SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY)
CBCS-NEW, STUDY & EVALUATION SCHEME
W.E.F. SESSION 2021-2022
B.Tech. II Year

MECHANICAL ENGINEERING

Programme Outcomes: Graduates will be able to:

PO1: Fundamentals: Apply knowledge of mathematics, science and engineering.
PO2: Problem analysis: Identify, formulate and solve real time engineering problems using first principles.

PO3: Design: Design engineering systems complying with public health, safety, cultural, societal and environmental considerations

PO4: Investigation: Investigate complex problems by analysis and interpreting the data to synthesize valid solution.

PO5: Tools: Predict and model by using creative techniques, skills and IT tools necessary for modern engineering practice.

PO6: Society: Apply the knowledge to assess societal, health, safety, legal and cultural issues for practicing engineering profession.

PO7: Environment: Understand the importance of the environment for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics, and responsibilities and norms of the engineering practice.

PO9: Teamwork: Function effectively as an individual and as a member or leader in diverse teams and multidisciplinary settings.

PO10: Communication: Communicate effectively by presentations and writing reports.

PO11: Management: Manage projects in multidisciplinary environments as member or a team leader.

PO12: Life-long learning: Engage in independent lifelong learning in the broadest context of technological change.

Programme Specific Outcomes:

PSO1: Identify, formulate and apply concepts acquired through Electronics & Communication Engineering courses to the real-world applications.

PSO2: Design and implement products using the cutting-edge software and hardware tools to attain skills for analyzing and developing subsystem/processes.

PSO3: Ability to adapt and comprehend the technology advancement in research and contemporary industry demands with demonstration of leadership qualities and betterment of organization, environment and society.

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CBCS-NEW, STUDY & EVALUATION SCHEME
W.E.F. SESSION 2021-2022
B.Tech. II Year (SEMESTER III)

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
1.	MA203TBS05	Statistical Methods	3	1	-	30	70	100	4
2.	ME203TPC01	Engineering Thermodynamics	3	1	-	30	70	100	4
3.	ME203TPC02	Fluid Mechanics	3	1	-	30	70	100	4
4.	ME203TPC03	Mechanics of Solids-I	3	1	-	30	70	100	4
5.	ME203TPC04	Manufacturing Processes	3	-	-	30	70	100	3
6.	ME203TMC02	Mandatory Course – Indian Knowledge System-I	1	-	-	-	-	-	-
		Total	**16**	**4**	**-**	**150**	**350**	**500**	**19**
PRACTICALS									
1.	ME203PPC01	Fluid Mechanics Lab	-	-	2	30	20	50	1
2.	ME203PPC02	Mechanics of Solids Lab	-	-	2	30	20	50	1
		Total	**-**	**-**	**4**	**60**	**40**	**100**	**2**
GRAND TOTAL			**16**	**4**	**4**	**210**	**390**	**600**	**21**

Total Credits : **21**
Total Contact Hour : **24**
Total Marks : **650**

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE –END SEMESTER EXAMINATION

ME203TBS05 – STATISTICAL METHODS

Unit I

Introduction to statistics , mathematical statistics , variable , frequency distribution , exclusive and inclusive class intervals type of series graphical representation histogram frequency polygon give measure of central tendency variation type of average, Mean median mode for grouped and un grouped data , geometric mean , harmonic mean , measure of description Skewness and Kurtosis.

Unit II

Curve fitting and Method of least square – straight line parabola correlation – scatter cliagrem's Karl Pearson's coefficient of correlation. Limits for correlation coefficient.Coefficient of correlation for bivariate frequency distribution, rank correction.Regression linear regression, Equation to the line of Regression. Regression coefficient, Angle between two lines of Regression

Unit III

Theory of Probability – Mathematical and statistical definition of probability Sample space finite sample space sample point, Events Theorem of total probability. Sample and compound event.Conditional probability.Theorem of compound probability. Boy's theorem. Use of binomial theorem.

Unit IV

Theoretically Distribution – Binomial Distribution Mean, Standard deviation and Pearson's β and γ coefficient. Poisson distribution, mean, variance normal Distribution.

Random and simple sampling – mean and standard deviation in simple sampling of attribute test of significance for large sample test of significance based on Chi square, T, F, and Z Distribution Degree of freedom, condition for applying

Unit V

Simulation Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation, simulation of Inventory system, simulation of Queuing system.

Text book:

1. Mathematical Statistics by M. Ray
2. S. C. Gupta and Kapoor – Fundamental of Mathematical Statistic
3. A.A. AFFI – Statistic Analysis
4. Probability & Statistics by Biswal, PHI

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME203TPC01	3	1	-	4 hrs	30	70	100	4

Engineering Thermodynamics

Course Objectives:

The objectives of the course are to make Students will able:

Understand the basic concepts of thermodynamics such as system, state, state postulate, equilibrium, process, and cycles.

Apply the first law of thermodynamics for simple open and closed systems under steady-state conditions.

Understand and apply entropy, availability, and irreversibility concepts to the basic thermodynamics devices.

To Derive simple thermodynamic relations of ideal and real gases.

Apply the rules for determining mixture properties to ideal-gas mixtures and real-gas mixtures.

Unit 1

Introduction, thermodynamic properties, equilibrium, zeroth and first laws of thermodynamics, work, and heat transfer interactions.

Unit 2

First law for a closed system, first law for an open system, second law of thermodynamics.

Unit 3

Entropy, Availability, exergy, and irreversibility

Unit 4

Thermodynamic relations, equilibrium, and third law.

Unit 5

Properties of Gases and Mixtures

Text/Reference Books:

Engineering Thermodynamics – P.K. Nag, McGraw Hill

Basic and Applied Thermodynamics – P.K. Nag, McGraw Hill

Fundamentals of Thermodynamics – Sonntag, Borgnakke, Van Wylen, Wiley

Thermodynamics-An engineering approach – Cengel and Boles, McGraw Hill

Course Outcome

1. Learn about the interrelationship of heat and work to draw an energy balance between a system and its surroundings.
2. Understands the concept of first law of thermodynamics.
3. Carry out Entropy and Exergy analysis of thermal systems to evaluate sustainability of practical equipment in industries.
4. Develop the Maxwell relations, which form the basis for many thermodynamic relations.
5. Apply the rules for determining mixture properties to ideal-gas mixtures and real-gas mixtures.

CO/PO Mapping (S/M/W indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	2	-	-	-	-	-	-	-	-	2	1	-
CO 2	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO 3	3	1	2	-	-	-	-	-	-	-	-		2	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	1	-
CO 5	3	1		-	-	-	-	-	-	-	-		2	-

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	TOTAL	Credits
ME203TPC02	3	1	0	4 hrs.	30	70	100	4

Fluid Mechanics

Course Objectives:

1. To familiarize with the properties of fluids and the applications of fluid mechanics.
2. To formulate and analyze problems related to calculation of forces in fluid structure interaction.
3. To understand the concept of fluid measurement, types of flows and dimensional analysis.
4. To understand boundary layer concepts and flow through pipes.

Syllabus Content:

UNIT-I:
Introduction and basic concepts, properties of fluids, pressures and fluid statics.

UNIT-II:
Fluid kinematics, fundamentals of flow visualization, vorticity and rotationality, Reynolds transport theorem, mass conservation, Bernoulli's and energy equations.

UNIT-III:
Flow in pipes, laminar and turbulent flow in pipes, minor and major losses, piping networks, flow measurements.

UNIT-IV:
Momentum analysis of fluid flow, linear and angular momentum, dimensional analysis and similitude.

UNIT-V:
Differential analysis of fluid flow, mass continuity and momentum equations, Navier-Stokes equations, Flow over bodies – drag and lift for flat plates, cylinders and spheres

Text/Reference Books:

1. Fluid Mechanics-Fundamentals and Applications – Cengel&Cimbala, McGraw Hill
2. An Introduction to Fluid Mechanics & Fluid Machines –Som& Biswas, McGraw Hill
3. Fluid Mechanics – FM White, McGraw Hill
4. Engineering Fluid Mechanics – K.L. Kumar, S.Chand& Co.

Course Outcome:

After successful completion of the course, the students shall be able to:-

1. State the Newton's law of viscosity and explain the mechanics of fluids at rest and in motion by observing the fluid phenomena.
2. Apply the Bernoulli equation to solve problems in fluid flows.
3. Analyze hydrostatic forces in submerged bodies.
4. Apply boundary layer theory to determine lift and drag forces on a submerged body
5. Create prototypes with the help of dimensional analysis.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME203TPC03	3	1	0	4 hours	30	70	100	4

MECHANICS OF SOLIDS-I

Course Objectives:

1. To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
2. To study the concept of shear force and bending moment.
3. To understand and apply the relation between moment, slope & deflection.
4. To identify the combined effect of torsion and bending.
5. To study about the strength of columns and the stress distribution in a cylinder.

Syllabus Content:

UNIT – I:

Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke's law, Poisson's ratio, shear stresses, stresses in the components subjected to multi-axial forces, thermal stresses, statically indeterminate systems.

UNIT – II:

Beams: Introduction of Beams, Various type of Beams, Various type of Supports, Reactions at supports, Shear force and bending moment at any section of a beam, Relation between Shear Force and Bending Moment, Point of contra-flexure.

Bending of beams: Bending of beams with symmetric section, boundary conditions, pure bending, and bending equation problems of simple bending.

UNIT- III:

Deflection of beam: Relation between slope deflection and radius of curvature, solution of beam deflection, problem by Macaulay's method, Direct integration method, Moment Area Method, Conjugate Beam method.

UNIT – IV:

Torsion: Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft, analysis of closed coil helical spring.

UNIT – V:

Principal stresses and strain: Transformation of plane stresses, Principal stresses, Maximum shear Stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principal Strains, Maximum shear strain.

Combined Loading: Components subjected to bending, torsion & axial loads.

Text/ Reference Books:

1. Elements of Strength of Material – S.P. Timoshenko & D.H. Young- AEWP
2. Strength of Materials by Sadhu Singh. 2. Strength of Materials by Sadhu Singh.
3. An Introduction of mechanics of solid by Crandall, Dahl &Lardnee Tata McGraw Hill
4. Advance Strength of Materials by L.S. Srinath
5. Mechanics of material by F.P. Beer & E.R. Johnson Jr. Tata McGraw Hil.
6. Engineering Mechanics of solids by Egor P. Popov., PHI
7. Introduction of solid mechanics by I. H. Shames

Course Outcome:

At the end of this course, students will demonstrate the ability to:

1. To get the knowledge of properties of material, stress, thermal stress and various mechanical components.
2. Able to understand how different components will fail under different types of load.
3. Understand the deflection/deformation behaviour due to different loading condition.
4. Able to apply concepts of stress, strain, principle stress in 1D, and 2D objects.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME203TPC04	3	-	-	3 hours	30	70	100	3

Manufacturing Processes

Course Objectives:

1. To understand various manufacturing processes & its classifications
2. To understand various Casting processes
3. To understand various welding processes
4. To understand various metal removal process
5. To appreciate the capabilities, advantages and the limitations of the processes

Syllabus Content:

UNIT-I:

Introduction and classification of manufacturing and type of current manufacturing processes:

Welding: Classification of welding process, basic principal & scope of application, Principle of Gas and electric arc welding, TIG& MIG processes and their parameters, characteristics of power sources, Polarity, soldering, brazing, electrodes, types & coatings, welding defects and remedies, Principle, equipment's & types of Resistance welding:.

UNIT-II:

Foundry: Moulding methods and materials, sand-clay-water system, additives, types of moulding sand and their properties, pattern making and types, pattern allowances and design considerations, core making.
Melting furnaces and practices: Melting cast iron, steel and nonferrous material, cupola, open furnaces, converter and crucible furnaces, electric, direct arc furnace and inductive furnace

UNIT-III:

Casting:
Elements of gating system-top gating, bottom gating, types of risers, solidification of casting, casting defects, clearing of casting, principle of die casting- gravity and pressure die casting, shell moulding, Centrifugal and investment casting
Plastic processing: injection, compression & blow moulding.

UNIT-IV:

Forming: mechanism of forming process, elastic and plastic deformation.
Rolling: classification, theories of Hot & Cold rolling, rolling mills & its types, calculation of rolling parameter & rolling defect, roll pass sequence.
Forging: Basic operations and their classification and defects.

Extrusion: Classification and principle of extrusion process, analysis of processes, drawing of rods, wire tube-analyses of wire drawing, tube drawing, defects in extrusion &

UNIT-V:

Sheet-metal working:
Role of sheet metal Components, description of cutting processes-blanking, piercing, stripper and stock guide, description of forming processes like bending, cup drawing, coining, embossing. **Basic elements of press-** classification, punch and die clearances, elements of die and punches, clearance, compound ,combination, progressive and inverted dies and their

Text/Reference Books:

1. R. A.Lindberg (1990), Processes and Materials of Manufacture, 4th Edition, PHI learning Publication.
2. Ghosh (2010), Manufacturing Science, second edition, East-West Press Pvt LTD.
3. A. Mubeen and M. Pervez (2012), Manufacturing Science, Edition: 1st, Publisher-Asian books private limited, ISBN: 818412167-9
4. P.N. Rao (2017), Manufacturing Technology, Vol.1, 4th Edition, Vol. 1, McGraw Hill Education.
5. P. N. Rao (2018), Manufacturing Technology-Foundry, Farming and Welding, 5th Edition, Vol. 1, McGraw Hill Education.
6. S. Kalpakjian and S. R. Schmid (2018), Manufacturing Engineering and Technology, SI Edition, Pearson publisher.

Course Outcome:

Students will try to learn:

1. To Acquired knowledge and hands-on competence in applying the concepts of manufacturing science in the design and development of mechanical systems.
2. Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
3. Work effectively with engineering and science teams as well as with multidisciplinary designs.
4. Skilfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SubCode	L	T	P	Duration	IA	ESE	Total	Credits
ME203PPC01	-	-	2	2-Hours	30	20	50	2

Fluid Mechanics LAB

Course Objectives

1. To practice basic programming features in SCILAB/MATLAB
2. To write program codes for solving elementary level problems in mechanical engineering
3. To develop GUI based codes for solving elementary problems in mechanical engineering
4. To apply the fundamentals of various courses and solve elementary engineering problems using computers

LABORATORY KITS

1. Apparatus for determination of metacentric height
2. Bernoulli's apparatus
3. Impact of jet apparatus
4. Venturimeter
5. Orificemeter
6. Pipe friction apparatus
7. Orifice apparatus
8. Mouth Piece apparatus with the provision for determination of hydraulic coefficient Cc, Cd & Cv
9. Vortex flow apparatus
10. Apparatus of head loss in various pipe fittings.
11. Reynold's apparatus
12. Complete setup for flow measurement using Pitot tube
13. Complete set for open channel apparatus

Course Outcomes

At the end of the course, the student shall be able to

1. Apply Bernoulli's principle in determining the coefficient of discharge of various flow meters
2. Compute the friction factor for fluid flow through set of pipes.
3. Analyze data using fluid mechanics principles and experimentation methods.

CO-PO Mapping

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SubCode	L	T	P	Duration	IA	ESE	Total	Credits
ME203PPC02	-	-	2	2-Hours	30	20	50	2

MECHANICS OF SOLIDS LAB

Course Objectives

1. To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
2. To study the concept of shear force and bending moment.
3. To understand and apply the relation between moment, slope & deflection.
4. To identify the combined effect of torsion and bending.

LABORATORY KITS

1. To study the Universal Testing Machine.
2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.
3. To study the Impact Testing Machine and test specimen of Izod and Charpy.
4. To determine Izod and Charpy Value of the given mild steel specimen.
5. To study the Torsion Testing Machine
6. To determine ultimate shear stress and modulus of rigidity under Torsion.
7. To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given
Material.
8. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
9. To study the Vickers Hardness Machine and to conduct a hardness test on the machine.

Course Outcomes

At the end of this course, students will demonstrate the ability to:

5. To get the knowledge of properties of material, stress, thermal stress and various mechanical components.
6. Able to understand how different components will fail under different types of load.
7. Understand the deflection/deformation behaviour due to different loading condition.
8. Able to apply concepts of stress, strain, principle stress in 1D, and 2D objects.

CO-PO Mapping

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Weightage: **1-Sightly;**
2-Moderately; 3-Strongly

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B.Tech. II Year (SEMESTER IV)

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
1.	MA204TBS06	Numerical Analysis & Computer Programming	3	1	-	30	70	100	4
2.	ME204TPC05	Applied Thermodynamics	2	1	-	30	70	100	3
3.	ME204TPC06	Kinematics Of Machinery	2	1	-	30	70	100	3
4.	ME204TPC07	Mechanics Of Solid-II	3	1	-	30	70	100	4
5.	ME204TPC08	Machine Tool Technology	3	-	-	30	70	100	3
6.	ME204TPC09	Materials Science & Metallurgy	3	-	-	30	70	100	3
		Total	**16**	**4**	**-**	**180**	**420**	**600**	**20**
PRACTICALS									
1.	ME204PPC03	Manufacturing Processes Lab	-	-	2	30	20	50	1
2.	ME204PPC04	Computer Aided Machine Drawing	2	-	2	30	20	50	3
		Total	**2**	**-**	**4**	**60**	**40**	**100**	**4**
GRAND TOTAL			**18**	**4**	**4**	**240**	**460**	**700**	**24**

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted. L-LECTURE,T-TUTORIAL,P-PRACTICAL, ESE –END SEMESTER EXAMINATION

SubCode	L	T	P	Duration	IA	ESE	Total	Credits
MA204TBS06	**3**	**1**	**-**	**4-Hours**	**30**	**70**	**100**	**4**

NUMERICAL ANALYSIS & COMPUTER PROGRAMMING

Unit-I

Approximation and errors in ComputationApproximation and round of errors, truncation errors and Taylor series, Determination of roots ofpolynomials and transcendental equations by Graphical methods and Bisection, Regula-falsi, secantand Newton-Raphon methods, solution of Linear simultaneous, linear algebraic equations bygauss Elimination Gauss-Jordan and Gauss-Siedel iteration method.

Unit -II

Empirical Laws, Curve Fitting & InterpolationCurve fitting linear and non-linear regression analysis (Method of group average and leastsquares) finite differences, backward, forward and central difference relation and their use inNumerical differentiation and integration and their application in interpolation.

Unit -III

Numerical Solution of Ordinary Differential EquationsNumerical Integration by Trapezoidal rule, Simpson's (1/3rd & 3/8th) rule and its errorestimation. Application of difference relations in the solution of partial differential equations.Numerical solution of ordinary differential equations by Taylor's series, Euler, modified Euler, Runge-Kutta and Predictor-Corrector method.

Unit -IV

Numerical Solutions of partial differential EquationsDepartment of Mechanical Engineering, School of Engineering & Technology, GGV, Bilaspur (C.G.)Introduction, classification of second order equations, finite difference approximations to partialderivatives, elliptic equations, solution of Laplace equation, solution by Poisson's equation,solution of elliptic equations by relaxation method, parabolic equations, solution of onedimensionalheat equation, solution of two-dimensional heat equation, Hyperbolic equations,solution of wave equation.

Unit -V

Computer ProgrammingI/O Statement, Mathematical Relational & Conditional statement & Expressions. Switch Loops andControl Statement. Introduction to one dimensional array and two dimensional arrays. Basic of I/Ofile Handling. C-Programming indicating numerical methods.

Text Books:

1. Numerical Methods in Engineering & Science-Dr.B.S.Grewal-Khanna Publishers, 6th Edn.2004.
2. Numerical Methods-P.Kandasamy,K.Thilagavathy& K. Gunavathy-S Chand& Co.,2Nd Rev. Edn.-2003
3. Let us C-Yashwantkanitkar
4. Introductory Methods of Numerical Analyisi-S.S.Sastry, 3rd Edn.-PHI-New Delhi,2003
5. Numerical Methods Analysis-James B.Scarborough, 6th Edn. Oxford & IBH Publishing Co.-New Delhi

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204TPC05	3	1	-	4 hrs	30	70	100	4

Applied Thermodynamics

Course Objective:

1. Evaluate and analyze the performance of open and closed gas power cycles.
2. Introduce the concept of a pure substance. Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data.
3. Analyze vapor power cycles for power generation. Investigate ways to modify the basic Rankine vapor power cycle to increase the cycle thermal efficiency.
4. Introduced the concepts of reversed Carnot cycle and vapor and absorption refrigeration cycle (VCR).
5. Explain the significance of Mach number on compressible fluid flow

Unit 1

Gas power cycles – Carnot, Stirling Ericsson, Air standard, Otto, Diesel, Dual Brayton cycles, Aircraft propulsion.

Unit 2

Properties of pure substances, thermodynamic processes for pure substance, steam tables, charts of thermodynamic properties.

Unit 3

Vapor Power cycles, Rankine cycle, regenerative cycle, exergy analysis of vapor power cycles binary vapor cycles.

Unit 4

Refrigeration cycles – reverses heat engine cycle, vapor compression, vapor absorption, gas refrigeration cycle, production of solid ice, Psychometrics.

Unit 5

Compressible fluid flow – stagnation properties, one dimensional steady isentropic flow, critical properties, shocks, introduction to kinetic theory of gases

Text/Reference Books:

Engineering Thermodynamics – P.K. Nag, McGraw Hill
Basic and Applied Thermodynamics – P.K. Nag, McGraw Hil

Fundamentals of Thermodynamics – Sonntag, Borgnakke, Van Wylen, Wiley
Thermodynamics-An engineering approach – Cengel and Boles, McGraw Hill

Course Outcome

1. Understand and explain the basic concepts and fundamental laws of thermodynamics to model the performance of various gas power cycles. Solve problems based on the Otto, Diesel, Stirling, and Ericsson cycles
2. Introduce the concept of a pure substance. Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data and be able to apply them to real thermodynamics problems.
3. Apply Rankine cycle to steam power plant and compare few cycles improvement method.
4. Evaluate the performance of refrigerators and heat pumps.
5. Develop relations of compressible flow encountered when gas flow at high speed. Learn about the shock wave and the variation of flow properties across the shock wave.

CO/PO Mapping
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO 3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	1	1	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204TPC06	2	1	-	3 hours	30	70	100	3

Kinematics of Machinery

Course Objectives:

1. Understand the fundamentals of mechanisms, and related terminologies.
2. Construct the velocity and acceleration diagram for a given mechanism.
3. Classify different types of gear and gear trains.
4. Identify different types of cam-followers.
5. Analyze different types of Clutches and Brakes.

Syllabus Content:

UNIT-I:

Mechanisms: Introduction and basic concepts, Mechanism and Machines, Links, kinematics pair, kinematics chain, degree of freedom & constrained motion, inversion of slider crank mechanism, four bar chain, etc. equivalent linkage, mechanism with lower pairs, pantograph

UNIT-II:

Velocity & Acceleration Analysis: Plane motion, absolute and relative motion, velocity and acceleration of a point, velocity and acceleration of a mechanism by relative velocity diagram, Coriolis components.

UNIT-III:

Gears & Gear Trains - Classification of gears, conjugate action, law of gearing, involutes and cycloidal tooth's profiles, interference and undercutting, contact ratio, gear train

UNIT-IV:

Cams & Followers: Classification of cam and follower, types of follower motion, uniform, simple harmonic, parabolic, cycloid, Cam's profile by graphical method.

UNIT-V:

Clutch & Brakes: Clutch: Calculations on single plate and multi plate clutch, cone clutch Brakes: Analysis of simple brakes assuming uniform pressure and uniform wear, band brake, block brake, internal shoe brake.

Text/Reference Books:

1. Mechanism of machines By Ghosh and Mallick East West Press
2. Theory of machine by S.S. Ratan TMGH
3. Theory of Machine by Thomas Beven, C.B.S. Publications
4. Theory of Machine by A. G Ambedkar, PHI
5. Theory of Machines by J.E. Shigley, Tata McGraw Hill Publishers

Course Outcome:

Students are able to:

1. Understand the basic concept of mechanisms.
2. Construct the velocity and acceleration of a mechanism.
3. Classify different types of Gear and Gears Trains.
4. Identify the working of different types of cam-followers.
5. Analyze different types of Clutches and Brakes.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204TPC07	3	1	0	4 hours	30	70	100	4

MECHANICS OF SOLIDS-II

Course Objectives:

1. To study different strain energy methods for finding the deflection of an elastic structure.
2. To study the continuous and fixed beams subjected to different loading conditions.
3. To determine the bending stresses in curved beams and stresses in axisymmetric circular members.
4. To calculate the bending stresses and deflections of beams under unsymmetrical loading, compute the shear centre for various sections and compute the crippling load and equivalent length for various types of columns of different end conditions.
5. To determine the stresses in thin and thick pressure vessels.

Syllabus Content:

UNIT – I:

Energy Methods: Introduction, Strain energy, Elastic strain energy in tension, compression, bending and torsion. Impact loading in tension and bending, Theorem of Castigliano and its applications, Reciprocal relations, Maxwell -Betti theorem.

UNIT – II:

Fixed Beams: Fixed beam subjected to different types of loads and couples, Calculations of fixing moments and reactions at supports, deflection. Effect of sinking of support.

Continuous beams: Continuous beams subjected to different type of loads and couples, beams with overhang, beams with one end fixed, Clapeyron's theorem. Effect of sinking of supports.

UNIT- III:

Bending of curved bars: Bending of curved bars in plane of loading, Winkler- Bach theory, crane hooks, chain links, bending of circular bars subjected to symmetric loading, bending of circular rings, stresses in circular rings.

UNIT – IV:

Unsymmetrical Bending: Introduction to unsymmetrical bending, Stresses and deflection in unsymmetric bending, Shear center for angle, Channel and I-sections.

Columns: Struts and Columns, Stability of columns, Euler's formula for different end conditions, Equivalent load, Eccentric loading, Rankine's formula.

UNIT – V:

Thin Pressure Vessel: Thin Pressure Vessels, Circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure.

Thick Pressure Vessel: Introduction, Lames Theorem, Thick Pressure vessels subjected to internal pressure, External Pressure & both, compound cylinders.

Text/ Reference Books:

1. Mechanics of Material – J. M. Gere and S. P. Timoshenko – CBS publisher
2. Strength of Materials by Sadhu Singh.
3. An Introduction of mechanics of solid by Crandall, Dahl & Lardnee Tata McGraw Hill.
4. Advance Strength of Materials by L.S. Srinath
5. Mechanics of material by F.P. Beer & E.R. Johnson Jr. Tata McGraw Hil.
6. Engineering Mechanics of solids by Egor P. Popov., PHI
7. Introduction of solid mechanics by I. H. Shames
8. Elements of Strength of Material – S.P. Timoshenko & D.H. Young- AEWP

Course Outcome:

At the end of this course, students will demonstrate the ability to:

1. Apply various strain energy methods to calculate the deflection in elastic members.
2. Compute the fixing moments, support reactions and deflection for fixed and continuous beams.
3. Analyse the curved beams and calculate the stresses and strains in rotating circular members.
4. Compute the stresses and deflections of beams under unsymmetrical loading, locate the shear centre in beams and analyse the crippling load and equivalent length for various types of columns of different end conditions.
5. Able to distinguish between thin and thick pressure vessels. Analyze the stresses in thin and thick walled pressure vessels and also sketch the radial pressure distribution and hoop/longitudinal stress distribution across the section of the pressure vessel.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204TPC08	3	-	-	3 hours	30	70	100	3

MACHINE TOOL TECHNOLOGY

Course Objectives:

6. To understand various manufacturing processes & its classifications
7. To understand various Casting processes
8. To understand various welding processes
9. To understand various metal removal process
10. To appreciate the capabilities, advantages and the limitations of the processes

Syllabus Content:

UNIT-I:

General purpose machine tools, mechanics, tools, geometry and chip formation, surface finish and machinability.

UNIT-II:

Machine tool: Generation and machining principles, setting and operations on machines: lathe, milling, shaping, slotting, planning, drilling, boring, broaching, grinding, gear cutting.

UNIT-III:

Tooling: Jigs and Fixtures, principles of location, clamping, indexing and design of simple jigs and fixtures.

UNIT-IV:

Batch production: NC Part programming. CNC machines, Finishing: Micro finishing, Introduction to 3D and 4D printing

Extrusion: Classification and principle of extrusion process, analysis of processes, drawing of rods, wire tube-analyses of wire drawing, tube drawing, defects in extrusion &

UNIT-V:

Non-conventional machining: EDM, LBM, EBM, ECM, USM, AJM, Rapid prototyping

Text/Reference Books:

1. Manufacturing technology (Vol.-I & II) by P.N. Rao Tata McGraw Hill Publishers.
2. Manufacturing Engg. And technology by S. Kalpakjian& S.R. Schmid, Addision Wesley Longman, New Delhi
3. Manufacturing science By A. Ghosh& A.K. Mallik East West Press Pvt. Ltd New Delhi
4. Manufacturing Process by O P Khanna Dhanpat Rai Publication
5. A Textbook of Production Engineering by Dr P C Sharma S Chand Publications
6. Metal Working Technology Narayanaswamy. R, , PHI

Course Outcome:

Students will able to:

1. Student will be able to choose machining processing to manufacture any component
2. Student will be able to Estimate machining time for milling and drilling process.
3. Student will be able to understand finishing processes
4. Student will be able to calculate forces during orthogonal metal cutting.
5. Student will be able to design jig and .fixture for given component

Course Outcomes and their mapping with Programme Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	P SO2	PSO3
CO1	2	2	2	1	-	-	-	-	2	-	-	2	2	1	2
CO2	2	2	2	1	-	-	-	-	2	-	-	2	3	1	2
CO3	2	2	2	1	-	-	-	-	2	-	-	2	3	1	2
CO4	2	2	2	1	-	-	-	-	2	-	-	2	3	1	2
CO5	2	2	2	1	-	-	-	-	2	-	-	2	3	1	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME05TPC09	**3**	**-**	**-**	**3**	**30**	**70**	**100**	**3**

MATERIALS SCIENCE & METALLURGY

Course Objectives:

1. To understand various mechanical properties of materials.
2. To understand how and why the properties of materials are controlled by its structure at the microscopic and macroscopic levels.
3. To understand how and why the structure and composition of a material may be controlled by processing.
4. To understand the inter-relationship between composition, structure and properties of engineeringmaterials.
5. Get knowledge about different materials, their properties and application.

Syllabus Content:

UNIT – I:

Introduction: Classification of engineering Materials, metals, non-metals, plastics, ceramics and composites. Crystalline structure of solids: concepts of unit cell and space lattice, miller indices, crystal structure determination by X-ray diffraction. Crystal structure of ferrous and non-ferrous metals, crystalimperfections.

Plastic Deformation: Mechanisms of plastic deformation, role of dislocation, slip and twinning, slip mechanism, strain hardening.

UNIT – II:

Phase Diagrams, Phases, phase rules, concept of equilibrium, Phase diagram, lever rule, eutectic, eutectoid, peristaltic and peritectoid systems, iron–carbon diagram, and simplified IC diagram. Heat Treatment Isothermal Transformation of austenite (TTT diagram), Transformations of austenite upon continuous cooling, annealing, normalizing, hardening, tempering, hardenability of steel, Surface hardening, tempering, case hardening, Jominy test for hardenability, recovery, recrystallization and grain growth, Age hardening.

UNIT- III:

Corrosion: Principles of corrosion forms of corrosion, factors affecting the rate of corrosion. Corrosiveagents and protection against corrosion.

Creep: Introduction to creep mechanism, creep curves, creep resistant materials, introduction tofatigue, cold working of metals and hot working.

UNIT – IV:

Engineering Materials: Ferrous: Cast irons, carbon and alloy steels and their coding, Non-ferrous: Aluminum, copper, nickel, chromium, zinc, lead, tin, tungsten, etc. and their alloys. Classification, structure, general properties and applications of polymers, ceramics and composites.

UNIT – V:

Powder Metallurgy: Characteristics of metal powder, Particle size, shape and size distribution, Characteristics of powder mass such as apparent density, tap density, flow rate, friction conditions. Properties of green compacts and sintered compacts. Machining, milling, atomization, electro-deposition, reduction from oxide, carbonyl process, production of alloy powders. Powder rolling, powder forging, powder extrusion and explosive forming technique.

Text/ Reference Books:

1. Raghavan, Material Science and Engineering.
2. Swamp, Elements of Metallurgy.
3. P N Rao, Manufacturing Technology (Vol. I & II).
4. Amitabha Ghosh & Asok Kumar Malik, Manufacturing Science

Course Outcome:

At the end of this course, the students will be able to

1. Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.
2. Understand concept of mechanical behavior of materials and calculations of same using appropriate equations
3. Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions
4. Understand and suggest the heat treatment process & types. Significance of properties. Introduce the principle of corrosion and creep, and factors affecting them.
5. Understanding the different process of Powder metallurgy, steps involved during the process and the characteristics of Metal powder.

Course Outcomes and their mapping with Programme Outcomes:

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204PPC03	-	-	2	2-Hours	30	20	50	1

Manufacturing Processes Lab

Course Objectives

1. Understand practical orientation of manufacturing processes.
2. Knowledge on different kinds of production processes and practices available for shaping or Molding several daily used parts for industries..
1. Prepare assembly drawings, sectional views and bill of materials for selection of equipment for various manufacturing processes will be understood.

LABORATORY

1. To study the Practice in Welding Shop
2. To study the Practice in Machine Shop
3. To study the Practice in Machining Shop
4. To study the Practice in Shaper Planner Machine
5.

Course Outcomes

At the end of this course, students will demonstrate the ability to:

1. Select suitable tools and equipment to prepare joints using bench-work tools.
2. Create joints using materials of specific shape and size by a suitable set of operations and check the accuracy of shape and dimensions.
3. Create model of different prototypes using carpentry, sheet metal and welding.
4. Demonstrate practical understanding of ARC welding lap and butt joint
5. Demonstrate practical understanding MIG welding exercises

CO-PO Mapping

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ME204PPC04	2	-	2	4-Hours	30	20	50	3

Computer Aided Machine Drawing Lab

Course Objectives

1. To familiarize with the standard conventions for different materials and machine parts in working drawings.
2. To gain knowledge of conventional representation of various machining and mechanical details as per IS.
3. To gain knowledge of threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and knuckle joint.
4. To make part drawings including sectional views for various machine elements.
5. To prepare assembly drawings given the details of part drawings.

LABORATORY

Part A: Drawing of Machine Elements and simple parts

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling,

Part B: Assembly Drawings

Drawings of assembled views for the part drawings of the following using conventions and Easy drawing proportions.
1. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector

Course Outcomes

1. Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
3. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
4. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
5. Title boxes, their size, location and details - common abbreviations and their liberal usage. Types of drawings – working drawings for machine parts.

CO-PO Mapping

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**