

K.L.N. COLLEGE OF ENGINEERING

Pottapalayam - 630612, Sivagangai District

(An Autonomous Institution, Affiliated to Anna University, Chennai)



Estd: 1994

FOURTH SEMESTER

CURRICULUM AND SYLLABUS

REGULATIONS 2024

For under Graduate Program

B.E. MECHANICAL ENGINEERING

(For the students admitted from the academic year 2024-2025 onwards)

Dr.P.Udhayakumar,
Professor & Head,
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Pottapalayam, Sivaganga – 630612



K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
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VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry.

VISION OF THE DEPARTMENT

To become a centre of excellence for Education and Research in Mechanical Engineering

MISSION OF THE DEPARTMENT

- Attaining academic excellence through effective teaching learning process and state of the art infrastructure.
- Providing research culture through academic and applied research.
- Inculcating social consciousness and ethical values through co-curricular and extra-curricular activities.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1** Graduates will have successful career in Mechanical Engineering and service industries.
- PEO2** Graduates will contribute towards technological development through academic Research and industrial practices.
- PEO3** Graduates will practice their profession with good communication, leadership, ethics and social responsibility.
- PEO4** Graduates will adapt to evolving technologies through life-long learning.

PROGRAM SPECIFIC OUTCOMES(PSOs)

- PSO1** Derive technical knowledge and skills in the design, develop, analyze and manufacture of mechanical systems with sustainable energy, by the use of modern tools and techniques and applying research based knowledge.
- PSO2** Acquire technical competency to face continuous technological changes in the field of mechanical engineering and provide creative, innovative and sustainable solutions to complex engineering problems.
- PSO3** Attain academic and professional skills for successful career and to serve the society needs in local and global environment.



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Knowledge and Attitude Profile (WK)

- WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.



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Program Outcomes (POs)

- PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7).
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)



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B.E. MECHANICAL ENGINEERING
REGULATIONS 2024
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS
SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	24BS401	Probability, Statistics and Numerical Methods <small>(Common to B.E Mech & EEE programmes)</small>	BS	4	3	1	0	4
2.	24ME401	Kinematics and Dynamics of Machines	PC	4	3	1	0	4
3.	24ME402	Machine Tool Technology	PC	3	3	0	0	3
4.	24ME403	Thermal Engineering	PC	4	3	1	0	4
5.	24ME404	Engineering Materials and Metallurgy	PC	3	3	0	0	3
THEORY CUM PRACTICAL								
6.	24ME405	Metrology and Measurement Practices	PC	5	3	0	2	4
PRACTICAL								
7.	24ME4L1	Machine Tool Technology Laboratory	PC	3	0	0	3	1.5
8.	24ME4L2	Thermal Engineering Laboratory	PC	3	0	0	3	1.5
9.	24HS4L1	Aptitude and Soft Skills – III <small>(Common to all B.E./B.Tech. programmes)</small>	EEC	2	0	0	2	1*
TOTAL				31	18	3	10	25

***The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA**

24BS401	PROBABILITY, STATISTICS AND NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the basic concepts of Probability and Statistics.
- To introduce the numerical methods for solving algebraic and transcendental equations and interpolation in various intervals.
- To acquaint the knowledge of various Numerical methods of solving ordinary differential equations.

UNIT - I PROBABILITY AND RANDOM VARIABLES 9+3

Probability –Axioms of probability- conditional probability – Baye’s theorem (Without Proof). Discrete and continuous random variables- Moments-Moment generating function – Binomial, Poisson and Normal distributions (Except derivations).

UNIT - II INTRODUCTION TO STATISTICS, CORRELATION AND REGRESSION 9+3

Measures of Central tendency- Mean-Median-Mode- Measures of Dispersion- Standard deviation -Coefficient of Variation- Correlation – Coefficient of correlation –Rank Correlation- Regression –Estimation of Regression line.

UNIT - III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterativemethods of Gauss Jacobi and Gauss Seidel - Eigen values of a matrix by Power method.

UNIT - IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolations – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT - V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods : Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne’s and Adams - Bash forth predictor corrector methods for solving first order equations.

TOTAL: 45+15 = 60 PERIODS

TEXT BOOKS:

1. Gupta.S.C., Kapoor.V.K., "Fundamental of Mathematical Statistics", Sultan chand & Sons Educational Publishers ,New Delhi, Reprint 2013
2. Grewal.B.S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, 10th Edition, 2015.

REFERENCES:

1. Johnson. R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw Hill, New Delhi , 2006.
3. Sastry. S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2018.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 5th Edition, New Delhi, 2007.
5. Veerarajan.T , Ramachandran. T, "Numerical Methods With Programs In C", Tata Mcgraw Hill Publishing Company Limited, 8th Edition, Reprint 2011.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: PROBABILITY, STATISTICS AND NUMERICAL METHODS		Course Code: 24BS401	
CO	Course Outcomes	Unit	K- CO
C209.1	Build the parameters of statistical distributions using basic probability theory concepts.	I	K3
C209.2	Compute the measures of central tendency, measures of dispersion to locate the central points and to know the amount of diversity in the distribution.	II	K3
C209.3	Solve algebraic and transcendental equations.	III	K3
C209.4	Solve numerical differentiation and integration using numerical techniques.	IV	K3
C209.5	Apply numerical techniques to solve the ordinary differential equations with initial and boundary conditions with engineering applications.	V	K3

24ME401	KINEMATICS AND DYNAMICS OF MACHINES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To study the basic components of mechanisms, analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and design cam mechanisms for specified output motions.
- To study the basic concepts of toothed gearing and kinematics of gear trains.
- To understand the cam mechanisms for specified output motions.
- To analyze the force-motion relationship in components subjected to external forces and analyzing of standard mechanisms.
- To Analyzing the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations

UNIT-I KINEMATICS OF LINKAGE MECHANISMS 9+3

Classification of mechanisms-Kinematic link, pair and chain , classification of Kinematic pairs, Degrees of freedom, Spatial relations Degrees of Freedom Velocity and acceleration analysis of four bar mechanism and slider crank mechanism by vector polygons: Angular velocity and angular acceleration of links

UNIT-II KINEMATICS OF CAM MECHANISMS 9+3

Classification of cams and followers, Terminology and definitions. Displacement diagrams, Uniform velocity, parabolic, simple harmonic and cycloidal motions.

UNIT-III GEARS AND GEAR TRAINS 9+3

Gear – Types and profile – nomenclature of gears – laws of gearing, Gear trains, Speed ratio, train value, Parallel axis gear trains, Epicyclic Gear Trains - algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear train

UNIT- IV STATIC AND DYNAMIC FORCE ANALYSIS 9+3

Applied and Constrained Forces, Free body diagrams – Static Equilibrium conditions , Static Force analysis in simple machine members , Dynamic Force Analysis , Inertia Forces and Inertia Torque, D’Alembert’s principle, superposition principle, Dynamic Force Analysis in simple machine members

UNIT -V BALANCING AND VIBRATION 9+3

Static and Dynamic balancing, Balancing of revolving and reciprocating masses, Balancing machines, Free vibrations, Equations of motion, natural Frequency, Damped Vibration, bending critical speed of simple shaft, Torsional vibration, Forced vibration, Modal analysis for Vibration

TOTAL:45+15 = 60 PERIODS

TEXT BOOKS:

1. Dr. R. K. Bansal , “Theory of Machines”, Laxmi Publications Pvt Ltd., New Delhi, 5th edition,2023.
2. Rattan, S.S, “Theory of Machines”, 5th Edition, Tata McGraw-Hill, 2019.

REFERENCES:

1. Ramamurthi. V, “Mechanics of Machines”, Narosa Publishing House, 3rd edition 2019.
2. Robert Norton., “Kinematics and Dynamics of machinery” 1st Edition., McGraw Hill India., 2009
3. Rao and Dukkipati, R.V, “Mechanism and Machine Theory”, New Age International Pvt. Ltd., 2010.
4. Thomas Bevan, “Theory of Machines”, CBS – 3rd Edition, 2010.
5. Amitabha Ghosh, Asok Kumar Mallik, “Theory of Mechanisms and Machines” East West Press, 2020.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: KINEMATICS AND DYNAMICS OF MACHINES		Course Code: 24ME401	
CO	Course Outcomes	Unit	K- CO
C210.1	Calculate Degrees of Freedom and determine the velocity and acceleration for simple mechanisms.	I	K3
C210.2	Develop the cam profile for various types of followers.	II	K3
C210.3	Determine the speed, torque, tooth load and contact ratio of gear pair and gear trains.	III	K3
C210.4	Calculate static and dynamic forces of mechanisms using free body diagram and D'Alembert's principle.	IV	K3
C210.5	Calculate the balancing masses and compute the frequency of free vibration and forced vibration using Modal analysis	V	K3

24ME402

MACHINE TOOL TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the mechanics of metal cutting, tool materials and tool life.
- To gain knowledge about the working principles of turning, shaping, planning, milling, drilling and grinding machines.
- To calculate the process parameters such as cutting speed, feed, Depth of Cut & machining time.
- To understand the working principle of CNC machine tools.
- To gain knowledge about CNC Programming.

UNIT - I THEORY OF METAL CUTTING

9

Mechanics of chip formation, Cutting forces in orthogonal and oblique cutting, Merchant circle diagram and measurement of cutting forces, Types of chips, single point cutting tool – nomenclature, cutting tool materials, tool wear, tool life and Taylor's equation, variables affecting tool life, Thermal effects, cutting fluids and Machinability.

UNIT - II TURNING MACHINES

9

Centre lathe and Capstan and turret lathe: constructional features, specification, lathe accessories, operations, Machining Time calculation, Automats: single spindle: swiss type, multi spindle

UNIT - III SPECIAL PURPOSE MACHINE TOOLS

9

Shaping, Planning, Drilling, Milling Machines: Classification, Constructional features (Horizontal Shaper and Planner, Radial & Bench Drilling machines, Column and Knee & Vertical Milling machine), specification, driving mechanisms, operations, Machining Time calculation Gear cutting: Indexing calculations in milling machine, Gear hobbing, Gear shaping processes.

UNIT - IV GRINDING AND FINISHING OPERATIONS

9

Constructional features (cylindrical, surface, centreless and internal grinding), specification, Operations, Selection of grinding wheel, mounting, glazing & loading, dressing, balancing, Machining Time calculation, honing, lapping, polishing and buffing.

UNIT - V CNC MACHINES

9

Computer Numerical Control (CNC) machine tools – Construction and working principle - CNC programming – Lathe ,Milling and drilling -G codes M codes

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters 2016
2. Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools" (Vol. – II), 4th Edition, Tata McGraw-Hill, New Delhi, 2019.

REFERENCES:

1. Chapman, W.A.J., Workshop Technology, Vol - II, Oxford & IBH Publishing Co. Ltd., 2019
2. HMT, "Production Technology", Tata McGraw Hill, 28th Reprint, 2008.
3. Philip F. Oswald, and Jairo Munoz, "Manufacturing Process and Systems", John Wiley India Edition, 11th Edition, Reprint 2016.
4. Mikell P. Groover, "Fundamentals of Modern Manufacturing", Wiley India Edition, 5th Edition, Reprint, 2016.
5. Milton C. Shaw, —Metal Cutting PrinciplesII, Oxford University Press, 4th Edition, 2016.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: MACHINE TOOL TECHNOLOGY		Course Code: 24ME402	
CO	Course Outcomes	Unit	K- CO
C211.1	Describe the theories of metal cutting and calculate cutting tool life, machining time and cutting forces in metal machining.	I	K3
C211.2	Identify accessories and tools required to perform a particular operation in centre and semi-automatic lathes.	II	K3
C211.3	Describe the constructional and operational features of various special purpose machine tools.	III	K3
C211.4	Discuss the process of grinding and other surface finishing operations.	IV	K3
C211.5	Discuss the need and process of CNC machines.	V	K3

24ME403

THERMAL ENGINEERING

L	T	P	C
3	1	0	4

OBJECTIVES:

- To understand different thermodynamic cycles.
- To understand the working and Performance parameters of IC engines.
- To understand the various Refrigeration systems and Coefficient of performance of Refrigeration systems.
- To understand the importance of Psychrometric process and Air conditioning systems.
- To understand the single stage and multistage air compressors.

UNIT - I GAS AND VAPOUR POWER CYCLES 9+3

Classification of IC engines, Working of two and four stroke engines, Valve and Port timing diagrams. Air Standard Cycles - Otto, Diesel, Dual. Cycle Analysis, Performance and Comparison. Vapour power cycle - Rankine cycle

UNIT - II INTERNAL COMBUSTION ENGINE: COMBUSTION AND PERFORMANCE 9+3

Fuels for IC engines, Combustion in SI and CI engines, Knocking and detonation – phenomena and control. Engine exhaust emissions and air pollution, Emissions control technique. Performance parameters and calculations. Morse and Heat Balance tests.

UNIT - III REFRIGERATION SYSTEMS 9+3

Refrigerants, Vapour compression refrigeration cycle- Super heating, Sub cooling. Performance calculations. Vapour absorption refrigeration system – Ammonia - water, Lithium bromide - water.

UNIT - IV PSYCHROMETRIC PROCESSES AND AIR CONDITIONING SYSTEMS 9+3

Psychrometric process, Air conditioning system – Working principles and concept of RSHF, GSHF, ESHF, Cooling Load calculations

UNIT - V RECIPROCATING AIR COMPRESSOR 9+3

Compressors, Classification of compressors, Performance of reciprocating air compressor, Effect of clearance volume. Multi stage reciprocating air compressor. Optimum intermediate pressure for perfect inter cooling, Compressor mean effective pressure.

TOTAL: 45+15 = 60 PERIODS

TEXT BOOKS:

1. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 10th Edition, 2018.
2. Nag.P.K., Engineering Thermodynamics, 6th Edition, Tata McGraw-Hill, New Delhi 2017

REFERENCES:

1. Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 7th Edition, Tata McGraw Hill, 2010
2. Sonntag, R.E., Borgnakke, C., and Van Wylen, "Fundamentals of Thermodynamics", 7th Edition, Wiley Eastern Ltd, 2009.
3. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8th Edition, 2003.
4. Sarkar, B.K, "Thermal Engineering" Tata McGraw-Hill Publishers, 2007
5. Rudramoorthy, R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: THERMAL ENGINEERING		Course Code: 24ME403	
CO	Course Outcomes	Unit	K- CO
C212.1	Calculate efficiency of gas and vapour power cycles.	I	K3
C212.2	Determine the performance of IC Engines.	II	K3
C212.3	Calculate performance of refrigeration cycles.	III	K3
C212.4	Compute cooling load using Psychrometric chart.	IV	K3
C212.5	Determine the performance of Reciprocating Air Compressors.	V	K3

24ME404	ENGINEERING MATERIALS AND METALLURGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
- To learn selecting and applying various heat treatment processes and its microstructure formation.
- To illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.
- To illustrate the different polymer, ceramics and composites and their uses in engineering field.
- To learn the various testing procedures and material characterization in engineering field.

UNIT - I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 9

Constitution of alloys – Solid solutions, substitutional and interstitial, phase Iron – Iron carbide equilibrium diagram, Isothermal transformation diagrams, cooling curves superimposed on I.T. diagram, continuous cooling Transformation (CCT) diagram Classification of steel and cast-Iron microstructure, properties and application.

UNIT - II HEAT TREATMENT 9

Full annealing, normalizing, hardening and tempering of steel. carburizing, Nitriding, cyaniding, Flame and Induction hardening

UNIT - III FERROUS AND NON-FERROUS METALS 9

Effect of alloying additions on steel , stainless and tool steels, HSLA, Maraging steels, alloy cast irons, Copper and its alloys, Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys, shape memory alloys, Properties and Applications

UNIT - IV NON-METALLIC MATERIALS 9

Polymers, Ceramics, Composites- Matrix and reinforcement Materials-applications of Composites - Nano composites, Bio materials, Semiconductors.

UNIT - V MECHANICAL PROPERTIES AND MATERIAL CHARACTERIZATION 9

Testing of materials under tension, compression and shear loads – Hardness tests, Impact test fatigue and creep failure mechanisms.
Introduction to Material characterization: Macroscopic and Microscopic observations, Principles of Optical and Electron microscopy (SEM and TEM)

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kenneth G.Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 9th edition, 2018.
2. Sydney H.Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 1994.

REFERENCES:

1. A. Alavudeen, N. Venkateshwaran, and J. T. Winowlin Jappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2. Amandeep Singh Wadhwa, and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3. G.S .Upadhyay and Anish Upadhyay, “Materials Science and Engineering”, Viva Books Pvt.Ltd, New Delhi, 2020.
4. Raghavan. V, “Materials Science and Engineering”, Prentice Hall of India Pvt.Ltd. 6th edition, 2019.
5. George Dieter, Mechanical Metallurgy, Tata McGraw-Hill, 3rd Edition, New Delhi, 2013

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: ENGINEERING MATERIALS AND METALLURGY		Course Code: 24ME404	
CO	Course Outcomes	Unit	K- CO
C213.1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.	I	K3
C213.2	Explain different heat treatment processes.	II	K3
C213.3	Clarify the effect of alloying elements on ferrous and non-ferrous metals.	III	K3
C213.4	Summarize the properties and applications of non-metallic materials.	IV	K3
C213.5	Explain the testing of mechanical properties and material characterization.	V	K3

24ME405	METROLOGY AND MEASUREMENT PRACTICES	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To make the students, familiar with characteristics of generalized measurement system limits, fits and tolerances.
- To relate various types of comparators, linear and angular measurement of part.
- To understand the principles of interference, principles of form measurement.
- To understand the methods of measurements of power, flow, temperature, speed, acceleration.
- To gain practical knowledge on dimensional measurement techniques such as linear and angular measurement of part, and physical measurement techniques such as force, torque, temperature, surface finish measurements and inspection methods using calipers, comparators, gauges and measuring machines.

UNIT - I BASICS OF METROLOGY 9

Basics of Measurement- significance, generalized measuring system, Standards, Precision, Accuracy, Sensitivity, Repeatability, Reproducibility, Linearity, Calibration, Errors-Systematic and Random, Uncertainty of Measurement,

LAB COMPONENT 6

1. Calibration and use of Vernier caliper, Micrometer.
2. Calibration and use of Vernier height gauge.

UNIT - II LINEAR AND ANGULAR MEASUREMENT 9

Linear Measuring Instruments –Internal/ External calipers, vernier caliper, vernier height gauge, depth gauge Comparators - mechanical, optical, electrical/electronic and pneumatic comparators, advantages, limitations and field of applications.

Angular measuring instruments – Types – Bevel protractor clinometers, angle gauges, spirit levels, sine bar

LAB COMPONENT 6

1. Measurement of linear dimensions using comparators.
2. Measurement of angles using Bevel protractor and Sine bar.

UNIT - III FORM MEASUREMENT 9

Principles and methods of straightness, flatness, roundness and roughness measurement, Screw Thread Measurement, Gear Measurement. Principles of measurement using Tool Maker’s microscope, profile projector.

LAB COMPONENT 6

1. Measurement of screw thread parameters using Three wire method (Floating carriage micrometer).
2. Measurement of screw thread parameters using Profile Projector, Tool Maker’s Microscope.
3. Measurement of gear parameters using Gear tooth Vernier caliper.

UNIT - IV ADVANCED METROLOGICAL MEASUREMENTS 9

Angle dekkor, Autocollimator optical flats, optical interferometer and laser interferometer, Coordinate Measuring Machine (CMM) Machine vision for metrology

LAB COMPONENT 6

1. Testing of straightness of a machine tool guideway using Autocollimator.
2. Measurement of features in a prismatic component using Coordinate Measuring Machine (CMM)

S.No.	Name of the Equipment	Quantity
1.	Micrometer	5Nos.
2.	Vernier Caliper	5Nos.
3.	Vernier Height Gauge	2Nos.
4.	Vernier depth Gauge	2Nos.
5.	Slip Gauge Set	1No.
6.	Gear Tooth Vernier	1No.
7.	Sine Bar	1No.
8.	Floating Carriage Micrometer	1No.
9.	Profile Projector/Tool Makers Microscope	1No.
10.	Mechanical/Electrical/Pneumatic Comparator	1No.
11.	Autocollimator	1No.
12.	Temperature Measuring Setup	1No.
13.	Force Measuring Setup	1No.
14.	Torque Measuring Setup	1No.
15.	Coordinate measuring machine	1No.
16.	Surface finish measuring equipment	1No.
17.	Bore gauge	1No.
18.	Telescope gauge	1No.

24ME4L1

MACHINE TOOL LABORATORY

L T P C
0 0 3 1.5

OBJECTIVES:

- To practice the various operations that can be performed in Lathe.
- To gain practical knowledge about shaper and milling machines.
- To understand the various grinding processes.
- To practice gear cutting methods
- To write CNC programs for Machining processes.

LIST OF EXPERIMENTS

1. External Thread cutting in lathe
2. Eccentric Turning in lathe
3. Square Head Shaping
4. Spur gear cutting in milling machine
5. Helical gear cutting in milling machine
6. Contour milling in vertical milling machine
7. Gear generation in gear hobbing machine
8. Gear generation in gear shaping machine
9. Surface grinding and Cylindrical grinding
10. Simple CNC Programming – Lathe and Milling

TOTAL: 45 PERIODS

S. No.	Name of The Equipment	Quantity
1	Centre Lathes	7
2	Shaper	1
3	Horizontal Milling Machine	1
4	Vertical Milling Machine	1
5	Surface Grinding Machine	1
6	Cylindrical Grinding Machine	1
7	Centerless grinding machine	1
8	Gear Hobbing Machine	1
9	Gear Shaping machine	1
10	CNC Lathe	1
11	CNC Milling machine	1

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: MACHINE TOOL LABORATORY		Course Code: 24ME4L1	
CO	Course Outcomes	Exp.No	K- CO
C215.1	Perform various operations in Lathe.	1,2	K3
C215.2	Perform shaping and milling operations.	3,4	K3
C215.3	Generate gear profile using milling, gear hobbing and gear shaping machines.	5-8	K3
C215.4	Use grinding machine for surface finishing operations on simple parts.	9	K3
C215.5	Develop CNC programming for the simple components produced in CNC lathe and CNC milling.	10	K3

24ME4L2 THERMAL ENGINEERING LABORATORY

L T P C
0 0 3 1.5

OBJECTIVES:

- To understand the working and performance of I.C.Engines.
- To measure properties of lubricants
- To measure COP of refrigerator.
- To determine COP of an air conditioner.
- To understand the working of air compressor.

LIST OF EXPERIMENTS

1. Valve Timing diagrams of four stroke diesel engine and Port Timing diagrams of two stroke petrol engine.
2. Determination of Flash Point, Fire Point and viscosity of various fuels / lubricants.
3. Determination of p-v diagram of IC engine using Data acquisition system.
4. Performance Test on 4 – stroke Diesel Engine.
5. Heat Balance Test on 4 – stroke Diesel Engine.
6. Retardation Test on a Diesel Engine.
7. Morse Test on Multi-cylinder Petrol Engine.
8. Determination of COP of a refrigeration system.
9. Determination of COP of an air conditioning system.
10. Performance test on a reciprocating air compressor

TOTAL: 45 PERIODS

S.No.	Name of the equipment	Quantity
1	I.C Engine – 2 stroke and 4 stroke model	1
2	Apparatus for Flash and Fire Point	1
3	Viscometer	1
4	Engine with data acquisition system	1
5	4-stroke Diesel Engine	3
5	Multi-cylinder Petrol Engine	1
6	Refrigeration test rig	1
7	Air-conditioning test rig.	1
8	Reciprocating air compressor.	1

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name: THERMAL ENGINEERING LABORATORY		Course Code: 24ME4L2	
CO	Course Outcomes	Exp.No	K- CO
C216.1	Draw the Valve Timing and Port Timing diagrams by using I.C Engine – 2 stroke and 4 stroke models.	1	K3
C216.2	Measure the value of Flash and Fire Point and viscosity of fossil fuels/lubricants.	2	K3
C216.3	Determine the performance of I.C. engines.	3-7	K3
C216.4	Determine the Coefficient of Performance (COP) of refrigeration and Air conditioning systems.	8,9	K3
C216.5	Calculate the volumetric efficiency of reciprocating air compressor	10	K3

24HS4L1

APTITUDE AND SOFT SKILLS - III

L	T	P	C
0	0	2	1

Module I LOGICAL REASONING SKILLS

10

Logical Reasoning, Letter and Symbol series, Number series, Analyzing arguments, Making judgments, Logical Reasoning, Direction Sense test, Venn diagrams, Seating arrangements, Cause and effect, Blood relation test, Dice Logical, verbal puzzles, Analytical puzzles and sudoku.

Module II BEHAVIOURAL SKILLS

5

Interview Etiquettes - Body language, Dress code, Eye contacts, Handshakes for Interview - Interview handling – Mock Interview Videos - High Frequency words in resume and interviews - Visual Interpretation – HR Interview question – Sell yourself - Interpersonal and intrapersonal communication

Module III VERBAL SKILLS

15

Vocabulary basics, Grammar basics, Critical Reasoning, Reading comprehension, Synonyms, Antonyms, Idioms and phrases - sentence completion, Spotting errors, Error correction, Sentence correction, Writing Resume, Letter writing, Official mail correspondence - Ways to communicate in different scenarios-job interview, business meeting, project proposal submission, informal gathering, speech for a large audience and debate.

TOTAL: 30 PERIODS

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1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – Abijith Guha, TMH
3. Quantitative Aptitude for Cat – ArunSharma, TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mc graw Hill Education, 2010