Shri Rawatpura Sarkar University Raipur

Examination Scheme & Syllabus

For

Diploma in Mechanical Engineering

Semester-V

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Three Years Diploma Programmme
Scheme of Teaching and Examination
Diploma Fifth Semester Mechanical Engineering
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the session: 2022-23)

S.N	Course Code	Course Title	Hours per week			Credit	Examination Scheme			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1.	DENME501T	Theory of machines	3	1	-	4	**30**	**70**	**100**	**3**
2.	DENME501P	Theory of machines-Lab	-	-	4	2	**15**	**35**	**50**	**-**
3.	DENME502T	Machine tool technology	3	1	-	4	**30**	**70**	**100**	**3**
4.	DENME503T	Design of machine element	3	1	-	4	**30**	**70**	**100**	**3**
5.	DENME504T	Computer aided design and manufacturing	3	1	-	4	**30**	**70**	**100**	**3**
6.	DENME504P	Computer aided design and manufacturing-Lab	-	-	4	2	**15**	**35**	**50**	**-**
7.	DENME505T	Metrology & instrumentation	3	1	-	4	**30**	**70**	**100**	**3**
8.	DENME505P	Metrology &instrumentation –Lab	-	-	4	2	**15**	**35**	**50**	**-**
9.	DENME506P	Industrial training /seminar	-	-	4	2	**15**	**35**	**50**	**-**
						28			**700**	

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Course Title	**THEORY OF MACHINE**				
Course Code	**DENME501T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Theoretical parts of machines elements.				
Course objectives	• Understand the fundamentals of the theory of kinematics and dynamics of machines. • Understand techniques for studying motion of machines and their components. • Use computer software packages in modern design of machines.				
Course Contents	**UNIT–I** **Simple Mechanism & velocity acceleration** Introduction of theory of machines, Definitions- statics, dynamics, Kinematics, Kinetics Kinematic pair, Kinematic chain, Machine, Structure Mechanism, Mechanism Inversion Relation between number of links, joints and pairs Four Bar chain and its inversion Slider Crank chain and its inversions. Concept of Relative and Absolute velocity, Angular and linear velocity of a point on a link, Instantaneous center of a link, its properties and uses, Acceleration of a link-centripetal, tangential, total, relative & absolute accelerations, Velocity and Acceleration diagrams for four bar and other mechanisms, Klein's construction for single slider crank mechanism, Analytical method of calculating the velocity and acceleration of piston in a reciprocating engine mechanism. **UNIT–II** **Friction & Flywheel, Crank Effort Diagrams** Pivot & collars friction, Power lost assuming uniform pressure and uniform wear, Clutch-need, classification, construction & working of single & multiplate clutches, Power transmitted by single and multiplate clutches, Brakes -need, types, braking force, braking torque, Band brakes, block brakes, Internally expanded brakes, Dynamometer-meaning, need types, Simple numerical calculation in above items. Dynamics of reciprocating engine mechanism, Inertia force due to reciprocating mass, Piston effort, crank effort, turning moment of Crankshaft, Analytical and graphical methods of construction of turning moment diagrams for Steam and I.C. engines, Fluctuation of energy and speed, Coefficient of fluctuation of energy and speed, Principle and application of Flywheel,103 Calculation of moment of inertia, weight of flywheel for steam and I.C.Engines.				

	UNIT–III **Power Transmission & Gears** Drives meaning, classification, Belt, chain and rope and gear drives, Flat and „V" belt, Ratio of tensions, Slip, Length of belt calculation for open and cross belt drives, Power transmitted, Effect of centrifugal force, centrifugal, tension, Total tension, Maximum stress in belt, Maximum Power transmitted. Velocity for maximum Power condition, V-belt drives Advantages and disadvantages, Rope drives – types, Ratio of tensions, Designation of ropes as per B.I.S,Chain drives:- classification, Designation of chain drives as per B.I.S. Types of Gears Simple and compound Gear Train Epicyclic Gear Train Law of Gearing, Interference Minimum number of teeth calculation for pinion and wheel to avoid interference Planet and Sun Gear. **UNIT–IV** **Governor, Cams & Followers** Function of Governer & its comparison with flywheel, Classification -Watt, Porter, Proell and Hartnell, their construction and working, Sensitivity, stability, Isochronism power and effort. Need, Classification, Motion of follower, Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration, simple harmonic motion, Cam profile for radial, effect knife edged follower **UNIT–V** **Balancing of Machine Parts & Vibrations** Concept, Static and dynamic balancing of rotating parts, Simple numerical problems on static balancing of several masses in single plane-graphical and analytical method. Introduction, elements of vibration. System classification and explanation of the types of vibration according to the actuating force on the body like undamped vibration, free damped vibration, forced undamped vibration and forced damped vibration. Classification and explanation of the type's vibration according to the number of degrees of freedom. Natural frequency of free vibrations: Critical speed of shaft.
Course Outcomes	• Distinguish kinematic and kinetic motion. • Identify the basic relations between distance, time, velocity, and acceleration. • Apply vector mechanics as a tool for solving kinematic problems. • Create a schematic drawing of a real-world mechanism..

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Text Books	1. J.M.Shah and H.M.Jadhwani- Theory of Machines 2. Abdulla Shariff- Theory of Machines 3. D.R.Malhotra- Theory of Machines 4. P.L.Ballaney- Theory of Machines
References Books	1. Thomas Bevan.- Theory of Machines 2. Khurmi & Gupta- Theory of Machines 3. S.S.Ratan- Theory of Machines

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Course Title	**MACHINE TOOL TECHNOLOGY**				
Course Code	**DENME502T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Basic Mechanical Engineering Machine tool design and materials				
Course objectives	• Acquire the knowledge of engg. Metrology and its practice which is having increasing importance in industry. • Specifically makes the student to improve applications aspect in the measurements and control of process of manufacture • Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.				
Course Contents	**UNIT–I** **Metal Cutting & Lathe Machine** Need of machine tool technology and it's use Material removal processes, Types of machine tools, Stages in cutting, factors affecting cutting, Types of chips, Continuous, discontinuous & built up edge(BUE), BUE formation condition and its effect upon surface finish Definition of cutting force, feed force, radial force power requirement for each type of force, Tool geometry and influence of tool angles, Desirable properties of cutting tool. Material and their influences on the choice of tools materials. Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, Types of cutting fluids. Cutting variables, tool wear and tool life, Tools life specifications, Taylor"s tool life equation Cutting speed calculation, Economics of metal cutting. Basic difference between central lathe, turret and capstan lathes, Working principle and types of automatic, work holding and tool holding devices, Tooling layout of capstan and turret Lathe indexing and bar feeding mechanism of capstan and lathes. **UNIT–II** **Boring machine, Milling Machines & Processes** Types of horizontal and vertical boring machines, Constructional features and working control features, Jig boring machine, its construction operation and application. Definition of milling, Classification of milling machine part and their functions, Types of table movement in universal milling machine, 124 Specification of milling M/C, Conventional and climb milling and different milling operations and applications, Milling cutters and tools angles, Classification of cutting tool materials, Use of arbor, collect and adopters machine attachment, Methods of mounting the cutter, work holding devices, dividing heads, direct simple, angular and differential indexing selection Cutting speed, feed and Depth of cut **UNIT–III** **Grinding & Finishing Processes Unconventional Machining** Definition of grinding and action in grinding, Types of abrasive materials and				

	their properties, Bonding materials, Grinding wheel classification, Condition for selection of grinding wheels, Balancing of grinding wheels, Glazing, loading dressing and Trueing. Principles of working of grinding machines and functions of main parts, Types of grinding processes, Function of tool and work holding devices, feed arrangement, Table drive in surface and cylindrical grinders, Types of lubricants and coolants used in Grinding, Grinding defects, their remedy and safety practices, Definition of micro finishing, honing, lapping, super finishing methods, Equipments involved, materials used, Tolerances obtained and limitations, Application of honing and lapping processes. Need for unconventional methods, Limitation of conventional machining, Scope of the Electro chemical machining process and limitations, Scope and limitation of ultra sonic machining process. **UNIT–IV** **Special purpose machines Jigs and Fixtures** Difference between forming and generation of gears, Principle of gear shaping hobbing and shaving, Principle of machining, rate of production, accuracy and limitations of these methods, Thread production use of die for threading, thread rolling & thread Milling, Broaches, Definition of broaching, Broaching machines, their working principles, advantages and limitations, Machining centers, transfer lines. Definition and functions of jigs and fixtures, Location of components by dowel pins and buttons, bushes and restrainer screws, Design criteria for simple jigs and fixtures, Selections criteria for method of preparation of jigs and fixtures. **UNIT–V** **Machine Tools and Testing of Machine Tools** Definition and Classification of machine tools, Requirement of machine tools, Drive systems stepped and step-less, drives, Advantages and limitations of the gear box drive, Function of feed box, types of feed gear boxes and advantages, Working principles of straight line motion, Control systems- multi handle, single lever and pre selective control system Need for leveled concrete foundation, Effect of foundation on accuracy of the product and life of the machine, Effect of weight of machine, soil bearing capacity and loading pattern upon foundation, Industrial safety, Selection of proper lifting devices for leveling of machines after grouting Instruments and aids required for testing the accuracy of machine, Load testing and product testing, Understanding of test chart and check list.

Course Outcomes	• Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting. • Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine. • Design locating and clamping devices to produce a component.
Text Books	1. Young- Manufacturing processes. 2. Suresh deleia- Manufacturing science & technology vol.I & II 3. Hazara Chaudhary- Workshop technology vol.I and II
References Books	1. Raghuvanshi- Workshop technology vol.I and II 2. Rousnoff- Manufacturing processes. 3. Chapman- Workshop technology vol.I and II

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Course Title	**DESIGN OF MACHINE ELEMENTS**				
Course Code	**DENME503T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Basic Mechanical Engineering.				
Course objectives	• To introduce students to the design and theory of common machine elements and to give students experience in solving design problems involving machine elements. • To synergize forces, moments, torques, stress and strength information to develop ability to analyze, design and/or select machine elements – with attention to safety, reliability, and societal and fiscal aspects. • To require the student to prepare professional quality solutions and presentations to effectively communicate the results of analysis and design				
Course Contents	**UNIT–I** **Introduction to machine design & Joints** Introduction to machine design, Basic design requirements for machine parts, 119 Factor influencing design of machine elements-strength, stiffness, light weight, wear resistance, minimum size, availability, processibility, safety, and compliance with standards, Basic design procedure, Types of failures, types of forces, types of loading, Common designation of materials, I.S. codes and values of tensile, compressive and shear strengths for commonly used materials. Function and application of Cotter Joints, Knuckle Joints, Members subjected to tensile, compressive and shear load, Design of Cotter Joint, Design of Knuckle Joint. **UNIT–II** **Design of Shaft and Axle Keys and Coupling** Types of keys and its uses, Design of rectangular, square key and splines, Types of coupling, Design of flanged coupling, protective type flanged coupling. Types of lever, bell crank lever, Design of bell crank lever, Design of C-clamp, Machine element subjected to bending-pulley arm, girder beam etc. Design of pulley arm, Materials of pulley arm. **UNIT–III** **Design of Levers and Pulley Arm, Helical, Leaf Spring** Types of lever, bell crank lever, Design of bell crank lever, Design of C-clamp, Machine element subjected to bending-pulley arm, girder beam etc. Design of pulley arm, Materials of pulley arm Function of spring, Types of spring and its uses, Terminology used in spring design, Design of Helical spring, Design of semi-elliptical leaf spring, Introduction of helper spring, initial gap.				

Board of Studies

Dr. AJAY KUMAR GUPTA

Mr. RAJ KUMAR BHARTI

	UNIT–IV **Belt and Rope Drives, Rivetted Joints** Comparative advantages and disadvantages of belt and rope drive, Belt tension, tension ratio, Power transmitted by belt, Calculation of thickness and width of belt, Design of rope drive, Materials selection for belt and rope drive Types of fasteners –temporary and permanent, Types of rivetted joint-lap and butt joint, Definition of common terms like pitch, back pitch, diametral pitch, efficiency and margin, Types of failure in a rivetted joints, Derivation of equation for checking the failure of a rivetted joint, Design of a single and double row lap & butt joint for a given tensile load, Efficiency of rivetted joint. **UNIT–V** **Design of Welded & Threaded Joints, Selection of Bearing** Advantages of welding over rivetting, Types of welded joints, Strength of the butt -weld, types of fillet joints and strength of fillet joint, Types of threads and their proportions, Types of bolts, Proportion of nut -bolt dimensions, Design of bolt, Designation of threads as per I.S. codes. Types of bearing, Radial and axial load, equivalent load, Static and dynamic capacity, Selection of bearing, Calculation of bearing life.
Course Outcomes	• Apply the collaborative and social aspects of research and writing processes • Comprehend that research and writing is a series of tasks, including accessing, retrieving, evaluating, analyzing, and synthesizing appropriate data and information from sources that vary in content, format, structure, and scope • Use appropriate technologies to organize, present, and communicate information to address a range of audiences, purposes, and genres. • Explain the relationships among language, knowledge, and power including social, cultural, historical, and economic issues related to information, writing, and technology.
Text Books	1. P.L. Balleny - Machine design 2. Abdul sheriff- Design of machine elements 3. G.R. Nagpal - Machine design
References Books	1. Sharma Agarwal- Machine design 2. R.S. Khurmi - Machine design 3. Padey & Shah- Machine design

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<table>
<tr><td>Course Title</td><td colspan="5">CAD/CAM</td></tr>
<tr><td>Course Code</td><td colspan="5">DENME504T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic Mechanical graph and design measurements and Engineering.</td></tr>
<tr><td>Course objectives</td><td colspan="5">• This course is to teach the theory and tools of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) with an emphasis on the central role of the geometric model in their seamless integration.
• It focuses on the integration of these tools and the automation of the product development cycle.
• It is to introduce geometric modeling techniques, data structure design and algorithms for solid modeling. It also covers the machining theory, automated CNC machining, and process control.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT–I
Introduction of CAD and drawing
Computer Aided Drafting Concept, List of various CAD Software, Components of Auto CAD 2000 window such as Tool bar, standard tool bar, menu bar, Setting drawing units, limits, Grid, and snap searing the life opening on existing file, Drawing basic activities like Line, Circle, Arc, and Polygon etc, Using object Snap like END POINT, MID POINT, INTERSECTION, and CENTER POINT etc.
UNIT–II
Editing Viewing Drawing and Dimensioning
Selecting objects selection set with its option Like, Pick box, Window, Crossing, Previous, Add Remove, Editing commands like Erase, Copy, Array, Mirror, Break, Fillet etc., Display Command like Zoom All, 400 Previous 400 Extents etc., Concept of Layers. Concept of Block. Types of dimension Linear, Horizontal, Vertical, Aligned, and Rotated, Text Style, Selecting Font Size, Alignment, TEXT:- Style key Line text, Multilane text, Text Style, Selecting font size, Alignment.
UNIT–III
Working with Three Dimensional Entities using Auto CAD & Solid Modeling
Right hand rule. Specifying coordinates using x,y,z Co-ordinates, using x,y,z filters, Entering cylindrical Co-ordinates, Entering Spherical Co-ordinates, Defining user-do ordinate system, world Co-ordinate system. Concept of solid modeling, Creating predefined solid primitives such as box, core, cylinder, sphere, tours, and wedge, Construction a region using Region Command, Creasing and extruded solid, creasing reveled solid, Creating Composite solids using union, intersection and interfere commands, Creating cross</td></tr>
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	sections of solid with section command. Using solid EDIT command with its option, Creating filets and chamfers on solids. **UNIT–IV** **Printing Plotting Drawing, Introduction to Conventional Numerical Control** Selecting various parameters such as paper size, paper units, Drawing orientation, Plot Scale. Plot Offset, Plot area, and Print preview. Introduction, Basic components of NC system, The NC procedures, NC coordinates systems, NC motion control systems, Applications of Numerical control and potential applications of NC machine tools **UNIT–V** **Introduction to Conventional Part Programming Numerical Control** Purpose of part programming, steps of part-programming, Difference between manual and computer assisted part programming, Difference between language based and CAD package-based part programming Classification of NC Controller technology as: - Computer numerical control. Direct numerical control. Adoptive control machining systems.
Course Outcomes	• explain the concepts and underlying theory of modeling and the usage of models in different engineering applications • Create accurate and precise geometry of complex engineering systems and use the geometric models in different engineering applications • Compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development
Text Books	1. Daniel Raker and Harbest Rice, BPB publications, Delhi (Latest edition.- Inside AUTO CAD 2. Donald D. Voisinet (2nd Fd.), MC. Grow-Hill-Introduction to computer Aided Drafting 3. BPB publication, Delhi-Mastering Auto CAD
References Books	1. Marthin, E.L.B.S-Numerical control 2. by D.J. Bowman, and R.N. MC Douglas , BPB Publications, Delhi-.Understanding CAD/DAM Design with computer

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Course Title	**METROLOGY AND INSTRUMENTATION**				
Course Code	**DENME505T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Mechanical measurements and Engineering.				
Course objectives	• Select suitable instrument / gauge / method of inspection for determining geometrical and dimensional measurements. • Calibrate measuring instruments and also design inspection gauges. Understand the advances in Metrology such as use of CMM, Laser, and Machine Vision System for Metrology etc. • Select and apply appropriate Quality Control Technique for given application				
Course Contents	**UNIT–I** **Simple Inspection & Measurement Concept** Meaning and application of inspection, daily life example of inspection, concept of inspection as applied to daily life and industries, Effect of absence of inspection in an industry, Classification of inspection function, meaning and advantages of each concept of inspection applied to metrology. Definition/ meaning of precision, its accuracy and error, Differentiation between precision measurement in industry, meaning of standard inspection and specification, relationship between cost and accuracy, Interchange ability and selective assembly Limits, fits and tolerance definition, Selection of fit, calculation of fundamental deviation, limit of sizes, selection of limit of sizes, selection of limits, tolerances and allowances. **UNIT–II** **Linear & Angular Measurements** Standards of length, Classification and use of slip gauges, wringing process, Gauge block calibration precautions to be observed while using gauge blocks, classification of linear measuring instrument direct and indirect, Construction and working of Vernier caliper, micrometers- outside and inside and depth, vernier height gauge, dial vernier and dial height gauge identification of parts, finding least count, precautions of each type, types of errors, Dial gauge types construction, principle, accuracy and precaution to be observed in handling, field of application, Comparators principle, type, working, use field of application of Mechanical, Electrical, Optical and Pneumatic comparators selection specific work , Measuring Machine-type, application limitations, working principle, Interferon meters type, working principle, and applications. Classification- direct and indirect, Protractor- vernier and optical, universal- working use and limitation, precautions, Angle blocks-set size, accuracy, calibration, method of measuring unknown angle and checking				

know angle, Sine bar- common types, use in actual practice for finding out known and unknown angle, Sprit level- types, use field of application, sensitivity, Clinometers types, working principle, accuracy, Angle Dakar-type, Principle of working method, field of application

UNIT–III

Concepts of Testing and surface roughness

Concept of square ness, flatness, square ness & Roundness, Straight edge method,Light gap and feeler gauge method, Wedge method, Precision level method, Auto collimator method, squarness- - indicator method, Square tester, Auto collimator method, Determination of straightness, flatness, squarness of a given piece, Use of v- block and dial indicator for determining roundness. Definition of primary and secondary texture, Real surface, geometrical surface, effective surface, Real profile, geometrical profile, effective profile, Reference line, lay, traversing length, sampling length, mean time, Center line of profile, "M" and "S" system of surface assessment, Salient features, merits and demerits of each basic unit of indication surface roughness- CL No. R.M.S., Ten point height, Interpretation of units graphically and mathematically, Types of surface measuring instruments, Method of surface measurement stylus skid, stylus pressure, Mechanical amplification, Tomlinson Mechanical surface finish recorder working principle, 109 Electrical amplification, Principle of current generating type and voltage variation type stylus instrument, Profilographits units, advantage, working principle, surface inspection by comparison methods (a) Touch inspection (b) Visual inspection (c) Scratch inspection (d) Microscope inspection – Limitations.

UNIT–IV

Screw Thread& Gear Measurements

Type of screw threads, Threads nomenclatures, Errors in screw thread pitch errors, Progressive and periodic instrument, Equipment reuired for measuring pitch, effective diameter and angle – procedure, advantages, limitation and precautions of each method, Limit gauges for screw thread measurement, procedure, Advantages and limitation of catch Gauge, Precautions observed while using a limit gauge. Types of gears, Gear nomenclature, Gear elements requiring measurement, Necessity of measuring gear elements accuracy, Types of gear tests, Different method of inspecting gear tooth from, Measurement of chordal thickness & constrict chord using vernier tooth caliper, Gear tooth profile check- involutes testing M/C- principle and uses, Electricity-Tests - Principle and use, Parkerson gear tester principle and use.

UNIT–V

Limit Gauges & Transducers Temperature Measurements

Definition of gauge and gauging, Necessity of gauging in industrial practice, Gauges types- according to use (shop, Inspection and reference gauge) type

	fixed limit, indicating and combination, Specific use (Screw pitch, gauge, template, feeler gauge- and their uses,application identification, selection and precautions, Working tolerance of gauges, Maximum and minimum metal conditions of tolerances, Calculation maximum and minimum metal conditions from given tolerances, tolerance frames and their use, selection and specification as per IS, 2251, 3455, 3484, Wear allowances and its selection for design Taylor‟s principle for design of "Go and NOGO" gauges, Application of principal, deviation, calculation of gauge dimensions from formula given in IS 3455, Meaning, function, Primary and secondary transducers, Classification – Mechanical Electrical, Active, Passive, Advantages of Electrical transducer, Working principle and application of resistance type, inductance type, capacitance type and piezo electric type, Transducers for pressure, temperature and flow measurement. Principle on which temperature measuring device work, Example of each type Temperature range, Various instruments/devices used, Bimetal thermometer, pressure spring thermometer, resistance thermometer, thermo meter working principle, range, Materials used and their characteristics, application, Comparison of resistance thermometer and thermister, Thermo couple principle, material working compensating lead, working range, Methods of measuring output i.e. mill voltmeter, potentiometer – application, comparison of various thermocouple, Pyrometer- redial and optical- working principle, construction, advantages, limitations, application in industrial situation, Types of error in temperature measurement (instrument error, thermal probe error)- reasons and effects of these errors way of reducing error.
Course Outcomes	• Understand the methods of measurement and selection of measuring instruments, standards of measurement • Identify and apply various measuring instruments • Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design • Recommend the Quality Control Techniques and Statistical Tools appropriately Analyze the Data collected
Text Books	1. R.K. Jain-Engineering Metrology 2. Kennedy-Inspection & Gauging 3. K.J. Hume,- Engineering Metrology
References Books	1. R.J. Sweeny, Jon wiley & sons-Practical Metrology 2. Beejwith & Buck, Addison-Metrology & gauging

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Course Title	**THEORY OF MACHINE-LAB**				
Course Code	**DENME501P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Basic Mechanical Engineering & Theory parts of machine.				
Course objectives	• Understand the fundamentals of the theory of kinematics and dynamics of machines. • Understand techniques for studying motion of machines and their components.				
Course Contents	**LIST OF PRACTICALS / TUTORIALS: -** 1. Identification, sketching & diagrams with labeling of various simple mechanisms such as Minidrafter, Manual Typewriter, bicycle brake, bicycle rear wheel Rachet mechanism, foot operated pump, Internal expanding brakes of two or four wheelers. 2. Four problems on velocity & Acceleration by relative velocity method and instantaneous center method to be solved graphically on sheet. 3. To determine velocity & Acceleration of a slider in slider crank mechanism by Klein‟s construction. 4. To draw cam profile for • Simple Harmonic Motion • Uniform acceleration & deceleration both for knife edge & roller follower. 5. Determine rotating mass to balance different rotating masses on different planes on an experimental four plane balancing machine. 6. To analyze sources of unbalancing in working model of single cylinder I.C. Engine. 7. Study & analysis of valve operating mechanism of an IC engine. **8.** Analysis and study of gears in the following (any two)- • Sugar cane crushing machine, • Differential of automobile • Gear box of two wheelers • Hand Drilling Machine				
Course Outcomes	• Distinguish kinematic and kinetic motion. • Identify the basic relations between distance, time, velocity, and acceleration. • Apply vector mechanics as a tool for solving kinematic problems. Create a schematic drawing of a real-world mechanism.				

Board of Studies

Dr. AJAY KUMAR GUPTA

Mr. RAJ KUMAR BHARTI

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Course Title	**CAD/CAM- LAB**				
Course Code	**DENME504P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Basic knowledge of computer and Machine tool design etc.				
Course objectives	• This course is to teach the theory and tools of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) with an emphasis on the central role of the geometric model in their seamless integration. • It focuses on the integration of these tools and the automation of the product development cycle. • It is to introduce geometric modeling techniques, data structure design and algorithms for solid modeling. It also covers the machining theory, automated CNC machining, and process control.				
Course Contents	**LIST OF PRACTICALS / TUTORIALS** 1. Auto CAD commands and their applications in various types of Designs/Drawings Ten/Fifteen experiments. CAM experiments on: 2. Entry of part programmed. 3. Preparation of control tape. 4. Development and execution of programs using following features. • Tool control. • Base control. 5. Use of point cut, point to point out and continuous cutting following tool path. 6. Execution of programmed using linear cutting and contour interpolation. **7.** Material job handling using Robot system and conveyer assembly				
Course Outcomes	• explain the concepts and underlying theory of modeling and the usage of models in different engineering applications • Create accurate and precise geometry of complex engineering systems and use the geometric models in different engineering applications • Compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development.				

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Course Title	**METROLOGY AND INSTRUMENTATION-LAB**				
Course Code	**DENME505P**				
Course Credits	**L**	**T**	**P**	**TC**	
			4	**2**	
Prerequisites	Basic knowledge of mechanical instruments.				
Course objectives	• Select suitable instrument / gauge / method of inspection for determining geometrical and dimensional measurements. • Calibrate measuring instruments and also design inspection gauges. Understand the advances in Metrology such as use of CMM, Laser, and Machine Vision System for Metrology etc. • Select and apply appropriate Quality Control Technique for given application				
Course Contents	1. **LIST OF PRACTICALS / TUTORIALS** 2. Measurement of a gap by means of slip gauges. 3. Measurement of diameter and height of a circular spigot. 4. Comparing methods of internal Measurement. 5. Comparing methods of external Measurement 6. Comparing methods of angular Measurement 7. Checking a sine bar. 8. Comparing methods of external, taper Measurement 9. Comparing methods of internal, taper Measurement a. Given a set of slip gauges, straightedge to be tested and surface plat, the student will test the straightness error in the given straightedge. 10. Given the surface plate, spirit level and straight edge the student will test the flatness of surface plate in the laboratory. 11. Check an engineers square in the laboratory provided with parallel set, slip gauges and plate and determine the square ness error. 12. Examination of the surface texture of the work piece of machined surface by microscope when specimen of corresponding standard surface is provided. 13. Determination of effective diameter of a screw with the help of screw thread 14. Micrometer and three wire and hand micrometer. Compare these two methods. 15. Determination of screw plug core diameter with the help of V shaped steel pieces and a micrometer. 16. Determination of outside diameter of a screw by a micrometer. 17. Determination of core diameter of an internal screw gauge with the help of pair of precision wedge parallels and outside micrometer.				

	18. Preparation of a cast internal screw thread with sulpher and graph its. 19. Setting of a roller type of adjustable thread gauge and inspection of given screw of given nominal size. 20. Inspect the gear tooth form by direct measurement. **21.** Inspect the gear tooth spacing by any one method.
Course Outcomes	• Understand the methods of measurement and selection of measuring instruments, standards of measurement • Identify and apply various measuring instruments • Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design • Recommend the Quality Control Techniques and Statistical Tools appropriately Analyze the Data collected

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<table>
<tr><td>Course Title</td><td colspan="5">INDUSTRIAL TRAINING/SEMINAR</td></tr>
<tr><td>Course Code</td><td colspan="5">DENME506P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>2</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic knowledge of mechanical fields.</td></tr>
<tr><td>Course objectives</td><td colspan="5">• The purpose of industrial training is to offer wide range of practical exposures to latest practices, equipments, machines used in Govt. industries, Semi Govt. Industries, private industry, workshops and ancillary units.
• Industrial training also helps the students in acquiring hands-on-experience of various practices and events required to perform in different job situations. Through the industrial training the students try to integrate all that they have learnt and put that into practice.</td></tr>
<tr><td>Course Contents</td><td colspan="5">Objectives of Industrial Training: -
The objective of the industrial training is to correlate theory and practice. Through industrial training students will be able to :-
• Acquaint themselves to industrial environments
• Follow industry work discipline
• Understand the psychology of the workers, their habits, attitudes and approach to problems.
• Familiarize with various materials, processes, products and their applications along with relevant aspects of shop floor management.
• Realize the size and scale of operations in the industries
• Get opportunities to use their knowledge in problem solving and in project assignments
• Understand various constraints of time and cost, within which goods/parts are produced and services rendered in specified quantum
• Understand the scope, function and job responsibilities in various departments of organizations.
Components of Industrial Training: -
The industrial Training has basically the following three components: -
• Orientation Programme
• Industrial Training in the Industry
• Report Writing and Evaluation During the orientation programme complete guidelines will be provided to the students regarding planning, implementation and evaluation of industrial training.
During the training student will have to maintain a daily dairy to record his observations and experiences at field and on the basis of daily dairy student has to prepare and submit Industrial Training Report. For evaluation each student has to prepare and present a seminar paper related to experience</td></tr>
</table>

	gained during the industrial training. Each student will be evaluated on the following criteria as mentioned in the evaluation. **Areas of Industrial Training Some of the areas for industrial training is suggested below :-** • Repair & maintenance of machines, equipment and tools • Welding and fabrication • Foundry Shop • Manufacturing of parts, components etc. • Repairing maintenance of air conditioner & refrigerator. • Workshop management. • CNC machines-operation and maintenance • Design and development of drawing using CAD software. • Inventory and store management • Calibration of measuring instruments. **Expected outcome:-** Expected outcome of industrial training is the work done by the student or a group of students during the industrial training. Proper recording of events and work done shall be recorded and assessed in the requisite format. The student shall be assessed on the basis of work done during industrial training and report submitted and also by way of oral/ viva voce examination/presentation after completion of the training. **Evaluation :-** The industrial training work of the student or a group of students will be evaluated jointly by faculty member and an expert from industry/field. **The basis of evaluation will cover following criteria:-** • Nature and extent of technical skills learnt • Innovative skills/problem solving skills. • Coordination and integration between theory and practice. • Planning and decision making skills. • Organization of work. • Assemble the component/materials being used in given task. • Work in group or independently and confidently. • Submission of report. • Skills and attitudes necessary in a technician.
Course Outcomes	• The duration of four weeks is kept for compulsory industrial training for all students of the programme. • It has been suggested that industrial training must be offered only after completion of fourth semester examination.

Diploma in Mechanical Engineering
Semester-V
2022-23

Board of Studies

Dr. AJAY KUMAR GUPTA

Mr. RAJ KUMAR BHARTI