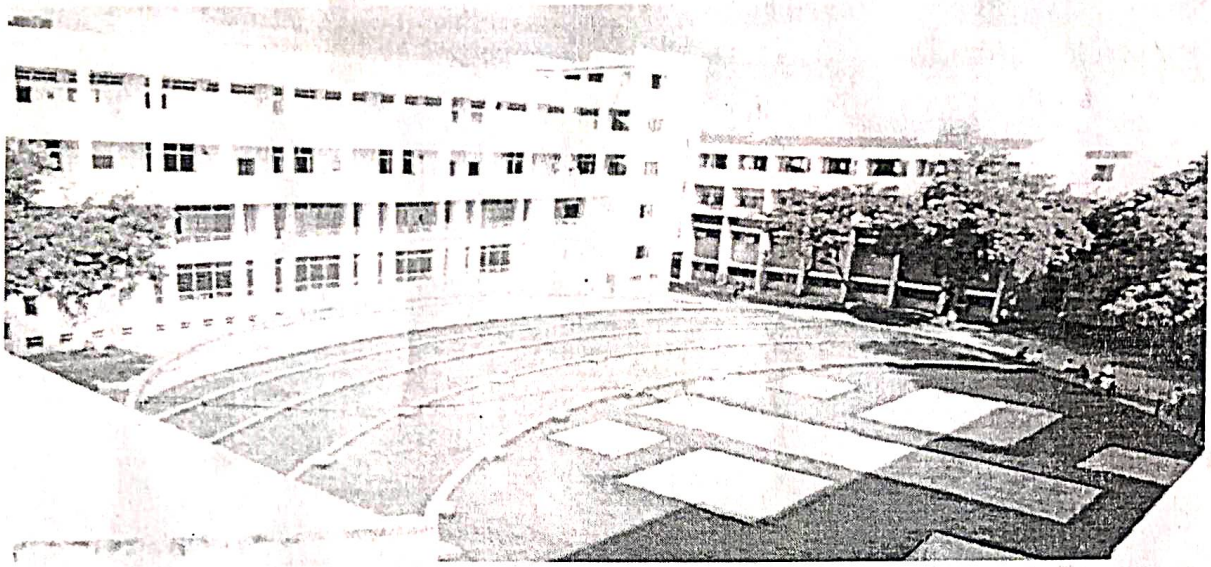
Dr. Ati B. Pawar

SANJIVANI RURAL EDUCATION SOCIETY'S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)



DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE–SY(NEP), TY, Final Year B. TECH (2021) PATTERN
from AY 2024-25

LIST OF ABBREVIATIONS			
Abbreviation	**Full Form**	**Abbreviation**	**Full Form**
ES	Engineering Science	HSMC	Humanity Science
PCC	Professional Core	CIA	Continuous Internal Assessment
PE	Professional Elective	OR	End Semester Oral Examination
OE	Open Elective	PR	End Semester Practical Examination
ISE	In-Semester Evaluation	TW	Continuous Term Work Evaluation
ESE	End-Semester Evaluation	BSC	Basic Science Course
PRJ	Project	MLC	Mandatory Learning Course

Sanjivani College of Engineering * Kopargaon-423603 *
Dept.of Mechanical Engineering

SRES'S SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)

F.Y. B. TECH. COURSE STRUCTURE-2023 PATTERN

(as per NEP 2020)

GROUP A: MECHANICAL

SEMESTER I

Course Title	Course Code	Teaching Scheme			Credits	Contact Hrs	Evaluation Scheme			ESE Hr
		L (hrs.)	T (hrs.)	P (hrs.)			CIA	ESE	Total/ Grade	
BSC										
Induction Programme	BSSH01									
Engineering Mathematics-I	BSSH101	3	1	--	4	4	40	60	100	3
Engineering Physics (Non Circuit)	BSSH102	3	--	--	3	3	40	60	100	3
Engineering Physics Lab	BSSH103	--	--	2	1	2	20	30	50	2
ESC										
Engineering Graphics	ESME111	2*	--	--	2	2	40	60	100	3
Engineering Graphics Lab	ESME112	--	--	4	2	4	20	30	50	2
Programming in C	ESME113	1	--	--	1	1	20	30	50	2
Programming in C Lab	ESME114	--	--	2	1	2	20	30	50	2
Basics of Mechanical Engg.	ESME115	2	--	--	2	2	20	30	50	3
Basics of Mechanical Engg. -Lab	ESME116	--	--	2	1	2	20	30	50	2
AEC										
Professional English	AESH181	2	--	--	2	2	20	30	50	2
CCA										
Music or Dance or Stress Management Through Ayurveda or German or Japanese or Entrepreneurship or Arts and Crafts	CCSH171A/ CCSH171B/ CCSH171C/ CCSH171D/ CCSH171E/ CCSH171F/ CCSH171G	--	--	2	1	2	20	30	50	2
Total		13	1	12	20	26	280	420	700	

L- Lecture, T – Tutorial, P - Practical in Lab, CIA- Continuous Internal Assessment, ESE- End Semster Examination

Minimum Marks for Passing Theory and Laboratory Course

1. *In End, Semester Examination (ESE) out of 60 marks, 24 marks and CIA+ESE = 40 marks are required.*
2. *In End, Semester Examination (ESE) out of 30 marks, 12 marks and CIA+ESE = 20 marks are required.*
3. *In Practical out of 50 marks, 20 marks are required.*
4. **Additional One Lecture for the Practice can be added*

SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON * Approved

Sanjivani College of Engineering * Kopargaon-423603 * Dept.of Mechanical Engineering

Sanjivani College of Engineering, Kopargaon
(An Autonomous Institute affiliated to SPPU, Pune)
Teaching and Evaluation Scheme AY 2024-25
Mechanical Engineering

SEMESTER-III

SR. No.	Code	Course Title	Type	Credits				Contact Hrs	Marks			Exam Head
				L	T	P	Total		CIA	ESE	Total	
1	PCME201	Engineering Mathematics-III	PCC	2	1	-	3	3	20	30	50	TH
2	PCME202	Engineering Thermodynamics	PCC	3	-	-	3	3	40	60	100	TH
3	PCME203	Strength of Materials	PCC	3	-	-	3	3	40	60	100	TH
4	PCME204	Manufacturing Processes	PCC	2	-	-	2	2	20	30	50	TH
5	PCME205	Manufacturing and Testing Lab	PCC	-	-	1	1	2	20	30	50	PR
6	MMME221	Machine Drawing & Drafting	MD M	2	-	-	2	2	20	30	50	TH
7	MMME222	Machine Drawing & Drafting Lab	MD M	-	-	1	1	2	20	30	50	PR
8	MMME223	Foundations of IOT Lab	MD M	-	-	1	1	2	20	30	50	PR
9	EEME241	Engineering Economics	EEM	2	-	-	2	2	20	30	50	TH
10	VEME251	Universal Human Values and Ethics	VEC	2	-	-	2	2	20	30	50	TW
11	CEME266	Community Engagement Project	CEP	-	-	2	2	4	20	30	50	OR
Total				16	0	6	22	28	280	420	700	

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON Approved

Sanjivani College of Engineering Dept.of Mechanical Engineering Kopargaon-423603

Academic Co-Ordinator
Dept.of Mech.Engg
Sanjivani COE Kopargaon

Head, Dept. of Mech. Engg.
Sanjivani College of Engg.,
Kopargaon - 423 603

SANJIVANI RURAL EDUCATION SOCIETY'S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE AND SYLLABI– SECOND YEAR B. TECH (NEP) PATTERN

for AY 2024-25

LIST OF ABBREVIATIONS			
Abbreviation	**Full Form**	**Abbreviation**	**Full Form**
ES	Engineering Science	HSMC	Humanity Science
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Engineering Mathematics (PC ME201)

Teaching Scheme		Examination Scheme	
Lectures:	3 Hrs. / Week	**CIA**	40 Marks
Tutorials	1 Hrs. / Week	**End Sem Exam:**	60 Marks
Credits:	**3**	**Total:**	100 Marks

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COURSE OBJECTIVES

1 To make students familiarize with concepts and techniques of vector calculus, probability and differential calculus.

2 The intent is to furnish them with the techniques to understand engineering mathematics and its applications that would develop logical thinking power, useful in their disciplines.

COURSE OUTCOMES

COs	Course Outcomes After successful completion of this course student will be able to	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Apply** statistical tools and probability distributions to solve real-world problems and make data-driven decisions. Action:Apply Knowledge:Statistical Methods and probability distributions Condition: Data Analysis	**3**	**Apply**
CO2	**Calculate** directional derivative, divergence and curl of vector function as well as vector integration with the help of Green's theorem, etc. Action: Apply Knowledge: Vector differentiation and Integration Condition: Vector function	**3**	**Apply**
CO3	**Determine** solution of partial differential equations using Fourier transform technique. Action: Analyze Knowledge:Fourier Transform Condition: Solution of partial differential equations	**3**	**Apply**

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	-	-	1	1	1	-	-
CO2	3	2	-	-	1	-	-	1	1	1	-	-
CO3	3	2	-	-	-	-	-	1	1	1	-	-
CO4	3	2	-	-	-	-	-	1	1	1	-	-
CO5	3	2	-	-	-	-	-	1	1	1	-	-
CO6	3	3	-	-	-	-	-	1	1	1	-	-

COURSE CONTENTS

Unit-I	**Statistical Analysis and Probability Distributions** Data analysis, Mean, Standard Deviation, Correlation, Regression. Introduction to Probability, Probability mass function, Binomial distribution, Poisson distribution, Normal distribution, Exponential distributions.	**No.of Hours** 10	**COs** 1
Unit-II	**Vector Calculus** Vector Differentiation, Gradient of scalar function, Divergence and curl. Line and Surface integrals, statements and Illustrations of Green, stokes and Gauss-Divergence theorem	**No.of Hours** 10	**COs** 2
Unit-III	**Fundamentals of Fourier Analysis and Partial Differential Equations** Basic Concept of Fourier series, Definition of Fourier transform, Fourier transform of exponential and hyperbolic functions, Separation of variables; solutions of one dimensional diffusion equation; first and second order one-dimensional wave equation and two dimensional Laplace equations, Introduction to Laplace Transform.	**No. of Hours** 10	**COs** 3

Text Book(s)

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012, **ISBN-13: 978-8174091154.**
2. S.P. Gupta, Statistical Methods, 28th Edition, Sultan Chand and Sons., New Delhi, 1997
3. H. K. Das, Engineering Mathematics, S Chand, 2006, **ISBN-8121905209**
4. P. C. Biswal, Probability and Statistics, PHI, New Delhi, 2012, **ISBN-9788120331402 Lib-56298**

Reference Books

1. K.A. Stroud & D. S. Booth, Advanced Engineering Mathematics, Industrial Press, 5/e, 2011, **ISBN-9780831134495**
2. P. C. Matthews, Vector Calculus, Springer, 2/e, 2012, **ISBN-9783540761808**
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 9/e, 2013, **ISBN-13: 978-0471488859.**
4. John A. Rice, Mathematical Statistics and Data Analysis, International Thomson Publication, 1995**, IBSN-0534209343**

Engineering Thermodynamics (PCME202)

Teaching Scheme		Examination Scheme	
Lectures:	3 Hrs. / Week	**CIA**	40 Marks
Practical:	NA	**End Sem Exam:**	60 Marks
Credits:	**3**	**Total:**	100 Marks

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Prerequisite Course: Engineering Physics, Basic Mechanical Engineering, Mathematics.

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Course Objectives:

Students will be able to

1. Understand fundamental concepts and Laws of thermodynamics
2. Apply the Laws of thermodynamics to different systems.
3. Understand the processes governing the ideal gas behaviour.
4. Understand reciprocating air compressor and evaluate its performance.
5. Use of Steam Table/ Mollier chart for solving numerical.
6. Understand steam generator and analyse its performance

Course Outcomes (COs): At the end of the course, learner will be able to

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
CO1	**Determine** work and heat interaction for thermodynamic processes by **applying** first law of thermodynamics	3	Apply
CO2	**Apply** Second Law of Thermodynamics to different systems and **Determine** the change in entropy for various processes.	3	Apply
CO3	**Evaluate** heat transfer, work transfer & other thermodynamic entities for the processes undergone by ideal gas.	3	Apply
CO4	**Estimate** performance parameters of single stage reciprocating air compressor	3	Apply
CO5	**Determine** performance parameters of Boilers.	3	Apply
CO6	**Evaluate the** performance of Thermal Equipment.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2					2	2					2
CO2	2	2	1	2					2	2					2
CO3	3	2	1	2					2	2					2

CO4	2	2	1	2					2	2					2
CO5	3	2	1	1					2	2					2
CO6	3	2	1	1					2	2					2

Course Contents

Unit	Contents	No. of Hours	COs
1	**Thermodynamic Concepts and First Law of Thermodynamics**		
	Thermodynamic Concepts: Role of thermodynamics in mechanical Engineering, Thermodynamic Systems, Boundary, State of system, Properties of system, Classification of properties, Thermodynamic equilibrium, Zeroth law of thermodynamics. Comparison of heat & work, types of work and their evaluation for thermodynamic processes. **First law of Thermodynamics**: First law of thermodynamics, Joules experiment, Applications of first law to flow and non-flow processes and cycles. Perpetual Motion Machine of the first kind (PMM I). Steady Flow Energy Equation (SFEE), Application of SFEE for devices such as nozzle, diffuser, throttling Device, turbine, compressor and heat exchanger.	9 Hrs.	CO1
2	**Second Law of Thermodynamics and Entropy**		
	Second Law of Thermodynamics: Limitations of first law of thermodynamics, Thermal reservoir, Heat Engine, Refrigerator and Heat pump, Efficiency and Coefficient of Performance (COP), Kelvin-Planck & Clausius Statement of the Second law of Thermodynamics, Perpetual motion machine of second kind (PMM – II), Concept of Reversibility and Irreversibility. **Entropy**: Entropy as a property, Clausius' theorem, Clausius inequality, Principle of increase of entropy, concept of absolute temperature, introduction to third law of thermodynamics **Availability**: Available and Unavailable Energy	9 Hrs.	CO2
3	**Ideal Gas Properties and Processes**		
	Ideal Gas Laws, Equation of State, Universal Gas constant and ideal Gas constant Various processes, p-v and T-s diagrams, Calculations of heat transfer, work done, internal energy, Change in entropy and enthalpy.	9 Hrs.	CO3
4	**Air Compressor**		
	Reciprocating Air Compressor: Applications of compressed air, single stage compressor without clearance and with clearance volume, volumetric efficiency, isothermal efficiency, adiabatic efficiency, effect of clearance volume, free air delivery, actual indicator diagram for air compressor, Multi staging of compressor(Two Stage only), optimum intermediate pressure, intercooler, after Cooler, Capacity control of compressors. Introduction to pre filters, after filters, Air dryers, Reservoir and Instrumentation for Air Compressor.	9 Hrs.	CO4
5	**Properties of Pure Substance & Steam Generators**		

	Formation of steam, phase-change phenomenon of a pure substance, Properties of steam, Use of Steam Tables, Study of P-v, T-s diagram. Mollier diagram for steam, Dryness fraction of steam and its determination, Study of steam calorimeters (Separating and throttling calorimeter only) **Steam Generators:** Classification, Constructional details of low pressure boilers, (water tube boiler & fire tube boiler), Boiler mountings and accessories, Introduction to IBR Act, Boiler performance, Specific Steam Consumption, Calculations-Equivalent Evaporation, Boiler efficiency, Heat balance Sheet .	9 Hrs.	CO5

Text Books:

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Engineering Thermodynamics	D.B. Spalding and E.H Cole	Arnold Publisher	
2.	Thermal Engineering	Domkundwar, Kothandaraman and Domkundwar	Dhanpat Rai Publishers	
3.	Engineering Thermodynamics	P.K.Nag	TataMcGrawHillPublications	
4.	Engineering Thermodynamics	R.K. Rajput	Laxmi Publications Pvt Ltd, 3rd Edition	
5.	Applied Thermodynamics	Onkar Singh	New Age International Publishers	
6.	Thermodynamics	C.P. Arora	Tata McGraw Hill	

Reference Books:

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Thermodynamics: An Engineering Approach	Yonus A Cengel and Michale A Boles	McGraw Hill Education	
2.	FundamentalsofEngineeringThermodynamics	Moran&Shapiro	John Wiley & Sons	
3.	Fundamentals of Thermodynamics	Sonntag, Borgnakke& Van Wylen	John Wiley &Sons Inc	
4.	Basic Engineering Thermodynamics	Rayner Joel	AWL-Addison Wesley	
5.	Thermal Engineering	P. L Ballaney	Khanna Publishers	
6.	Thermal Engineering	Sadhu Singh	Pearson India Education	

Strength of Materials (PCME 203)

Teaching Scheme		Examination Scheme	
Lectures:	3 Hrs. / Week	**CIA**	40 Marks
Practical:	-	**End Sem Exam:**	60 Marks
Credits:	**3**	**Total:**	100 Marks
		Time Allotted	3 hrs

Prerequisites: Applied Mechanics, Mathematics

Course Objectives:

1. To study the concepts of stress, strain, principal stresses and principal planes.
2. To study the concept of shearing force and bending moment due to external loads in determinate beams.
3. To compute slopes and deflections in determinate beams
4. To determine stresses and deformation in circular shafts due to torsion.

Course Outcomes (COs): At the end of this course, students will be able to,

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	Determine stresses and strains, deformation and mechanical properties of engineering materials subjected to different loading conditions.	3	Apply
2.	Draw shear force and bending moment diagrams for determinate beams subjected to different loading conditions.	3	Apply
3.	Draw the bending stresses and shear stresses distribution diagrams for symmetric cross sections under different loading conditions.	3	Apply
4.	Determine slope and deflection due to external loads in determinate beams.	3	Apply
5.	Compare the diameter of the shaft on the basis of torsional strength and torsional rigidity.	3	Analyze

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	2			2	2	1		2	3	1	
CO2	1	2	2	1	2				1	1		2	2		
CO3	1	2	2	1	2			2	2	1		2	2		
CO4	2	2	2	1	1			2	2	1		2	2	1	
CO5	3		1	2	1				1	1		2	3		

Course Contents

Unit	Contents	No. of Hours	COs
1	**Linear Elasticity - Material Behavior**		
	Stress, strain, types of stresses, Stress-strain diagram for ductile and brittle materials, Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Interrelation between elastic constants, factor of safety, Margin of safety. **Thermal stresses and strains,** Stress-strain-temperature relationships in thin-walled pressure vessels. **Principal stresses and strains:** Normal and shear stresses on any oblique plane. Derivation of expression for principal stresses and maximum shear stress, Combined stresses. Graphical solution using Mohr's circle.	10 Hrs.	CO1
2	**Forces and Moments Transmitted by Slender Members**		
	Shear force and bending moment diagrams for statically determinate beams due to concentrated load, uniformly distributed load and couple, Relationship between rate of loading, shear force and bending moment diagrams Maximum bending moment and point of contra shear and contra flexure.	9 Hrs.	C02
3	**Bending and Shear Stresses**		
	Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, second moment of area for circular, hollow, rectangular, I, T sections with respect to centroidal and parallel axes, bending stress distribution diagrams. **Shear stresses:** Derivation of shear stress distribution formula, shear stress distribution diagrams for circular, hollow, rectangular, I, T sections.	10 Hrs.	C03
4	**Slope and Deflection of Beams**		
	Slope and deflection of determinate beams, double integration method, Macaulay's method, derivation of formula for slope and deflection for standard cases.	8 Hrs.	C04
5	**Buckling and Torsion**		
	Buckling of columns: Derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for end conditions-both ends hinged, both ends fixed, one end hinged and one end fixed, Rankine's formula	8 Hrs.	C05

	Torsion: Stresses, strain and deformations in determinate homogeneous shafts of solid and hollow circular section and subjected to twisting moment, derivation of torsion equation.		

Text Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	A Textbook of Strength of Materials	R K Bansal	Laxmi Publications	6th Edition
2.	Strength of Materials	S.S. Rattan	Tata McGraw Hill Education (India) Pvt.Ltd., 2nd Edition, 2010	
3.	Strength of material	Ramamurtham	Dhanpat Rai Publication	
4.	Mechanics of Solids	S.S. Bhavikatti	The New Age International Publishers	
5.	Strength of material	B.K. Sarkar	Tata McGraw-Hill Education Publication	620.12
6.	Strength of materials	R.K. Rajput	S. Chand Publications	

Reference Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Mechanics of Materials	Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf	Tata McGraw-Hill, Sixth Edition, 2012	
2.	Strength of Materials	G. H. Ryder	Macmillan Pub	
3.	Engineering Mechanics of Solids	E.P. Popov	Prentice Hall Publication	
4.	Strength of materials	Singer and Pytel	Harper and row Publication	
5.	Mechanics of Materials	Andrew Pytel & Jaan Kiusalaas	Global Engineering	
6.	Mechanics of Materials	R. C. Hibbeler	Prentice Hall Publication	

Manufacturing Processes (PCME204)

Teaching Scheme		Examination Scheme	
Lectures:	02 Hrs/week	**CIA**	20 Marks
Tutorials :	--	**End Sem Exam:**	30 Marks
Credits:	02	**Total:**	50 Marks
		Time Allotted	2 Hrs.

Prerequisite of Course: Basic mechanical Engineering, Mathematics, Engineering graphics

Course Objectives:

1. To understand casting processes and metal forming processes and To calculate solidification time of castings and forces in metal forming.
2. To study different types of plastic molding processes and metal joining processes, their parameters and applications
3. To understand various sheet metal working operations, and study various types of Additive manufacturing processes.

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	Describe various types of pattern, pattern allowances, core, castings and to calculate solidification time of casting **and forces acting in metal forming.** **Action**: Describe and Calculate (Apply) **Knowledge**: Metal mould **Condition:** Casting and forging components for automotive parts.	3	Apply
2.	Describe various types of plastic processing methods, types of joining processes and their applications **Action**: Describe (Understanding) **Knowledge**: Plastic moulds, Metal Joining(Conceptual and Procedural) **Condition: I**ndustrial / real life applications	2	Understanding
3.	Design dies for sheet metal working operations and Describe types of additive manufacturing processes **Action:** Design and Describe (Apply) **Knowledge**: Sheet metal components (Conceptual and Procedural) **Condition: I**ndustrial / real life applications	3	Apply

1. Course contents

Unit	Contents	No. of Hours	COs
1	**Casting and Metal forming Processes**		
	CASTING – Pattern- types, material and allowances, molding sand. Types of mold, **Core** – types and manufacturing, **Gating system and Riser** - types and design (Numerical), Heating and pouring, cooling and solidification- process and time estimation (Numerical), Defects and remedies, **Die casting**, Investment casting, Centrifugal Casting, Continuous Casting. Safety measures and professional ethics.		

	Metal Forming Hot and Cold Working- Concepts and comparative study, Material behavior in metal forming. **Processes** Rolling-Types of rolling mills, flat rolling analysis, power required (Numerical) Forging-Types, process parameter, Analysis of open die forging (Numerical) Extrusion-Types, process parameter, Extrusion dies, Shape factor. Drawing-Wire drawing and its analysis, Tube drawing. Safety measures and professional ethics.	12	
2	**Plastic and Joining Processes**		
	Molding – Compression molding, Transfer molding, Blow molding, Injection molding – Process and equipment. Extrusion of Plastic – Type of extruder, extrusion of film, pipe, cable and sheet Thermoforming – Principle, pressure forming and vacuum forming. Safety measures and case study on impact of plastic processing on environment. **Material Joining-** Types of joints. Welding Classification, Defects, safety measures and case study on impact of welding on environment. Professional ethics. Gas welding - Oxy acetylene gas welding, Hydrogen gas welding. Arc welding - Metal arc welding(SMAW), Gas metal arc welding, (MIG, MAG) Tungsten inert gas welding, (TIG) Submerged arc welding,(SAW) Resistance welding - Resistance but welding, seam welding, spot welding, Solid state welding - Forge welding, Friction welding, Pressure welding etc	6	
3	**Sheet Metal Working and Advanced manufacturing processes**		
	Metal Working Types of sheet metal operations, **Types of dies** and punches, material for dies and punches, Die design for **Progressive and Drawing Die**, clearance analysis, center of pressure, blank size determination (Numerical), strip layout, sheet utilization ratio (Numerical), methods of reducing cutting forces. **Additive Manufacturing Processes** Definition, need, raw materials, types of processes:Photopolymerization , Binder jetting, Material extrusion, Powder Bed Fusion, Sheet Lamination and Direct Energy Deposition. Limitations, strengths Programming methods. **Simulation in Manufacturing_Process** Simulation, Plant Simulation, Product simulation Ergonomics simulation	12	

Text Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Metal Casting – Computer Aided design and analysis	B. Ravi	Prentice Hall of India	
2.	Casting: An analytical approach	Reikher	Springer publications.	
3.	Rapid tooling guidelines for sand casting	Wang	Springer publications.	
4.	Degormos Materials and process in manufacturing	J. T. Black	John Willey and sons	
5.	Fundamentals of modern manufacturing: Materials and systems	M.P Grover	Materials and systems	

Reference Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Elements of workshop Technology Vol. I &II	Hajara Choudhari, Bose S.K	Asian Publishing House	
2.	Fundamentals of Manufacturing Engineering	D. K. Singh	Ane's Books. Pvt. Ltd.	
3.	Manufacturing technology	P.N.Rao	The Mc Graw hill companies	
4.	Injection Mold Design	David O Kazmer		
5.	Maufactucring processes for Engineering materials	Serope Kalpakjian Stevn		
6.	Additive manufacturing Processes	John O. Milewski	Springer publications.	

Manufacturing and Testing Lab (PCME 205)

Teaching Scheme		Examination Scheme	
Practical:	02 Hrs/week	**CIA**	20 Marks
Credits:	01	**Practical Exam:**	30 Marks
		Total:	50 Marks

Prerequisite of Course: Basic mechanical Engineering, Mathematics, Engineering graphics,

Course Objectives:

1. To operate lathe machine and perform operations turning, facing, taper turning and threading.
2. To learn arc welding.
3. To study sand casting, gating system, types of cores, patterns.
4. Conduct various tests to determine mechanical properties of the given specimen.

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	To create a job by performing machining operations like Facing, Plain turning, knurling, threading operations on lathe	6	Create
2.	To perform Arc Welding on given component	6	Create
3.	To perform sand molding process	6	Create

List of Practicals:

Pr. No	Description	CO
1.	To perform Facing, Plain turning, knurling, threading operations on lathe.	
2.	To perform Arc Welding on Square frame.	
3.	Demonstration on Sand Molding Process.	
4.	Demonstration of Additive manufacturing (3D printing) process	
5.	Tension test on a ductile material to determine its mechanical properties.	
6.	Tension test on a brittle material to draw stress-strain diagram and to evaluate its ultimate stress	
7.	To determine Compressive strength of materials	
8.	To determine Shear strength of mild steel material under single and double shear	

Text Books

Text Books:
1. Hajara Choudhari, Bose S.K. – Elements of workshop Technology Vol. I &II , Asian Publishing

House.
2. D. K. Singh – Fundamentals of Manufacturing Engineering – Ane's Books. Pvt. Ltd.
3. P.N.Rao – Manufacturing technology – The Mc Graw hill companies.

Reference Books:

1. B. Ravi – Metal Casting – Computer Aided design and analysis- Prentice Hall of India
2. Reikher – Casting: An analytical approach – Springer
3. Wang – Rapid tooling guidelines for sand casting – Springer
4. J. T. Black – Degormos Materials and process in manufacturing – John Willey and sons
5. Serope Kalpakjian Stevn- Maufactucring processes for Engineering materials.
6. John O. Milewski, Additive manufacturing Processes,Springer publications.

Machine Drawing and Drafting (MMME221)

Teaching Scheme		Examination Scheme	
Lectures:	2 Hrs/week	**Continuous Assessment**	20 Marks
Tutorials :	-- Hrs/week	**End Sem Exam:**	30 Marks
Credits:	2	**Total:**	50 Marks
		Time Allotted	1 Hr.

Prerequisite of Course: Basic Mechanical Engineering, Engineering Graphics

Course Objectives:

1. To understand requirements of industrial drawings.
2. To read, understand and explain basic Geometric Dimensioning & Tolerancing concepts.
3. To apply various geometric and dimension tolerances based on type of fit

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	Understand the standards used in Machine Drawing and IS Conventions	2	Understand
2.	Apply limits , Fits and Tolerance, Surface Finish Symbols In Drawing of machine parts.	3	Apply
3.	Apply drafting commands to draw different machine parts using AUTOCAD.	3	Apply

Course contents

Unit	Contents	No. of Hours	COs
1	**IS Conventions**		
	Introduction to machine drawing, Dimensioning technique for machine components, Conventional representation of machine components as per IS code: SP-46 such as screw threads, springs, gears, bearing, tapped holes, knurling, splined shafts, tapers, chamfers, countersunk and counter bores, keys, & welded joints, Surface Roughness Introduction, terminology, machining symbol with all parameters, roughness values (Ra) indicating surface roughness on drawing.		
2	**Limits, Fits and Tolerances**		
	Definitions applied to tolerances, types of tolerance, types of fits, fit system. Geometrical tolerances – Nomenclature, tolerance frame, types of geometrical tolerances & their symbols, indicating geometric tolerances on drawing. Interference and clearance fit calculation for 2 part assembly. Importance of GD&T, difference between position tolerance and plus minus tolerance , datum selection process from assembly & manufacturing approach, concept & calculation of MMC,LMC,RFS, concept & reading of feature control frame, tolerance selection criteria for ideal assembly approach, ASME Standards: ASME Y14.5, Rules.		

3	**Drafting using AUTOCAD**		
	Introduction to AutoCAD, Installation and settings, All Basic Drawing & Editing Commands, First angle method, Third angle method , Dimensions ,Tangent method, complex drawings		

2. Text Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Standards: ASME Y14.5 – 2018			
2.	Machine Drawing	Narayana, K. L., Kannaiah, P., Venkata Reddy, K.	New Age International Publishers, New Delhi, India, ISBN-13: 978-8122440546	
3.	Machine Drawing	Bhatt, N. D. and Panchal, V. M	Charotar Publishing House Pvt. Ltd, Anand, India, ISBN-13: 978-9385039232	

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3.	Machine Drawing	Bhatt, N. D. and Panchal, V. M	Charotar Publishing House Pvt. Ltd, Anand, India, ISBN-13: 978-9385039232	
4.	AUTO CAD	David Frey	David Frey	
5.	Engineering Drawing With An Introduction To Autocad	Jolhe. D. A	T M H Pub, 2008	

Reference Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
7.	Geometric Dimensioning and Tolerancing for Mechanical Design	Cogorno, G. R.,	3rd edition, McGraw-Hill Education	
8.	Geometric Dimensioning and Tolerancing: A Complete Guide	Blokdyk, Gerardus,	5STARCooks	
9.	Standards: ISO/TR 23605:2018, ISO 1101:2017, SP 46, IS 15054(2001)			

Machine Drawing and Drafting Lab (MMME222)

Teaching Scheme		Examination Scheme	
Practical:	2 Hrs/week	**Continuous Assessment**	20 Marks
Credits:	1	**Practical Exam:**	30 Marks
		Total:	50 Marks

Prerequisite of Course: Basic Mechanical Engineering, Engineering Graphics

Course Objectives:

1. To understand requirements of industrial drawings.
2. To read, understand and explain basic Geometric Dimensioning & Tolerancing concepts.
3. To apply various geometric and dimension tolerances based on type of fit

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	Understand the standards used in Machine Drawing and IS Conventions	2	Understand
2.	Apply limits , Fits and Tolerance, Surface Finish Symbols In Drawing of machine parts.	3	Apply
3.	Apply drafting commands to draw different machine parts using AUTOCAD.	3	Apply

List of Practicals:

Pr. No	Description	CO
1.	One A2 size sheet based on various IS conventions (Manual Drawing).	1
2.	One A2 size sheet on Assembly of simple mechanical system (Manually).	1
3.	One A2 size sheet on Details of simple mechanical system (Manually).	1
4.	Interference and clearance fit calculation for 2 part assembly (Numericals)	2
5.	Tolerance selection criteria for ideal assembly approach (Numericals)	2
6.	One A2 size sheet on Assembly of simple mechanical system (By using AUTOCAD software).	3
7.	One A2 size sheet on Details of simple mechanical system (By using AUTOCAD software).	3

Text Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Standards:ASME Y14.5 – 2018			
2.	Machine Drawing	Narayana, K. L., Kannaiah, P., Venkata Reddy, K.	New Age International Publishers, New Delhi, India, ISBN-13: 978-8122440546	
3.	Machine Drawing	Bhatt, N. D. and Panchal, V. M	Charotar Publishing House Pvt. Ltd, Anand, India, ISBN-13: 978-9385039232	

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Standards:ASME Y14.5 – 2018			
2.	Machine Drawing	Narayana, K. L., Kannaiah, P., Venkata Reddy, K.	New Age International Publishers, New Delhi, India, ISBN-13: 978-8122440546	
3.	Machine Drawing	Bhatt, N. D. and Panchal, V. M	Charotar Publishing House Pvt. Ltd, Anand, India, ISBN-13: 978-9385039232	
4.	AUTO CAD	David Frey	David Frey	
5.	Engineering Drawing With An Introduction To Autocad	Jolhe.D.A	T M H Pub, 2008	

Reference Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1.	Geometric Dimensioning and Tolerancing for Mechanical Design	Cogorno, G. R.,	3rd edition, McGraw-Hill Education	

2.	Geometric Dimensioning and Tolerancing: A Complete Guide	Blokdyk, Gerardus,	5STARCooks	
3.	Standards: ISO/TR 23605:2018, ISO 1101:2017, SP 46, IS 15054(2001)			

Fundamentals of IoT Lab (MMME223)

Teaching Scheme		Examination Scheme	
Practical:	2 Hrs/week	**Continuous Assessment**	20 Marks
Credits:	1	**Practical Exam:**	30 Marks
		Total:	50 Marks

Course Objectives:

1. To identify and study different control system components.
2. To understand simulation on controllers.
3. To demonstrate working of different actuating systems and sensors.
4. To learn and demonstrate IoT

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1	Select sensors for automation system	2	Understand
2	Understand the components of IoT system and Thing Speak	2	Understand
2	Simulate circuits in simulation software tinker CAD	3	Apply
4	Understand programing of Arduino in Arduino IDE for actuators	2	Understand

List of Practicals:

Pr. No	Description	CO
1.	Determination of Ambient Temperature using Arduino	CO1
2.	Determine light intensity using Photo-resistor and LED using Arduino	CO1
3.	Generate temperature data using IoT based ThingSpeak ,Arduino and ES32	CO2
4.	Generate humidity data using IoT based ThingSpeak ,Arduino and ESP32	CO2
5.	Identifying gas leakage using GAS SENSOR	CO3
6.	Detect obstacle using ultrasonic sensors and simulate in TinkerCAD	CO3
7.	Vibration level classification using Accelerometer, Arduino	CO4
8.	Controlling speed of stepper motor using Arduino	CO4

4. Reference Books

Sr. No.	Title of Book	Authors	Publication House	Accession No
1	Designing IoT	Mcewen Adrian	Wiley	63818-N
2	IoT	Bagha Arshdeep	Universities Press	64434-N
3	Getting Started with IoT	Cuno Pfister	O. Reilly	59825-N, 59826-N
4	IoT connecting objects with Web	Chauchi Hakima	Willey	63310 to 63314-N
5	IoT hands on Approach	Bagha and Modisetty	Universities Press	63299-N to 63303-I
6	IoT	Paj Pathari	Universities Press	64303-N

Engineering Economics (EEME 241)

Teaching Scheme		Examination Scheme	
Lectures:	2 Hrs/week	**Continuous Assessment**	20 Marks
Tutorials :	--	**End Sem Exam:**	30 Marks
Credits:	2	**Total:**	50 Marks
		Time Allotted	1 Hrs.

Prerequisite of Course: Basic Mathematics

Course Objectives:

1. To make students understand the basic principles of engineering economics.
2. To make students aware of Engineering Economic Analysis and Cost Analysis.
3. To make students understand making financial decisions when acting as team member or manager in the engineering project based on time value of money.

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

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1.	Understand the basic principles of engineering economics	2	Understand
2.	Apply the knowledge of inflation, currency fluctuations, depreciation and taxes on decision making and engineering assets evaluation	3	Apply
3.	Compare and select investment alternatives based on costs and time value of money	3	Apply

Course contents

Unit	Contents	No. of Hours	COs
1	**Principles of Engineering Economics**	10	1
	Concept of Utility, Law of Diminishing Marginal Utility – Concept, Law of Diminishing Return – Concept, Law of Demand & Supply: Meaning and Determinants of Demand. Demand Function, Law of Demand, Market Demand, Elasticity of demand. Types of elasticity, Measurement of elasticity. Significance and uses of the elasticity. Meaning and Determinants of Supply, Law of supply. Equilibrium of demand and supply i.e. price determination. Competition – Concept, Types (Monopoly, Oligopoly, etc.)		
2	**Engineering Economic Analysis and Cost Analysis**	10	2

	Introduction, Concept of Money – Its Functions & worth. Inflation – Concept, Causes, Remedies to control inflation, Value of Currency, Factors governing exchange rates, Currency Fluctuations. Concept of Taxes, Types of Taxes – Direct & Indirect, Depreciation, Importance of cost in competitive environment, Elements of cost, product cost and process cost, Marginal cost, Standard cost, Break even analysis, P/V Ratio, Pricing under perfect competition, Pricing under imperfect competition, Introduction to Budget and Budgetory control.		
3	**Time Value of Money**	10	3
	Concept of Interest, Time Value of Money – Basis for comparison of alternatives, Discount Rate, Compound Rate, Present Worth, Future Worth, Annual Worth, Annuity, Perpetuity. Life Cycle Costing, Numerical Applications on Time Value of Money, Value analysis or value engineering		

3. Reference Books:

1. Theusen H.G., Engineering Economic Analysis, Prentice Hall of India

2. Henry M. Steiner, Engineering Economic Principles, McGraw Hill

3. M. S. Mahajan, Engineering Economics, Everest Publishing House, Pune

4. Samuelson PA, Nordhaus WD, Economics, Tata McGraw Hill

5. Colin Drury, "Management and Cost Accounting", English Language Book Society, Chapman and Hall London.

6. Khan M. Y., Jain P. K., "Financial Management", Tata McGraw Hill

7. Chan S Park, "Fundamentals of Engineering Economics", Pearson

8. James Riggs, "Engineering Economics", Tata McGraw-Hill

Universal Human Values and Ethics (VEME251)

Teaching Scheme		Examination Scheme	
Lectures:	2 Hrs. / Week	**CIA**	20 Marks
Practical:	-	**End Sem Exam:**	30 Marks
Credits:	**2**	**Total:**	50 Marks

Course Objectives:

1. To help the students appreciate the essential complementarity between values and skills to ensure mutual happiness and prosperity.
2. To elaborate on 'Self exploration' as the process for Value Education
3. To facilitate the understanding of harmony at various levels starting from self and going towards family and society.
4. To elaborate on the salient aspects of harmony in nature and the entire existence
5. To explain how the Right understanding forms the basis of Universal human values and definitiveness of Ethical human conduct.
6. To provide the vision for a holistic way of living and facilitate transition from chaotic life to an orderly life.

Course Outcomes (COs):

After successful completion of this course, the students should be able to:

COs	Course Outcomes	Blooms Taxonomy	
		Level	Descriptor
1	Recognize the concept of self-exploration as the process of value education.	1	Remember
2	Interpret the human being as the coexistence of Self and Body.	2	Understand
3	Explain relationship between one Self and the other Self as the essential part of relationship and harmony in the family	2	Understand
4	Explain the goal of human being living in the society, the system required to achieve the human goal and the scope of this system.	2	Understand
5	Draw ethical conclusions in the light of Right understanding facilitating the development of holistic technologies, production systems and management models	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	-	-	-	-	-	2	-	3	2	1	-	3
2	-	-	-	-	-	2	-	3	2	1	-	3
3	-	-	-	-	-	3	2	3	3	1	-	3
4	-	-	-	-	-	3	2	3	3	1	-	3
5	-	-	-	-	-	3	2	3	3	1	-	3

COURSE CONTENTS

Unit No.		No. of Hours	COs
Unit-I	**Introduction to Value Education & Harmony in human being**	12	1,2
	Value education and Skill education; Priority of values over skills; Implications of Value education; Self-exploration as the process for Value education; Basic human aspirations and their fulfillment; Understanding Human being as the coexistence of self and the body; Discrimination between the needs of the self and the body;		
Unit-II	**Harmony in the Family & Society**	12	3,4
	Family as the basic unit of human interaction; Understanding relationship; Feelings in relationship; Right feeling; Understanding Human Goal; Human Order; Dimensions of Human Order; Professions in a human society		
Unit-III	**Right Understanding in life and profession**	12	5
	Universal Human Values and Ethical Human Conduct; Professional Ethics in the light of right understanding; Holistic development towards Universal Human Order; Vision for Holistic technologies, Production systems and Management models; Journey towards Universal Human Order		

Text Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books Pvt. Ltd.
2. M. Govindrajan, S. Natarajan, V. S. Senthil Kumar, "Engineering Ethics (including Human Values)", Eastern Economy Edition, Prentice Hall of India, 2001

Reference Books:

1. B. P. Banerjee, "Foundations of Ethics and Management", Excel Books Pvt. Ltd.
2. P. L. Dhar, R. R. Gaur, "Science and Humanism", Commonwealth Publishers

3. M. K. Gandhi, “The Story of my Experiments with Truth”, Discovery Publisher
4. http://uhv.org.in/

Considering the specific nature of this course, the methodology is explorational and thus universally adaptable. In order to connect the content of this course with practice, minimum 6 group activities should be conducted with active involvement of the students. The continuous assessment should be strictly based on the participation of the students in these activities.

Community Engagement Project (CEME266)

Teaching Scheme		Examination Scheme	
Practical:	4 Hrs./ Week	**CIA**	20
Credits:	2	**End Sem Exam**	30
		Total:	50

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Prerequisite Course: active participation in extra-curricular activities

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Course Objectives: (Please specify Six Objectives)

1. To demonstrate the personal skills and team work
2. To demonstrate the communication and presentation skills
3. To demonstrate the leadership and event management skills

Course Outcomes (COs): At the end of the course, learner will be able to

COs	Course Outcomes	Bloom's Taxonomy	
		Level	Descriptor
CO1	Demonstrate the improvement in personal skills and team work	3	Apply
CO2	Demonstrate the improvement in communication and presentation skills	3	Apply
CO3	Demonstrate the improvement in leadership and event management skills	3	Apply

A) General Guidelines

1) CEP is group based activity.
2) A small technical topic will be allotted to each group.
3) Each group must select such a topic which will lead them to make a model.
4) Every group has to select topics relevant with national/international project competitions like Hackathon, Dipex and many more.
5) For ex., i) A working model
   ii) A product useful to the society
   iii) Modernization of existing laboratory set up
   iv) Computerization of existing setup
   v) Development of mobile app/mechanism
   vi) Applying IoT technique to the existing lab setup
   vii) Troubleshooting in existing system
6) Each group, then, will thoroughly study the topic with literature.
7) Each group will make a report and presentation based on project.
8) Students shall submit comprehensive project report after completing the work to the

satisfaction.

9) At last, the exhibition of all models by all groups will be held in department.
10) Based on group's performance, students will be evaluated.

B) Guidelines for group formation

1. One group contains only 3 or 4 students.
2. In one batch, 5 or 6 groups will be formed.
3. Groups will be formed either roll nos wise or by students willingness.

C) Guidelines for topics and guides

1. The batch faculty will be the guides for the respective batch.
2. The group can take any other expert faculty, than batch faculty, as co-guide.
3. Topics will be either suggested by guide/co-guide or will be selected by students.
4. The guide/co-guide will look for model making preparation, report writing and presentation.
5. The students are expected to utilize the laboratory resources before or after their contact hours.

D) Guidelines about evaluation and rubrics

1. The CEP work is evaluated based on oral presentation and the project report jointly by external and internal examiners appointed by the Head of the Department.
2. 2 credits shall be awarded to the candidate after the viva voce, project demonstration and report submission at the End of Semester.
3. The review committee may be constituted by the Head of the Department and the progress of the project shall be evaluated based on a minimum of two reviews.
4. The rubrics for evaluation is as follows:

Review-I (Total – 20 marks)

Attendance till review:	5 marks
Problem identification, problem statement and project work:	15 marks

Review-II (Total – 20 marks)

It shall be conducted based on implementation, testing, results, poster presentation, demonstration, whichever is applicable.

Both reviews will get averaged out of 20 marks

Attendance till review:	5 marks
Demonstration of Project Work and Final project report:	**15 marks**

Final Oral Examination: 30 Marks