds using two moulding boxes with and without Patterns (Split pattern,Core boxes).
Experiment -5 Production of metal component using sand casting.

PART-B

Experiment -6 Preparation of one model on lathe involving plain turning, facing, knurling and eccentricturning.
Experiment -7 External threads cutting, V-thread and square thread.
Experiment -8 Taper turning by different methods.
Experiment -9 Cutting of V-groove using a shaper.
Experiment -10 Surface grinding.

Reference Books

1. Serope Kalpakjian & StevenRSchmid, **"Manufacturing Engineering and Technolog y",** Pearson Education Asia, 7th edition, 2013, ISBN: 978-0133128741.
2. P.N.Rao, **"Manufacturing Technology: Foundry Forming and Welding"** 2nd Ed., Tata McGraw Hill, 2003.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Perform foundry sand testing and evaluate moulding properties such as strength, permeability, and grain fineness number.	**3**	**2**		**2**	**2**								
CO2	Demonstrate mould preparation, core making, and sand casting for producing simple components.	**3**	**2**		**2**	**2**								
CO3	Operate basic machine tools (lathe, shaper, grinder) and perform machining operations such as turning, threading, taper cutting, and surface finishing.	**3**	**2**		**2**	**3**								
CO4	Apply manufacturing process knowledge to correlate experimental results with theoretical concepts and prepare technical reports.	**2**			**3**	**2**					**3**			

Academic Year: 2025-26	Semester: III	Scheme: CBCS & OBE
Course Title : EMPLOYABILITY ENHANCEMENT SKILLS – III		
Course Code: **P24HSMC310B**	CIE Marks:50	CIE Weightage: 50%
Teaching hours/week (L:T:P): 0:2:0	SEE Marks:50	SEE Weightage: 50%
Teaching hours of Pedagogy:42 Hours	Exam Hours:	
Credits:01		

Course learning Objectives:

- **CL01:** Apply arithmetic techniques to solve quantitative aptitude problems
- **CL02 :** Analyze logical reasoning patterns to draw valid conclusions.
- **CL03 :** Solve complex puzzle-based reasoning problems with accuracy.
- **CL04 :** Demonstrate effective oral communication in GDs, JAMs, and public speaking.
- **CL05 :** Exhibit team collaboration, time management, and presentation skills.

Unit 1:	**Hrs:10**
Arithmetic Fundamentals Percentages, Profit & Loss, Ratios, Averages, Simplification.	
Self-Study Content: Practice daily problems.	
Unit 2:	**Hrs:10**
Logical Reasoning: Blood Relations. Directions, Coding-Decoding, Number Series, Syllogisms	
Self-Study Content: Solve puzzles.	
Unit 3:	**Hrs:6**
Puzzle-Based Reasoning Seating Arrangements (Linear, Circular), Floor Puzzles, Condition-based Puzzles	
Self-Study Content: Attempt timed sets for accuracy and strategy.	
Unit4:	**Hrs:8**
Soft Skills – Communication Group Discussion, JAM, Public Speaking, Body Language	
Self-Study Content: Practice speaking daily to boost fluency and confidence.	
Unit 5:	**Hrs:8**
Aptitude: Algebra Algebra covers expressions, exponents, factorization, linear equations, quadratic equations, roots, simplification, and problem-solving with variables and constants.	
Self-Study Content: Solve concept-based problems	

Reference Books

Title	**Author**	**Edition**	**ISBN**
Quantitative Aptitude for Competitive Examinations	R.S. Aggarwal	2021	9789352832163
A Modern Approach to Logical Reasoning	R.S. Aggarwal	2021	9789352832170
Soft Skills	Dr. K. Alex, S. Chand	2019	9789352835546

Web links and Video Lectures (e-resources)

- https://www.youtube.com/playlist?list=PL0oZLcCMn5NNMEuqRfOggRy-pQ97dgqjc
- https://www.youtube.com/watch?v=Q2PL-pnULV0

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Analyze logical case studies to draw valid conclusions. 2. Participate in puzzle-solving and reasoning hunts. 3. Practice JAM sessions and group discussions for fluency. 4. Collaborate on timed group projects and presentations.

Course Outcomes		**Program Outcomes**										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	Apply arithmetic techniques to solve quantitative aptitude problems.	3	3		2	1					1	1
CO2	Analyze logical reasoning patterns to draw valid conclusions.	2	3	2	2						1	
CO3	Solve complex puzzle-based reasoning problems with accuracy.	2	3	3	3	3				1	1	
CO4	Demonstrate effective oral communication in GDs, JAMs, and public speaking									2	3	1
CO5	Exhibit team collaboration, time management, and presentation skills.									3	2	3

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: National Service Scheme		
Course Code: P24NSS311	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

CO1: Analyze Indian agriculture and organic farming: Assess historical and current trends in Indian agriculture, focusing on organic farming's potential for sustainability and market access.

CO2: Design waste management systems: Apply the 5 R's to design and evaluate waste management solutions considering technical, economic, and environmental factors.

CO3: Develop women's empowerment strategies: Create plans for information-sharing platforms to address women's social and economic needs and promote community participation.

CO4: Apply engineering to sustainable development: Integrate engineering knowledge to develop practical solutions for organic farming, waste management, and community development.

CO5: Evaluate sustainable development impacts: Assess the social, economic, and environmental impacts of sustainable development initiatives.

Course Description: This course explores critical aspects of sustainable development, focusing on organic farming practices, effective waste management strategies, and initiatives for empowering women in social and economic spheres. It emphasizes practical application, problem-solving, and community engagement.

Course Content:

- Organic farming and its role in Indian agriculture (historical context, current practices, and future trends). Emphasis on connectivity for marketing organic produce.
- Waste management strategies across public, private, and governmental organizations, with a focus on the 5 R's (Reduce, Reuse, Recycle, Recover, Refuse).
- Establishing information-sharing platforms for women to address social and economic challenges.

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Yoga		
Course Code: P24YOG311	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

CO1: Understand Yoga's principles and philosophy: Explain the meaning, history, schools, aims, and importance of prayer in Yoga.

CO2: Perform basic Yoga practices safely: Execute Suryanamaskar and selected Asanas with proper technique, breathing, and safety awareness.

CO3: Analyze Yoga's benefits and contraindications: Explain the physiological and Psychological benefits and identify contraindications and precautions for various practices.

CO4: Apply Yoga for stress management and well-being: Integrate Yoga into daily life for Stress reduction, focus enhancement, and improved well-being.

CO5: Evaluate Yoga misconceptions: Identify and debunk common myths, promoting a Scientifically informed understanding of Yoga.

Course Description: This course introduces students to the fundamental principles and practices of Yoga, emphasizing its holistic benefits for physical, mental, and emotional well-being. It explores the philosophical underpinnings of Yoga, various techniques, and their practical application in daily life. The course also addresses common misconceptions and provides guidelines for safe and effective practice.

Course Content:

- **Introduction to Yoga:**
  - Meaning and Definitions of Yoga
  - Historical Overview and Different Schools of Yoga (e.g., Hatha, Raja, Karma, Bhakti)
  - Aim and Objectives of Yoga: Physical health, mental clarity, spiritual growth, stress management.
  - Importance of Prayer and its role in Yoga
- **Yogic Practices for Common Man:**
  - Brief introduction to various yogic practices suitable for beginners.
  - Focus on promoting positive health and stress reduction.
- **Rules and Regulations for Yogic Practices:**
  - Guidelines for safe practice (e.g., appropriate time, place, clothing, empty stomach).
  - Contraindications and precautions for specific conditions.
- **Misconceptions of Yoga:**
  - Addressing common myths and misunderstandings about Yoga.
  - Clarifying the scientific basis of Yoga's benefits.
- **Suryanamaskar (Sun Salutation):**
  - Suryanamaskar prayer and its meaning.
  - Need, importance, and benefits of Suryanamaskar.

- Detailed breakdown of the 12 counts with proper breathing and movement coordination.
- Practice of 2 rounds.

- **Asanas (Postures):**
  - Meaning and importance of Asanas.
  - Detailed study of the following Asanas:
    - **Sitting:** Padmasana (Lotus Pose), Vajrasana (Thunderbolt Pose)
    - **Standing:** Vrikshasana (Tree Pose), Trikonasana (Triangle Pose)
    - **Prone:** Bhujangasana (Cobra Pose), Shalabhasana (Locust Pose)
    - **Supine:** Utthitadvipadasana (Raised Two-Legged Pose), Ardha Halasana (Half Plough Pose)
  - For each Asana:
    - Meaning of the name.
    - Step-by-step technique.
    - Breathing pattern.
    - Benefits.
    - Precautionary measures and contraindications.

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: Physical Education		
Course Code: P24PED311	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes: At the end of the course, the student will be able to

1. Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Create a foundation for the professionals in Physical Education and Sports
4. Participate in the competition at regional/state / national / international levels.
5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.
6. Understand and practice of Traditional Games

Module I: Orientation 4 Hours

1. Lifestyle
2. Health & Wellness \
3. Pre-Fitness test.

Module II: General Fitness & Components of Fitness 4 Hours

1. Warming up (Free Hand exercises)
2. Strength – Push-up / Pull-ups
3. Speed – 30 Mtr Dash

Module III: Specific games (Any one to be selected by the student) 16 Hours

1. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.
2. Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: **BASIC ENGINEERING MATHEMATICS–I**		
Course Code: **P24MADIP301**	CIE Marks: **100**	CIE Weightage:100
Teaching hours/week (L:T:P:S) **04 (L:2, T:2)**	SEE Marks: --	SEE Weightage:--
Teaching hours of Pedagogy: 40	Exam Hours: 00	
Credits: 0		
Prerequisite:		
Basic Mathematics		
Course learning Objectives:		
CLO1: To provide basic concepts of complex trigonometry, vector algebra, differential & integral calculus, vector differentiation and various methods of solving first order differential equations.		
Unit 1		**Hrs: 8**
Complex Trigonometry: Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof). **Vector Algebra:** Scalar and vectors. Vectors addition and subtraction. Multiplication of vectors (Dot and Cross products). Scalar and vector triple products-simple problems		
Self-Study Content: De-Moivre's theorem (without proof). Roots of complex number - Simple problems.		
Unit 2		**Hrs: 8**
Differential Calculus: Polar curves –angle between the radius vector and the tangent pedal equation-Problems. Taylors series and Maclaurin's series expansions- Illustrative examples. **Partial Differentiation:** Elementary problems. Euler's theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function.		
Self-Study Content: Review of successive differentiation. Formulae for n^{th} derivatives of standard functions- Liebnitz's theorem (without proof). Application to Jacobians, errors & approximations.		
Unit 3		**Hrs: 8**
Integral Calculus: reduction formulae for for $\sin^n x$, $\cos^n x$ and $\sin^m x \cos^n x$ and evaluation of these with standard limits-Examples. Applications of integration to area, length of a given curve, volume and surface area of solids of revolution.		
Self-Study Content: Differentiation under integral sign (Integrals with constants limits)-Simple problems		
Unit4		**Hrs: 8**
Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only).		
Self-study components: Solenoidal and irrotational vector fields-Problems.		
Unit 5		**Hrs: 8**
Ordinary differential equations (ODE's): Introduction-solutions of first order and first-degree differential equations: homogeneous, exact, linear differential equations of order one and equations reducible to above types.		

Self-Study Content: Applications of first order and first-degree ODE's - Orthogonal trajectories of Cartesian and polar curves. Newton's law of cooling, R-L circuits- Simple illustrative examples from engineering field.

Suggested Learning Resources:

Textbooks:

	Title	Author	Year & Edition **(Latest)**	Publisher
1.	Higher Engineering Mathematics	B. S. Grewal	44th Edition 2018	Khanna Publishers, New Delhi

Reference Books:

1.	Advanced Engineering Mathematics	E. Kreyszig	10th Ed., 2015	John Wiley & Sons
2.	Engineering Mathematics	N. P. Bali and Manish Goyal	7th Ed., 2007	Laxmi Publishers

Course Out comes: After completing the course,the students will be able to

CO1	Demonstrate the fundamental concepts–in complex numbers and vector algebra to analyze the problems arising in related area of engineering field.
CO2	Identify–partial derivatives to calculate rate of change of multivariate functions
CO3	Apply-the acquired knowledge of integration and differentiation to evaluate double and triple integrals to compute length surface area and volume of solids of revolution and identify velocity, acceleration of a particle moving in a space
CO4	Find analytical solutions by solving first order ODE's which arising in different branches of engineering.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2										
CO2	2	3										
CO3	3	2										
CO4	2	3										

Strength of correlation: Low-1, Medium-2, High-3

Academic Year: 2025-26	Semester: III	Scheme: P24
Course Title: **Additional Communicative English – I**		
Course Code: P24HDIP310	CIE Marks: 100	CIE Weightage:100%
Teaching hours/week (L:T:P): 0:2:0	SEE Marks: -	SEE Weightage: -
Teaching hours of Pedagogy: 30 Hours	Exam Hours: 3 Hrs	
Credits: 00		

Module-1

Introduction to Communication Skills **6 Hours**

Introduction to communication, Meaning and process, Channels of communication, Elements of communication, Barriers to effective communication. Activities - Making introductions, Sharing personal information, Describing feelings and opinions.

Module-2

Listening Skills I **4 Hours**

Hearing vs. Listening, Types of listening, Determinants of good listening, Active listening process, Barriers to listening, Activities - Listening for pronunciation practice, Listening for personal communication, Listening for communication - language functions

Module-3

Speaking Skills I **6 Hours**

Basics of speaking, Elements and Functions of speaking, Structuring your speech, Focusing on fluency, Homographs and Signpost words. Activities – Free Speech and Pick and Speak

Module-4

Reading Skills I **4 Hours**

Developing reading as a habit, Building confidence in reading, improving reading skills, Techniques of reading - skimming and scanning. Activities - understanding students' attitudes towards reading, countering common errors in reading, developing efficiency in reading.

Writing Skills I **4 Hours**

Improving writing skills, Spellings and punctuation, Letter and Paragraph writing. Activity – Writing your personal story

Module-5

Body Language and Presentation Skills **6 Hours**

Elements of body language, Types, Adapting positive body language, Cultural differences in body language. 4 Ps in presentations, Overcoming the fear of public speaking, Effective use of verbal and nonverbal presentation techniques. Activity – Group presentations

Course Outcomes: On completion of this course, students will be able to,

CO 1: Understand the role of communication in personal and professional success

CO 2: Comprehend the types of technical literature to develop the competency of students to Apprehend the nature of formal communication requirements.

CO 3: Construct grammatically correct sentences to strengthen essential skills in speaking & writing and to develop critical thinking by emphasizing cohesion and coherence

CO 4: Demonstrate effective individual and teamwork to accomplish communication goals.

Textbooks and Reference Books:

1. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2015.

2. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
3. Developing Communication Skills by Krishna Mohan& Meera Banerjee (Macmillan)
4. The Oxford Guide to Writing and Speaking, John Seely, Oxford.
5. English Language Communication Skills - Lab Manual cum Workbook by Rajesh Kumar Singh, Cengage learning India Pvt Limited – 2018

CO – PO – PSO Matrix

CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2	PS O3
CO1				3	1			2						
CO2				3	1				1					
CO3				3					2	1				
CO4				2				3			1			

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: APPLIED MATHEMATICAL METHODS		
Course Code: **P24MA401A**	CIE Marks: **50**	CIE Weightage: **50**
Teaching hours/week (L:T:P) 02:02:00	SEE Marks: **50**	SEE Weightage: **50**
Teaching hours of Pedagogy: 40	Exam Hours: 03	
Credits: 03		
Prerequisite:		
Basic algebra		
Course learning Objectives:		
CLO1: **Familiarize** the importance of calculus of complex functions associated in dual plane, best fit curves and regression lines, random variables and probability distributions, solutions of ordinary differential equations by using power series. CLO2: **Apply** C-R equations to find analytic, potential, stream functions, evaluate complex integrals, properties of regression lines, probability functions to analyse distributions, solve differential equations by power series method.		
Unit 1: Calculus of complex functions		**Hrs: 08**
Introduction to complex variables. Definitions- limit, continuity, differentiability and Analytic functions of x: Cauchy- Riemann equations in Cartesian and polar forms (no proof)-Harmonic function and Problems. Construction of analytic functions when $u\ or\ v$ is given- Milne-Thomson method, Applications to flow problems. Conformal transformations: Introduction. Discussion of transformations for $w = z^2, w = z + \frac{1}{z};\ z \neq 0$.		
Self-Study Content: Derivation of Cauchy – Riemann equation in Cartesian and polar form. Discussion of transformations for $w = e^z$.		
Unit 2: Complex integration		**Hrs: 08**
Bilinear Transformations-Problems, line integrals of complex function. Cauchy's theorem (Statement), Cauchy's integral formula. Taylor's and Laurent's series (Statements only) - illustrative examples. Singularities, poles and residues with examples, Cauchy's Residues Theorem (statement only & Problems) - Illustrative examples.		
Self-Study Content: Contour integration Type-I & Type-II problems		
Unit 3: Statistical Methods		**Hrs: 08**
Brief review of measures of central tendency and dispersion. Moments, skewness and kurtosis. Curve Fitting: Curve fitting by the method of least squares, fitting the curves of the forms $y = ax + b,\ y = ab^x$ and $y = ax^2 + bx + c$. **Correlation and regression**: Karl Pearson's coefficient of correlation and rank correlation- problems, Regression analysis, lines of regression and problems.		
Self-Study Content: Fit a curve of the form $y = ax^b,\ y = ae^{bx}$. Curve Fitting Using the Curve Fitting App in MATLAB, Pearson's Correlation Coefficient in MATLAB and Regression Analysis in MATLAB		

Unit4: Probability and Distribution	Hrs: 08
Random variables and Probability Distributions: Review of random variables. Discrete and continuous random variables- problems. Binomial, Poisson, Exponential, and Normal distributions (with usual notation of mean and variance) – problems. **Joint Probability Distributions:** Introduction, Joint probability and Joint distribution of discrete random variables and continuous random variables.	
Self-Study Content: Geometric and Gamma distributions – problems. Geometric and Gamma distributions – problems. Normal Distribution and Binomial Distribution and Probability Distributions using MATLAB.	
Unit 5: Special functions	**Hrs: 08**
Power series solution of a second order ODE, Series solution-Frobenius method. Series solution of Bessel's differential equation leading to $J_n(x)$. Expansions for $J_{\frac{1}{2}}(x)$, $J_{-\frac{1}{2}}(x)$,$J_{\frac{3}{2}}(x)$ and $J_{-\frac{3}{2}}(x)$. Series solutions of Legendre's differential equation leading to $P_n(x)$. Rodrigue's formula, Legendre's polynomials - simple illustrative examples.	
Self-Study Content: Basics of Series solutions of ODE's; analytic, singular point and basic recurrence relations.	

Suggested Learning Resources:

Textbooks:

	Title	Author	Year & Edition **(Latest)**	Publisher
1.	Higher Engineering Mathematics	B. S. Grewal	44th Edition2018	Khanna Publishers, New Delhi
2.	Advanced Engineering Mathematics	E. Kreysizig,	10th Ed. (Reprint) 2016.	John Wiley and sons

Reference Books:

1.	Higher Engineering Mathematics	B. V. Ramana	11th Ed	McGraw–Hill Education
2.	Advanced Engineering Mathematics	H. C. Taneja	Volume I & II	I. K. International Publishing House Pvt. Ltd., New Delhi
3.	A text book of Engineering Mathematics	N. P. Bali and Manish Goyal,	Reprint,2010	Laxmi Publications

Web links and Video Lectures (e-resources)
1. Integrating complex functions MATLAB 2. How to Perform Curve Fitting Using the Curve Fitting App in MATLAB 3. Matlab | Pearson's Correlation Coefficient - YouTube 4. Regression Analysis in MATLAB - YouTube 5. Normal Distribution and Binomial Distribution MATLAB Code | binopdf normcdf Mean Variance 6. MATLAB Tutorial 25 Working with Probability Distributions

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Flip Class 2. Seminar/ poster Presentation 3. Individual Role play/Team Demonstration/ Collaborative Activity 4. Case study 5. Learn by Doing

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Understand fundamental concepts in calculus of complex functions, statistics, probability and special functions.
CO2: Apply tools taught to analyze transformations arising in engineering field and evaluate complex integrals and draw statistical inferences.
CO3: Analyze problems in engineering field by employing special functions, complex functions and statistical methods.
CO4: Evaluate integrals of complex functions, regression and correlation coefficient, probability of a discrete and continuous variable, series solution of special differential equations.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2										
CO2	2	3										
CO3	3	2										
CO4	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

|Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Process and Testing of Advanced Materials		
Course Code: P24ME402	CIE Marks:50	CIE Weightage:50
Teaching hours/week (L:T:P) 2:2:0	SEE Marks:100	SEE Weightage:50
Teaching hours of Pedagogy:40	Exam Hours: 3hrs.	
Credits: 03		

Prerequisite:

- Basic knowledge of Engineering Physics and Chemistry, particularly atomic structure and bonding.

Course learning Objectives:

CLO1: To understand the synthesis, structure, and application of advanced materials like nanomaterials, superalloys, and cryogenic steels.
CLO2: To comprehend the behavior, fabrication methods, and applications of shape memory alloys and bio-composites.
CLO3: To acquire knowledge on superfinishing techniques of honing, lapping, and their role in achieving superior surface quality.
CLO4: To understand the principles, process and applications of various NDT techniques.
CLO5: To apply knowledge of surface NDT methods such as Liquid Penetrant and Magnetic Particle Testing in identifying surface and subsurface defects.

Unit 1:	**Hrs:8**

Nano-materials: Introduction processes to prepare nano-materials, uses, future prospects, nano electromechanical systems, applications of CNT. **Super-alloys**: Nickel alloys, types of super-alloys, heat-resisting alloys, hastelloy, nickel–molybdenum steel alloy, cryogenic steels (or extremely low temperature purpose alloys), Ni-based cryogenic steels.

Self-Study Content: Biomedical Materials and applications.

Unit 2:	**Hrs:8**

Shape Memory Alloys: Introduction, concept, shape memory effect (SME), material systems of different shape memory alloys, preparation of SMA, applications. **Biocomposite Materials**: Biodegradable plant fibre-reinforced composite, advantages, disadvantages, applications, and different types of plant fibres for green composite.

Self-Study Content: Custom sandwich composite for paddle surfboard.

Unit 3:	**Hrs:8**

Super Finishing: Principle, machines, tools, and abrasives employed for achieving high-quality surface finishes. **Honing Process:** Introduction, factors which affect the honing process, principles, lay pattern, flexible and rigid honing, advantages, limitations and applications. **Lapping Process:** Components, material removal mechanism for brittle material, various types, cylindrical lapping, thread lapping, lap plates.

Self-Study Content: surface texturing through abrasive blasting.

Unit4:	**Hrs:8**

Overview of NDT: NDT versus Mechanical testing, overview of the non-destructive testing methods for the detection of manufacturing defects and material characterisation, relative merits and limitations, various physical characteristics of materials and their applications in NDT.
Visual inspection – Unaided and aided procedure, methods and applications of visual inspection.

Self-Study Content: Comparison of destructive and non-destructive testing methods with industrial

examples.	
Unit 5:	**Hrs:8**
Surface NDT Methods: Liquid Penetrant Testing – principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, testing procedure, interpretation of results. advantages and limitations of various methods. **Magnetic particle inspection (MPI)** - Theory of magnetism, inspection materials, magnetization methods, interpretation and evaluation of test indications, principles and methods of demagnetization, residual magnetism.	
Self-Study Content: Advantages and limitations of advantages and limitations of various methods.	

Web links and Video Lectures (e-resources)
1. https://archive.nptel.ac.in/courses/112/103/112103250/ 2. Theory and Practice of Non-Destructive Testing by IIT Madras – NPTEL(RanjitBauri) 3.https://testbook.com/mechanical-engineering/honing-process-steps-and-types 4.https://voliro.com/blog/non-destructive-testing/
Active Based Learning (Suggested Activity in Class)/ Practical Based Learning.
1. Flip Class 2. Seminar/ poster Presentation 3. Individual Role play/Team Demonstration/ Collaborative Activity 4. Case study 5. Learn by Doing

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Apply the fundamental knowledge of advanced materials like nanomaterials, superalloys, and cryogenic steels in engineering applications.	3	2	2	1	1							1	
CO2	Understand and evaluate the properties, preparation methods, and industrial applications of shape memory alloys and biocomposites.	3	2	2	1	1				1				1
CO3	Analyze surface finishing processes such as honing, lapping, and their role in improving material performance and quality.	3	3	3	2	2							1	
CO4	Assess and select appropriate non-destructive testing (NDT) methods for detecting material defects and ensuring structural integrity.	3	3	2	3	3			1	1	1			1

Suggested Learning Resources:

Textbooks:

Sl. No.	Title	Author	Year & Edition	Publisher
1	Practical Non-Destructive Testing	Baldev Raj, T. Jayakumar, M. Thavasimuthu	2009	Narosa Publishing House
2	Non-Destructive Testing Techniques	Ravi Prakash	1st Revised Edition, 2010	New Age International Publishers
3	Principles of Abrasive Processing	M. C. Shaw	1996	Oxford University Press
4	Micromanufacturing Processes	V. K. Jain	2012	CRC Press
5	Nanofinishing Science and Technology: Basic and Advanced Finishing and Polishing Processes	V. K. Jain	2016	CRC Press

Reference Books:

Sl. No.	Title	Author	Year & Edition	Publisher
1	ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", Volume-17	ASM International	2000	American Society of Metals, Ohio
2	Introduction to Non-destructive Testing: A Training Guide	Paul E. Mix	2nd Edition, 2005	Wiley, New Jersey
3	Handbook of Non-destructive Evaluation	Charles J. Hellier	2001	McGraw Hill, New York
4	Advanced Methods of Machining	J. A. McGeough	1988	Springer Science & Business Media
5	Introduction to Machining Science	G. K. Lal	2007	New Age International Publishers
6	Manufacturing Science	A. Ghosh and A. K. Malik	2010	East West Press

Course Title: Applied Thermodynamics		
Course Code: P24ME403	CIE Marks: 50	CIE Weightage: 50%
Teaching hours/week (L:T:P): 2:2:0	SEE Marks: 50	SEE Weightage: 50%
Teaching hours of Pedagogy:40	Exam Hours: 03 Hours	
Credits: 03		

Prerequisite:

A solid understanding of basic thermodynamics, engineering physics, and mathematics is essential. Familiarity with fluid mechanics is also recommended.

Course learning Objectives: The objectives of this course are to

CLO1: Demonstrate an understanding of thermodynamic principles by analyzing air standard and vapor power cycles.
CLO2: Evaluate the performance characteristics of air standard and vapor power cycles using appropriate thermodynamic methods.
CLO3: Describe the operational principles of mechanical systems such as compressors, refrigeration units, and internal combustion engines.
CLO4: Analyze and compute performance metrics for compressors, refrigeration systems, and internal combustion engines.

Unit 1:	**Hrs: 9**

Air Standard Cycles: Otto cycle and Diesel cycle: P-V and T-S diagrams, description and efficiencies. Comparison of Otto and Diesel cycles. Brayton cycle for gas turbine power plants. Deviations of practical gas turbine cycles from ideal cycles. Numerical Problems.
Case Study: Performance enhancement of a gas turbine power plant using inter-cooling, reheating and regeneration in a Brayton cycle.

Self-Study Content: Ideal cycles for jet propulsion, turbo jet cycle, turbo jet, ram jet and turbo prop engines.

Unit 2:	**Hrs: 9**

Vapour Power Cycles: Carnot vapour power cycle and its performance. Simple Rankine cycle: description, T-S diagram and expression for efficiency. Deviation of simple Rankine cycle from Ideal cycles. Reheat Cycle, Ideal regenerative cycle and practical regenerative cycles with open and closed type feed water heaters, Numerical Problems.
Case Study 1*:* Comparative analysis of Carnot and Rankine cycles for steam power generation: Feasibility, efficiency, and practical constraints.
Case Study 2*:* Influence of key operating parameters (boiler pressure, condenser pressure, and superheating) on the efficiency and performance of a simple Rankine cycle.

Self-Study Content: P-V and T-S diagrams, description of Dual cycle, Sterling cycle, Atkinson cycle.

Unit 3:	**Hrs: 7**

Reciprocating Air Compressors: Working of single stage reciprocating air compressors, Work input using P-V diagram and steady flow analysis. Effect of clearance volume on volumetric efficiency, isothermal and mechanical efficiencies. Multistage compression, advantages of multistage compression.
Case Study*:* Derivation and application of optimum intermediate pressure in multistage reciprocating air compressors under perfect and imperfect inter cooling conditions. Numerical Problems.

Self-Study Content: Brief explanation of rotary compressors, fans and blowers.

Unit4:	**Hrs: 8**

Refrigeration: Introduction, Units of refrigeration and COP, Refrigerants and Properties of good refrigerants, refrigerating effect, capacity, power required to drive the compressor. **Psychrometry:** Psychrometric properties, relations, processes, chart, summer and winter air conditioning systems, numerical problems.

Case Study: Impact of sub-cooling and superheating on the performance of a vapor compression refrigeration system.

Self-Study Content: Vapor absorption refrigeration system and steam jet refrigeration.

Unit 5: **Hrs: 7**

Testing of I.C. Engines: Testing of SI and CI engines. Performance factors, basic testing factors and basic measurements for engine performance. Indicated power, friction power: Willian's line method, Morse test and motoring test. Brake power: principle of mechanical, hydraulic and eddy current dynamometers.

Case Study 1: Volumetric method for measuring fuel consumption in internal combustion engine testing: Procedure.

Case Study 2: Preparation and analysis of a heat balance sheet for an I.C. engine: Interpretation of energy distribution and system efficiency.

Self-Study Content: Combustion in I C engines, delay period and factors affecting delay period. Diesel knock and methods of controlling diesel knock.

Suggested Learning Resources:

Textbooks:

Sl. No	Title	Author	Year & Edition (Latest)	Publisher
1	Basic and Applied Thermodynamics	P.K.Nag	2nd Edition 2009 ISBN: 9780070151314	Tata McGraw Hill
2	Thermodynamics: An engineering approach	Yunus A. Çengel Michael A. Boles	6th edition, 2007 ISBN: 9780073305370	Tata McGraw Hill
3	Thermal Engineering	Mahesh.M.Rathore	1st Edition, 2010 ISBN: 9780070681132	Tata McGraw Hill
Reference Books:				
1	Fundamentals of Classical Thermodynamics	Gordon. J. Van Wylen	3rd edition, 1988, ISBN: 9780471610762	John Wiley and Sons Canada, Limited
2	Engineering Thermodynamics	D. B. Spalding and E. H. Cole	3rd edition, ISBN: 9780713132991	Arnold 1973
3	Engineering Thermodynamics	R. K. Rajput	4th Edition, ISBN: 9788131800584	Laxmi Publications
4	A course in Thermal Engineering	S Domkundwar,C.P. Kothandaraman and V.Domkundwar	2004, ISBN: 9788177000214	DhanpatRai and Co

5	Internal Combustion Engines	M.L.Mathur and R.P.Sharma	2010, ISBN: 9788189928469	DhanpatRai& Co
6	Internal Combustion Engines	V. Ganesan	4th edition, 2012, ISBN: 9781259006197	Tata McGraw Hill

Web links and Video Lectures (e-resources)

1. https://www.youtube.com/watch?v=LUZrZJJ7zNQ
2. https://www.youtube.com/watch?v=lhilSmE2Ee0&list=PL6Qggk0O9yRItYPKm51jEnZoMmSOM4XA&index=2
3. https://www.youtube.com/watch?v=V3Cc_TkJh6Q&list=PL6Qggk0O9yRItYPKm51jEnZoMmSOM4XA&index=3

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning(Example)

1. Flip Class
2. Seminar/ poster Presentation
3. Individual Role play/Team Demonstration/ Collaborative Activity
4. Case study
5. Learn by Doing
6. Mini Project

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** the knowledge of thermodynamics to describe the different thermodynamic cycles.	3	2		2								2	
CO2	**Apply** the basic principles of thermodynamics to describe the working of mechanical systems involving various power producing and power absorbing machines.	3	2		2								2	
CO3	**Analyze** the performance of air standard cycles and vapor power cycles.	2	3		2									2
CO4	**Analyze** the performance parameters of air compressors, refrigerators and I C engines	2	3		2									2

Academic Year: 2025-26	Semester: IV	Scheme: P24

Course Title: Mechanics of Materials		
Course Code: P24ME404	CIE Marks:50	CIE Weightage:50
Teaching hours/week (L:T:P): 2:2:0	SEE Marks:100	SEE Weightage:50
Teaching hours of Pedagogy:40	Exam Hours:3	
Credits:03		

Prerequisite:

- Fundamentals of Engineering Mechanics are required to understand forces, moments, equilibrium, types of supports, and free body diagrams essential for the study of *Mechanics of Materials*.
- Basic Material Science knowledge is necessary to grasp material properties like elasticity, plasticity, and stress-strain behavior, which are fundamental to *Mechanics of Materials*.
- Applied Mathematics and Physics skills are needed to solve problems involving force, deformation, and energy calculations in the subject of *Mechanics of Materials*.

Course learning Objectives:

CLO1: Understand the fundamental concepts of stress, strain, elastic constants, and their application to bars of uniform and varying cross-sections.

CLO2: Learn the methods to analyze shear forces and bending moments in beams under various loading and support conditions.

CLO3: Understand the theory of simple bending, shear stress distribution, and their application in beams of different cross-sections.

CLO4: Gain knowledge of torsional behavior of shafts, analyze torque transmission, and understand the stability of columns using classical theories.

CLO5: Develop the ability to apply energy methods and graphical techniques like Mohr's circle for solving complex stress-strain problems in two dimensions.

Unit 1:	**Hrs: 8**

Simple stresses and strains: Stress, types, Saint Venant's principle, stress-strain curve for mild steel, working stress, proof stress, factor of safety, Hooke's law, modulus of elasticity, strain energy, proof resilience, longitudinal strain, lateral strain, poison's ratio, stress strain analysis of bars of uniform cross section, stepped bars, volumetric strain, volumetric strain of a cylindrical bar, principle of superposition. Modulus of rigidity, bulk modulus, relation among elastic constants.

Self-Study Content: circular bar with continuously varying section

Unit 2:	**Hrs: 8**

Compound bars: Stress analysis of composite bars. Thermal stresses in uniform and compound bars**.** **Compound stresses**: Principal planes and stresses, plane of maximum shear stress in general 2D system. Mohr's circle diagram (2D).

Self-Study Content: Strain on inclined plane due to normal stress in X and Y directions.

Unit 3:	**Hrs: 8**

Shear force and Bending Moment Diagrams (SFD and BMD): Types of beams, loads and supports, shear force and bending moment, sign conventions, point of contraflexure, and relationship between load intensity, shear force and bending moment. SFD and BMD for different beams subjected to concentrated loads, uniformly distributed load and uniformly varying load.

Self-Study Content: Applications of beams.

Unit4:	**Hrs:8**

Bending and shear stresses in Beams: Theory of simple bending, assumptions in simple bending, relationship between bending stresses and radius of curvature, relationship between bending moment and radius of curvature, section modulus. Bending stresses in beams of uniform section. Shearing stresses in beams, shear stress across rectangular, I and T sections. (Moment of Inertia to be provided for numerical problems). Strain energy: load applied gradually, suddenly and load with impact.
Self-Study Content: Macaulay's method for simply supported beam.
Unit 5: **Hrs:8**
Torsional stresses: Introduction to torsion, pure torsion, assumptions, derivation of torsional equation, polar modulus, torsional rigidity and torque transmitted by solid and hollow circular shafts. Shafts in series and parallel. **Columns:** Introduction to Columns, Euler theory for axially loaded elastic long columns, Euler equation for columns with Both ends hinged and Both ends fixed, Limitations of Euler's theory, Rankine's formula.
Self-Study Content: Euler equation for one end fixed and other end is free, and one end fixed and the other end is hinged.

Suggested Learning Resources:

Textbooks:

Sl.No.	Title	Author	Year & Edition **(Latest)**	Publisher
1	Strength of Materials	S. S. Bhavikatti	4th Edition, 2013	Vikas Publication House-Pvt Ltd
2	Strength of Materials	S. S. Rattan	3rd Edition,2017	Tata McGraw-Hill, New Delhi

Reference Books:

1.	Mechanics of Materials	James M. Gere, Stephen P. Timoshenko	2nd Edition, 1984	CBS Publishers and Distributers Delhi.
2	Strength of Materials	Dr. R. K. Bansal	6th Edition, 2023	Laxmi Publication, New Delhi
3	Mechanics of Materials	Dr. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain	Revised,2017	Laxmi Publications, New Delhi. 2002

Web links and Video Lectures (e-resources)
1.https://archive.nptel.ac.in/courses/105/106/105106172/
2.https://www.youtube.com/watch?v=coRgpxG2pyY
3.https://www.youtube.com/watch?v=RkS8DjzvEvM.
4. https://www.youtube.com/watch?v=CnONQoxubLw&ab_channel=nptelhrd
5.https://www.youtube.com/watch?v=wJWt0dcgafs&ab_channel=nptelhrd
Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)

1. Perform mechanical tests (tension and impact) and interpret real-time experimental data through group discussions.
2. Seminar/ poster Presentation
3. Construct the model that demonstrates different beams and loads.
4. Construct the model that demonstrates different columns with end conditions.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Understand** the concepts of stress, strain, elastic constants, and analyze bars of uniform, stepped cross-sections under axial loading.	3	2											
CO2	**Analyze** stresses in compound bars, determine thermal stresses, and evaluate principal stresses and maximum shear stresses using Mohr's circle in two-dimensional stress systems.		3	1										
CO3	**Construct** shear force and bending moment diagrams for beams subjected to different types of loads and support conditions.	1	2											
CO4	**Analyze** and calculate bending and shear stresses in beams using the theory of simple bending and shear stress distribution across rectangular, I, and T sections.		3	1										
CO5	**Apply** torsion theory to solid and hollow shafts, evaluate torque transmission, **analyze** columns for buckling using Euler's and Rankine's formulas, and apply strain energy methods under different loading conditions.	3	2											

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Mechanical Measurements and Metrology		
Course Code: P24ME405	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 2:2:0	SEE Marks:100	SEE Weightage:50%
Teaching hours of Pedagogy: 40	Exam Hours: 3Hrs	
Credits:03		

Prerequisite:

- Knowledge of basic Mathematics (algebra, geometry), and basic physics (especially mechanics and electricity) for calculations and understanding measurement principles.
- Understanding of basic Mechanical concepts like force, materials, and common manufacturing processes (machining, casting, etc.) for applying measurement techniques.

Course learning Objectives:

CLO1: The basic concepts of measurement and metrology, and strengthening their knowledge about advancements in system of limits, fits, tolerances and gauging of mechanical elements.
CLO2: The various measuring equipment's and use of this in industry for quality inspection.
CLO3: Develop the ability to calibrate and operate precision measuring instruments, and perform measurements for surface roughness, alignment, and screw thread parameters in practical settings.

Unit 1:	**Hrs:8**

Basic Concepts of Measurement and Metrology: Definition and significance of measurement, Generalized measurement system, Performance characteristics of measuring instruments (Only static characteristics), Inaccuracy of Measurements, Definition and objectives of metrology. Standards, Line and end standard, Wave length standard, Transfer from line to end standard. Slip gauges, Wringing phenomena, Numerical problems on building of slip gauges and calibration of end bars.

Self-Study Content: Imperial standard yard and International Prototype meter

Unit 2:	**Hrs:8**

System of Limits, Fits, Tolerances and Gauging: Definition of tolerance, specification in assembly, Principle of interchangeability and selective assembly. Concept of limits of size and tolerances, Compound tolerances, accumulation of tolerances. Definition of fits, types of fits. Hole basis system and shaft basis system, Geometric dimensioning and tolerancing. Classification of gauges, Basic concept of design of gauges (Taylor's principles), wear allowance on gauges. Types of gauges -plain plug gauge, ring gauge, snap gauge, gauge materials, numerical problems on gauge design.

Self-Study Content: Limit gauges for tapers.

Unit 3:	**Hrs:8**

Comparators: Characteristics and classification of comparators. Mechanical comparators- Johnson Mikrokator, Sigma Comparators, Optical Comparators -principles, Zeiss ultra-optimeter, Electric and Electronic Comparators, LVDT, Pneumatic Comparators, Solex Comparator. Back Pressure gauges, **Surface Roughness and Metrology of Screw Thread:** Surface roughness terminology, Methods of measuring surface roughness, Taylor-Hobson Talysurf, Analysis of surface traces, Measurement of basic elements of thread.

Self-Study Content: Measurements of alignment using Autocollimator

Unit4:	Hrs:8
Transducers: Introduction, Transfer efficiency, classification of transducers. Mechanical Transducers: diaphragms, bellows. Electrical transducers: sliding contact resistive type, capacitive transducer, Piezo-Electric transducer. **Signal Conditioning:** Inherent problems in Mechanical systems, Electrical intermediate modifying devices, Input circuitry-simple current sensitive circuit, Electronic amplifiers, Filters, Types of filters, telemetry.	
Self-Study Content: Applications of Transducers.	
Unit 5:	**Hrs:8**
Advanced Measurement Systems: Coordinate Measuring Machines (CMM)-Working principle of CMM, Types of CMM (Bridge, Cantilever, Gantry, Horizontal Arm), CMM Probes: Contact and Non-contact probes, Touch-trigger probes, Scanning probes. **Optical 3D Measuring Instruments**- Laser Vision Systems: Working principles, Components, Benefits and limitations of optical 3D measurements. **Strain Measurement**- Methods of strain measurement, Strain gauges, Preparation and mounting of strain gauges. **Temperature Measurement**- Thermocouple, Laws of thermocouple, Thermocouple materials.	
Self-Study Content: Pyrometers, Optical pyrometers.	

Suggested Learning Resources:

Textbooks:

SI No.	Title	Author	Year &Edition	Publisher
1.	Engineering Metrology	R. K. Jain	2004, 20th Edition	Khanna Publishers, Delhi ISBN: 9788174091536.
2.	Mechanical Measurements	Thomas G. Beckwith, RoyD. Marangoni and John H.Lienhard	2007, 6th Edition	Pearson Prentice Hall ISBN: 9780201847659

Reference Books:

1.	Engineering Metrology	I. C. Gupta	2012, 7th Edition	DhanpatRai Publications ISBN: 9788189928452.
2.	Mechanical Measurements	R. S. Sirohi and H. C. Radha Krishna	2013, Revised 3rd Edition	New Age International ISBN: 9788122403831.
3.	Measurement Systems	Doblin	2012, 6th Edition	Tata McGraw Hill ISBN: 9780070699687

Web links and Video Lectures (e-resources)

1. https://youtu.be/HpIEeBtJupY
2. https://youtu.be/-_qz8_sbhwY
3. https://youtu.be/uAntebtIgCY
4. https://youtu.be/rbk28swIiHU
5. https://youtu.be/OcbkOvjZujU
6. https://youtu.be/fbk0_nPNUTE
7. https://youtu.be/zmxjlFEcCUM
8. https://youtu.be/Hi7NUJdznc0
9. https://youtu.be/2vgkxHe_24g
10. https://youtu.be/TyM28gmhJcc

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Perform calibration and error analysis activities on different measuring instruments and present accuracy reports. 2. Conduct hands-on projects using sine bars, autocollimators, and profile projectors to measure real components. 3. Analyze surface roughness traces from Talysurf measurements and discuss surface finish implications in groups. 4. Design simple plug and ring gauges using Taylor's principles and validate fit concepts through small group competitions. 5. Set up strain gauge circuits and perform real-time strain, force, and torque measurements with live data interpretation.

Course Articulation Matrix														
Course Outcomes		**Program Outcomes**											**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
CO1	**Understand** and **apply** the basic concepts of measurement, metrology, and standards, including slip gauges and calibration techniques.	3												
CO2	**Design** and **analyze** tolerances, fits, and gauges for mechanical systems, ensuring effective assembly and product quality.	3	3											
CO3	**Apply** the principles of comparators and measure surface roughness and screw thread parameters using various measurement instruments.		3											
CO4	**Analyze** advanced measurement systems and techniques for dimensional, strain, and temperature measurements in engineering applications.			2										

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title:Manufacturing Process-II		
Course Code: P24ME406	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):2:2:0	SEE Marks:100	SEE Weightage:50%
Teaching hours of Pedagogy: 40	Exam Hours: 3Hrs	
Credits:03		

Prerequisite:

Basic understanding of Manufacturing Process-I, including material properties and conventional manufacturing techniques, is essential. Knowledge of engineering drawings and workshop practices is important for effective learning.

Course Learning Objectives:

CLO1: Understand the basic metal forming processes of forging, rolling, extrusion, drawing, sheet metal forming and powder metallurgy.

CLO2: Give complete insight regarding the mechanical equipment and operations involved to fulfill various applications.

Unit 1:	**Hrs:8**

Introduction to Metal Working: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes. Effect of parameters in metal forming process-Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, residual stresses in wrought products.

Self-Study Content: Concepts of biaxial and triaxial stresses, plane stress and plane strain.

Unit 2:	**Hrs:8**

Forging and Rolling: Classification of forging processes, forging machines and equipments, Forging die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging, advantages and disadvantages of forging. Classification of Rolling processes. Rolling mills, Defects in rolled products, Rolling variables roll camber.

Self-Study Content: Hand forging equipments and operations.

Unit 3:	**Hrs:8**

Extrusion and Drawing: Types of Extrusion, Extrusion variables, Extrusion dies. Seamless tube extrusion, Lubrication in Extrusion, Deformation of metal flow in extrusion, Defects in extruded products. Drawing equipment, Elements of drawing Die, dead zone formation, drawing variables, Tube drawing-classification of tube drawing.

Self-Study Content: Extrusion of brittle metals.

Unit4:	**Hrs:8**

Sheet Metal Forming: Sheet metal forming methods, Dies and Punches-classification of dies. Open back inclinable press, Limiting drawing ratio in drawing, Forming limit criterion, Defects in deep drawn products. High energy rate forming (HERF) - Explosive forming, electromagnetic forming, electro hydraulic forming.

Self-Study Content: Parameters affecting drawability

Unit 5:	**Hrs:8**

Powder Metallurgy: Basic steps in powder metallurgy, methods of powder production, Characteristics of metal powder. Conditioning and blending powders, Compacting metal powders, Sintering-sintering mechanism, isostatic pressing and types of isostatic pressing, finishing operations of powder metallurgy parts, advantages, disadvantages and applications of powder metallurgy.

Self-Study Content: Safety and environmental aspects of powder metallurgy.

Suggested Learning Resources:				
Textbooks:				
SI No.	**Title**	**Author**	**Year & Edition**	**Publisher**
1.	Mechanical Metallurgy	George E. Dieter	2013,3rd Edition	Tata McGraw Hill Education
2.	Manufacturing Engineering and Technology	Serope Kalpak Jain and Stevan R. Schmid	2014,4th Edition	Pearson Education
Reference Books:				
1.	Materials and Processes in manufacturing	J.T. Black, Ronald A. Kohser,	2011,11th Edition	Wiley
2.	Principles of Industrial metal working process	G. W. Rowe	2005,1st Edition,	CBS Publisher
3.	Manufacturing Science	AmitabhaGhosh and Asok Kumar Mallik	2010,2 ndEdidtion	East-West press Pvt. Ltd
4.	Theory of Plasticity and Metal Forming Processes	SadhuSingh	2003, 1st Edidtion	Khanna Publishers
Web links and Video Lectures (e-resources)				
1. http://nptel.ac.in/courses/112107145/ 2. https://youtu.be/yGKym19qxiM 3.https://youtu.be/Xf08dgnlwXg 4.https://youtu.be/9RtAis5pnq				

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning (Example)
1. Show forged or rolled parts (or images), and have students identify the defect. 2. Use a manual setup with lead wires or soft tubing to demonstrate drawing and observe dead zone formation. 3. Classify the defects and present reports on causes and preventive measures based on Forming Limit Diagram concepts. 4. Demonstrate compaction using sand in a mold and then heat it under controlled lab conditions.

Course Articulation Matrix														
Course Outcomes		**Program Outcomes**											**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
CO1	**Apply** the concept of metal forming processes, types and applications.	3												
CO2	**Apply** the knowledge of metal forming processes for production of engineering parts.	3												
CO3	**Analyse** the various process parameters in metal forming processes.		3											

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Mechanical Measurements and Metrology Laboratory		
Course Code: P24MEL407	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):0-0-2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:24 Hrs.	Exam Hours: 2 Hrs.	
Credits:01		

Course learning Objectives:

The course aims at making students familiar with different measurementequipments and use of this in industry for quality inspection and safety.

Course content

1. Calibration of measuring instruments.
2. Measurement of angle using Sine bar and Sine Centre.
3. Measurements using Profile Projector.
4. Measurements using Toolmaker's Microscope.
5. Measurement of alignment using Autocollimator.
6. Calibration of LVDT.
7. Measurements of Surface roughness using Tally surf.
8. Mechanical Comparator.
9. Measurement of Screw threads parameters using floating carriage.
10. Measurement of cutting tool forces using drill tool Dynamometer.

Reference Books

1) R. K. Jain, **"Engineering Metrology",** DhanpatRai Publications ISBN: 9788189928452.
2) I. C. Gupta, **"Engineering Metrology",** DhanpatRai Publications ISBN: 9788189928452.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Calibrate and verify the accuracy of basic mechanical and electrical measuring instruments.	**3**	**2**		**3**	**2**								
CO2	Perform angular, dimensional, and alignment measurements using sine bars, profile projectors, toolmaker's microscope, and autocollimator.	**3**	**2**		**2**	**2**								
CO3	Operate comparators, Talysurf, and floating carriage systems to evaluate surface roughness and screw thread parameters.	**3**	**2**		**2**	**3**								
CO4	Apply strain and force measurement techniques using LVDT and dynamometer and prepare experimental reports linking theory with practice.	**2**	**2**		**3**	**2**				**2**	**3**			

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Manufacturing Process – II Laboratory		
Course Code: P24MEL408	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):0-0-2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:24 Hrs.	Exam Hours: 2Hrs.	
Credits:01		

Course learning Objectives:

The course aims at enabling the students to have practical knowledgeabout preparation of components through sand casting and forging processes.

Course content

1. Use of forging tools and equipments.
2. Prepration model involving upsetting, drawing and bending operations, along with length and volume calculations.
3. Preparing minimum three models involving upsetting, drawing and bendingoperations, along with length and volume calculations.
4. Use of sheet metal tools and equipments.
5. Preparing sheet metal models.

Reference Books

1. Serope Kalpakjian & Steven R Schmid, **"Manufacturing Engineering andTechnology",** Pearson Education Asia, 7th edition, 2013, ISBN: 978-0133128741.
2. P. N. Rao, **"Manufacturing Technology: Foundry Forming and Welding"** 2ndEd.,Tata McGraw Hill, 2003.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	Demonstrate the use of forging tools and equipment.	**2**	**2**	**2**										
CO2	Prepare models using upsetting, drawing, and bending operations with length and volume calculations.	**3**	**2**	**2**	**2**									
CO3	Perform sheet metal forming operations using appropriate tools and prepare models.	**2**	**2**	**2**										
CO4	Correlate theoretical knowledge of forging and sheet metal processes with practical outcomes through experimental reports.	**2**	**2**	**2**	**3**					**2**	**3**			

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Fluid Measurement And Machinery Laboratory		
Course Code: P24MEL409	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P):0-0-2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:24 Hrs.	Exam Hours: 2 Hrs.	
Credits:01		

Course learning Objectives:

- **CLO1:** Understand the basic measurement techniques of fluid flow.
- **CLO2:** Evaluate the performance of vanes, turbines, pumps, compressor and blower.
- **CLO3:** Provide training to students to enhance their practical skills.
- **CLO4:** Develop team qualities and ethical principles.

Course content

PART-A **10 Hrs**

Exp-1 Calibration of Venturi meter and determination of its co-efficient of discharge.

Exp-2 Calibration of Orifice meter and determination of its co-efficient of discharge.

Exp-3 Calibration of V-Notch for flow through channel.

Exp-4 Determination of coefficient of friction in flow through pipes.

Exp-5 Determination of Vane efficiency (Coefficient of impact) for different vanes.

PART-B **20 Hrs**

Exp-6 Performance test on Pelton wheel Turbine.

Exp-7 Performance test on Centrifugal Pump.

Exp-8 Performance test on Reciprocating Pump.

Exp-9 Performance test on Two Stage Reciprocating Air Compressor.

Exp-10 Performance test on Air Blower.

Reference Books

1. Dr. JagadishLal, **"Fluid Mechanics and Hydraulics",** Metropolitan Book Co. Pvt .Ltd, New Delhi, 2002, ISBN: 9788120002722.
2. Dr. R.K.Bansal, "**Fluid mechanics and hydraulic machines",** Laxmi publications Ltd., New Delhi, 9th Edition, 2015, ISBN: 9788131808153.

Course Outcomes: At the end of the course, students will be able to,

1) Apply Bernoulli's principle to determine flow rate, pressure changes for flow through pipes and **examine** the fluid flow rate in an open channel.

2) Compare the effect of friction in pipes of different materials.

3) **Analyse**the performance parameters of vanes, turbine, pumps, compressor and blower.

4) Make use of experimental data for writing a report as an **individual** or **as a team** member to **communicate** effectively.

Course Articulation Matrix

Course Outcomes		Program Outcomes											PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**Apply** Bernoulli's principle to determine flow rate, pressure changes for flow through pipes and **examine** the fluid flow rate in an open channel.	3	2		1									
CO2	**Compare** the effect of friction in pipes of different materials.	3	1		1									
CO3	**Analyse** the performance parameters of vanes, turbine, pumps, compressor and blower.	3	3		2									
CO4	**Make use of** experimental data for writing a report as an **individual** or **as a team** member to **communicate** effectively.									3	3			

Academic Year: 2025-26	Semester: IV	Scheme: CBCS & OBE
Course Title : **EMPLOYABILITY ENHANCEMENT SKILLS – IV**		
Course Code: **P24HSMC410B**	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:2:0	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy:48 Hours	Exam Hours:	
Credits:01		

Course learning Objectives:

- **CL01:** Write and execute basic C programs using control structures and operators.
- **CL02:** Implement arrays, functions, recursion, pointers, and structures in C.
- **CL03:** Solve aptitude problems involving time, speed, work, and mixtures.
- **CL04:** Compose professional emails and workplace communication.
- **CL05:** Demonstrate workplace etiquette and grooming standards for interviews

Unit 1:	**Hrs:8**
C Programming Basics Data Types, Variables, Operators, Input/Output, Control Statements	
Self-Study Content: Programming Basics	
Unit 2:	**Hrs:8**
Arrays, Functions & Recursion Single & Multi-dimensional Arrays, Functions, Recursive Problems	
Self-Study Content: Basics of Functions	
Unit 3:	**Hrs:8**
Pointers & Structures Pointers, Strings, Structures & Unions, Memory Allocation	
Self-Study Content: Pointer Concepts	
Unit4:	**Hrs:12**
Aptitude – Arithmetic Application Time, Speed & Distance, Time & Work, Pipes & Cisterns, Mixtures	
Self-Study Content: Aptitude Basics	
Unit 5:	**Hrs:12**
Soft Skills – Workplace Etiquette Email Writing, Workplace Communication, Grooming, Interview Do's & Don'ts	
Self-Study Content: Refer Handouts	

Reference Books

Title	Author	Edition	ISBN
Let Us C	Yashavant Kanetkar	17th Edition, 2023	9789391030834
Programming in ANSI C	E. Balagurusamy	8th Edition, 2019	9789353162344
High School English Grammar & Composition	Wren & Martin	Latest	9789352530144
Quantitative Aptitude for Competitive Examinations	R.S. Aggarwal	2021	9789352832163

Web and Video link(s):

1. C Language Tutorial for Beginners (with Notes & Practice Questions) https://youtu.be/irqbmMNs2Bo?si=9uZaN3_Pl-o7GzHE
2. Introduction to Aptitude and Reasoning https://youtu.be/AFh1-fqdaf4?si=qe64J_Yg7sIrWuKN

Active Based Learning (Suggested Activity in Class)/ Practical Based Learning

1.Carry out hands-on activities to analyze and represent data structures.

2. Compose professional emails and workplace communication

3. Develop and demonstrate mini projects using suitable data structures for real-life applications

Course Outcomes		Program Outcomes										
		1	2	3	4	5	6	7	8	9	10	11
CO1	Write and execute basic C programs using control structures and operators..	3	3	3	1	2					1	
CO2	Implement arrays, functions, recursion, pointers, and structures in C.	3	3	3	2	3					1	1
CO3	Solve aptitude problems involving time, speed, work, and mixtures	3	3		2	1					1	2
C04	Compose professional emails and workplace communication								1	2	3	1
C05	Demonstrate workplace etiquette and grooming standards for interviews.								3	2	2	2

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: National Service Scheme		
Course Code: P24NSS411	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

CO1: Analyze and propose water conservation: Assess water resource issues and recommend conservation strategies considering stakeholder roles.

CO2: Develop rural business proposals: Create actionable business proposals for increasing village income, including market analysis and implementation plans.

CO3: Enhance educational outcomes and access: Design and implement initiatives to improve school performance and promote higher/technical/vocational education enrolment.

CO4: Apply engineering to community development: Integrate engineering knowledge to develop solutions for water conservation, business development, and educational initiatives.

CO5: Evaluate community development impacts: Assess the social, economic, and environmental impacts of community development projects.

Course Description: This course focuses on practical strategies for community development, covering water conservation techniques, business development in rural areas, and educational enhancement initiatives. It emphasizes stakeholder engagement, project planning, and implementation.

Course Content:

- Water conservation techniques, the role of different stakeholders (e.g., government, communities, NGOs), and implementation strategies.
- Developing actionable business proposals to increase village income and outlining implementation approaches.
- Supporting local schools to improve academic results and increase enrolment in higher/technical/vocational education.

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Yoga		
Course Code: P24YOG411	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

CO1: Understand Yoga's ethics and philosophy: Explain Patanjali's Ashtanga Yoga (Yamas and Niyamas) and their relevance to personal and professional life.

CO2: Perform Yoga practices safely: Execute Suryanamaskar, selected Asanas, Kapalabhati, and Pranayama techniques with correct technique, breathing, and safety awareness.

CO3: Analyze Yoga's effects: Describe the benefits and contraindications of practiced techniques, explaining their impact on body and mind.

CO4: Apply Yoga for well-being: Integrate Yoga for stress management, focus, mindfulness, and overall well-being.

CO5: Understand Yoga's interconnectedness: Articulate the relationship between physical practices, mental states, and ethical principles in Yoga.

Course Description: This course introduces students to the ancient practice of Yoga, focusing on its physical, mental, and ethical dimensions. It covers key components of Patanjali's Ashtanga Yoga, including Yamas and Niyamas, along with practical training in Asanas, Suryanamaskar, Pranayama, and Shatkarmas like Kapalabhati. The course aims to equip students with tools for stress management, improved focus, and overall well-being.

Course Content:

- **Patanjali's Ashtanga Yoga:** Yama (Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha), Niyama (Shaucha, Santosha, Tapas, Svadhyaya, Ishvarapranidhana)
- **Suryanamaskar:** 12 counts, 4 rounds
- **Asanas:**
  - Sitting: Sukhasana, Paschimottanasana
  - Standing: Ardhakati Chakrasana, Parshva Chakrasana
  - Prone: Dhanurasana
  - Supine: Halasana, Karna Peedasana
- **Kapalabhati:** 40 strokes/min, 3 rounds
- **Pranayama:** Suryanuloma-Viloma, Chandranuloma-Viloma, Suryabhedana, Chandra Bhedana, Nadishodhana

Meaning, Need, importance of Pranayama. Di fferent types. Meaning by name, technique, precautionary measures and benefits of each Pranayama

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: Physical Education		
Course Code: P24PED411	CIE Marks:50	CIE Weightage:50%
Teaching hours/week (L:T:P): 0:0:2	SEE Marks:50	SEE Weightage:50%
Teaching hours of Pedagogy: 20-24 Hrs	Exam Hours: 2 Hrs	
Credits: 00		

Course Outcomes: At the end of the course, the student will be able to

1. Understand the ethics and moral values in sports and athletics
2. Perform in the selected sports or athletics of student's choice.
3. Understand the roles and responsibilities of organisation and administration of sports and games.

Module I: Ethics and Moral Values 4 Hours

1. Ethics in Sports
2. Moral Values in Sports and Games

Module II: Specific Games (Any one to be selected by the student) 16 Hours

1. Volleyball – Attack, Block, Service, Upper Hand Pass and Lower hand Pass.
2. Athletics (Track Events) – Any event as per availability of Ground

Module III: Role of Organization and administration 4 Hours

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: **BASIC ENGINEERING MATHEMATICS–II**		
Course Code: **P24MADIP401**	CIE Marks: **100**	CIE Weightage:**100**
Teaching hours/week (L:T:P:S) **04 (L:2, T:2)**	SEE Marks: --	SEE Weightage:--
Teaching hours of Pedagogy: 40	Exam Hours: 00	
Credits:0		
Prerequisite:		
Basic Mathematics		
Course learning Objectives:		
CLO1: To provide essential concepts of linear algebra, introductory concepts of second & higher order differential equations along with various techniques/methods to solve them, Laplace & inverse Laplace transforms and elementary probability theory.		
Unit 1		**Hrs: 08**
Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations - Gauss elimination method. Gauss-Jordan and LU decomposition methods. Eigen values and Eigen vectors of a square matrix.		
Self-Study Content: Application of Cayley-Hamilton theorem (without proof) to compute the inverse of a matrix-Examples.		
Unit 2		**Hrs: 08**
Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators and variation of parameters. Solution of Cauchy's homogeneous linear equation and Legendre's linear differential equation.		
Self-Study Content: Method of undetermined coefficients		
Unit 3		**Hrs: 08**
Multiple Integrals: Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration. Vector Integration: Vector Integration: Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green's, Stokes's and Gauss theorems (without proof) problems.		
Self-Study Content: Orthogonal curvilinear coordinates.		
Unit 4		**Hrs: 08**
Laplace transforms: Laplace transforms of elementary functions. Transforms of derivatives and integrals, transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods.		
Self-Study Content: Application to solutions of linear differential equations and simultaneous differential equations.		
Unit 5		**Hrs: 08**
Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples.		
Self-Study Content: State and prove Bayes's theorem.		

Suggested Learning Resources:				
Textbooks:				
Sl. No.	**Title**	**Author**	**Year & Edition**	**Publisher**
1.	Higher Engineering Mathematics	B. S. Grewal	44th Edition 2018	Khanna Publishers, New Delhi
Reference Books:				
1.	Advanced Engineering Mathematics	E. Kreyszig	10th Ed., 2015	John Wiley & Sons
2.	Engineering Mathematics	N. P. Bali and Manish Goyal	7th Ed., 2022	Laxmi Publishers

Course Out comes: After completing the course, the students will be able to	
CO1	Apply matrix theory for solving systems of linear equations in the different areas of linear algebra.
CO2	Solve second and higher order differential equations occurring in electrical circuits, damped/un-damped vibrations.
CO3	Identify-the technique of integration evaluates double and triple integrals by change of variables, and vector integration technique to compute line integral
CO4	Explore the basic concepts of elementary probability theory and apply the same to the problems of decision theory,

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3										
CO2	3	3										
CO3	3	2										
CO4	2	3										
Strength of correlation: Low-1, Medium-2, High-3												

Academic Year: 2025-26	Semester: IV	Scheme: P24
Course Title: **Additional Communicative English – II**		
Course Code: P24HDIP410	CIE Marks: 100	CIE Weightage:100%
Teaching hours/week (L:T:P): 0:2:0	SEE Marks: -	SEE Weightage: -
Teaching hours of Pedagogy: 30 Hours	Exam Hours: 3 Hrs	
Credits: 00		

Module-1	
Listening Skills II	**2 Hours**
Levels of listening, Active listening, Techniques of listening. Activity: Listening for main ideas and Listening for specific information	
Speaking Skills II	**6 Hours**
Language of discussion – Giving opinion, agreeing / disagreeing, asking questions, making suggestions. Sentence stress – content and structure words, Speaking situations, Intonations and Summarizing skills	
Module-2	
Reading Skills II	**2 Hours**
Guessing meaning from the context, Understanding graphical information, Summarizing. Activity: Book review	
Writing Skills II	**4 Hours**
Linkers and connectives, Sentence and paragraph transformation, Mind mapping techniques, Letter writing, Essay writing	
Module-3	
Email Etiquette	**4 Hours**
Parts of an email, Writing an effective subject line, email language and tone. Activity: Email writing practice - Scenario based emails	
Group Presentations	**2 Hours**
Group presentations by the students	
Module-4	
Goal Setting	**2 Hours**
Defining goals, types of goals, Establishing SMART goals, Steps in setting goals, Goal setting activity	
Individual Presentations	**4 Hours**
Individual presentation by the students	
Module-5	
Teamwork	**4 Hours**
Defining teams, Team vs. Group, Benefits and challenges of working in teams, Stages of team building, Building effective teams, Case studies on teamwork	

Course Outcomes: On completion of this course, students will be able to,

CO 1: Understand the role of communication in personal and professional success

CO 2: Comprehend the types of technical literature to develop the competency of students to apprehend the nature of formal communication requirements.

CO 3: Construct grammatically correct sentences to strengthen essential skills in speaking & writing and to develop critical thinking by emphasizing cohesion and coherence

CO 4: Demonstrate effective individual and teamwork to accomplish communication goals.

Textbooks and Reference Books:

1. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2015.
2. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
3. Developing Communication Skills by Krishna Mohan& Meera Banerjee (Macmillan)
4. The Oxford Guide to Writing and Speaking, John Seely, Oxford.
5. English Language Communication Skills - Lab Manual cum Workbook by Rajesh Kumar Singh, Cengage learning India Pvt Limited – 2018
6. The 7 Habits of Highly Effective People by Stephen R Covey, Simon & Schuster – 2020
7. You Are the Team: 6 Simple Ways Teammates Can Go from Good to Great by Michael G. Rogers

CO – PO – PSO Matrix

CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2	PS O3
CO1				3	1			2						
CO2				3				2	1					
CO3				3	2						1			
CO4				1				3			1			