Lession Plan 2024-25

Mechanical-2nd Semester

APPLIED PHYSICS-II

1St Sessional Exam 2024 UNIT I **Wave Motion and its Applications** 1.1 Waves: definition, types (mechanical and electromagnetic wave) 1.2 Wave motion- transverse and longitudinal with examples, terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wave length 1.3 Simple harmonic motion (SHM): definition, examples 1.4 Cantilever: definition, formula of time period (without derivation) 1.5 Free, forced and resonant vibrations with examples 1.6 Sound waves: types (infrasonic, audible, ultrasonic) on the basis of frequency, noise, coefficient of absorption of sound, echo **UNIT II** **Optics** 2.1 Reflection and refraction of light with laws, refractive index 2.2 Lens: introduction, lens formulae (no derivation), power of lens and simple numerical problems 2.3 Total internal reflection and its applications, critical angle and conditions for total internal reflection 2.4 Superposition of waves (concept only), definition of Interference, Diffraction and Polarization of waves 2.5 Introduction to Microscope, Telescope and their applications	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **Electrostatics and Electricity** 3.1 Electric charge, unit of charge, conservation of charge 3.2 Coulomb's law of electrostatics 3.3 Electric field, electric lines of force (definition and properties), electric field intensity due to a point charge 3.4 Definition of electric flux, Gauss law (statement and formula) 3.5 Capacitor and capacitance (with formula and unit) 3.6 Electric current and its SI Unit, direct and alternating current 3.7 Resistance, conductance (definition and unit) 3.8 Series and parallel combination of resistances 3.9 Ohm's law (statement and formula) **UNIT IV** **Classification of Materials and their Properties**	Upto-24-04-2024

4.1 Definition of energy level, energy bands 4.2 Types of materials (conductor, semiconductor, insulator and dielectric) with examples, intrinsic and extrinsic semiconductors (introduction only) 4.3 Introduction to magnetism, type of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials with examples 4.4 Magnetic field, magnetic lines of force, magnetic flux 4.5 Electromagnetic induction (definition)	
3rd Sessional Exam 2024 **UNIT V** **Modern Physics** 5.1 Laser: introduction, principle, absorption, spontaneous emission, stimulated emission, population inversion 5.2 Engineering and medical applications of laser 5.3 Fibre optics**:** introduction to optical fibers (definition, principle and parts), light propagation, fiber types (mono-mode, multi-mode), applications in medical, telecommunication and sensors 5.4 Nanotechnology: introduction, definition of nanomaterials with examples, properties at nano scale, applications of nanotechnology (brief)	Upto-25-05-2024

APPLIED MATHEMATICS – II

1St Sessional Exam 2024 UNIT I **Differential Calculus** 1.1 Definition of function; Concept of limits (Introduction only) and problems related to four standard limits only. 1.2 Differentiation of x_n, sin x, cos x, e_x by first principle. 1.3 Differentiation of sum, product and quotient of functions **UNIT II** **Differential Calculus and Its Applications** 2.1 Differentiation of trigonometric functions, inverse trigonometric functions. Logarithmic differentiation, successive differentiation (upto 2nd order) 2.2 Application of differential calculus in: (a) Rate measures (b) Maxima and minima	Upto-14-03-2024

2nd Sessional Exam 2024 **UNIT III** **Integral Calculus** 3.1 Integration as inverse operation of differentiation with simple examples. 3.2 Simple standard integrals and related problems, Integration by Substitution method and Integration by parts. 3.3 Evaluation of definite integrals with given limits. $\pi/2$ π /2 $\pi/2$ Evaluation of $\int \sin^n x.\, dx$, $\int \cos^n x\, dx$, $\int \sin^m x \cos^n x\, dx$ 0 0 0 using formulae without proof (m and n being positive integers only) using pre-existing mathematical models. **UNIT IV** **Application of Integration, Numerical Integration and Differential Equations** 4.1 Applications of integration: for evaluation of area under a curve and axes (Simple problems). 4.2 Numerical integration by Trapezoidal Rule and Simpson's 1/3rd Rule using pre-existing mathematical models. **Differential Equations** 4.3 Definition, order, degree, Type of differential Equations, linearity, Formulation of ordinary differential equation (up to 1st order), solution of ODE (1st order) by variable separation method.	Upto-24-04-2024
3rd Sessional Exam 2024 **UNIT V** **Statistics and Software Statistics** 5.1 Measures of Central Tendency: Mean, Median, Mode 5.2 Measures of Dispersion: Mean deviation, Standard deviation **Software** 5.3 SciLab software – Theoretical Introduction. 5.4 Basic difference between MATLAB and SciLab software, 5.5 Calculations with MATLAB or ScilLab - (a) Representation of matrix (2×2 order), (b) Addition, Subtraction of matrices (2×2 order) in MATLAB or SciLab	Upto-25-05-2024

APPLIED CHEMISTRY

1St Sessional Exam 2024 UNIT 1 **Atomic Structure, Periodic Table and Chemical Bonding**. 1.1 Bohr's model of atom (qualitative treatment only), dual character of matter: derivation of de- Broglie's equation, Heisenberg's Principle of Uncertainty, modern concept of atomic structure: definition of orbitals, shapes of s, p and d-orbitals, quantum numbers and their significance. Electronic configuration: Aufbau and Pauli's exclusion principles and Hund's rule, electronic configuration of elements up to atomic number 30. 1.2 Modern Periodic law and Periodic table, classification of elements into s, p, d and f-blocks, metals, non-metals and metalloids (periodicity in properties excluded). 1.3 Chemical bonding: cause of bonding, ionic bond, covalent bond, and metallic bond (electron sea or gas model), Physical properties of ionic, covalent and metallic substances. **UNIT II** **Metals and Alloys** 2.1 Metals: mechanical properties of metals such as conductivity, elasticity, strength and stiffness, luster, hardness, toughness, ductility, malleability, brittleness, and impact resistance and their uses. 2.2 Definition of a mineral, ore, gangue, flux and slag. Metallurgy of iron from haematite using a blast furnace. Commercial varieties of iron. 2.3 Alloys: definition, necessity of making alloys, composition, properties and uses of duralumin and steel. Heat treatment of steel-normalizing, annealing, quenching, tempering	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **Water, Solutions, Acids and Bases** 3.1 Solutions: definition, expression of the concentration of a solution in percentage (w/w, w/v and v/v), normality, molarity and molality and ppm. Simple problems on solution preparation. 3.2 Arrhenius concept of acids and bases, strong and weak acids and bases, pH value of a solution and its significance, pH scale. Simple numerical problems on pH of acids and bases. 3.3 Hard and soft water, causes of hardness of water, types of hardness – temporary and permanent hardness, expression of hardness of water, ppm unit of hardness; disadvantages of hard water; removal of hardness: removal of temporary hardness by boiling and Clark's method; removal of permanent hardness of water by Ion-Exchange method; boiler problems caused by hard water: scale and sludge formation, priming and foaming, caustic embrittlement; water sterilization by chlorine, UV radiation and RO. **UNIT IV** **Fuels and Lubricants** 4.1 Fuels: definition and classification of higher and lower calorific	Upto-24-04-2024

values, units of calorific value, characteristics of an ideal fuel. Petroleum: composition and refining of petroleum; gaseous fuels: composition, properties and uses of CNG, PNG, LNG, LPG; relative advantages of liquid and gaseous fuels over solid fuels. Scope of hydrogen as future fuel. 4.2 Lubricants- Functions and qualities of a good lubricant, classification of lubricants with	
3rd Sessional Exam 2024 **UNIT V** **Polymers and Electrochemistry** 5.1 Polymers and Plastics: definition of polymer, classification, addition and condensation polymerization; preparation properties and uses of polythene, PVC, Nylon-66, Bakelite; definition of plastic, thermoplastics and thermosetting polymers; natural rubber and neoprene, other synthetic rubbers (names only). 5.2 Corrosion: definition, dry and wet corrosion, factors affecting rate of corrosion, methods of prevention of corrosion—hot dipping, metal cladding, cementation, quenching, cathodic protection methods 5.3 Introduction and application of nanotechnology: nano-materials and their classification, applications of nanotechnology in various engineering applications (brief).	Upto-25-05-2024

MECHANICAL ENGINEERING DRAWING-I

1St Sessional Exam 2024 **1. Detail and Assembly Drawing (02 sheets)** Principle and utility of detail and assembly drawings, Practical exercise on drawing from detail to assembly or vice versa using different wooden joints as example (lap joint – T joint and corner joint, Mortise and tenon joint, Bridle joint, Mitre faced corner joint). **2. Threads (02 sheets)** Nomenclature of threads, types of threads. Single and multiple start threads, right hand and left hand thread. Forms of various external thread sections such as V thread (Metric thread, British associate, American thread, Basic whitworth thread), Square, Acme, Knuckle, and Buttress thread. Simplified conventional representation of V thread. **3. Nuts and Bolts (03 sheets)** Different views of hexagonal and square headed nuts and bolts. Assembled view of nuts and bolts with washers. Foundation bolt- Rag bolt, Hook bolt. Lewis bolt, Eye bolt and curved bolt (Free hand)	Upto-14-03-2024

2nd Sessional Exam 2024 **4. Locking Devices (01 sheet)** Locking nuts - Castle nut, Sawn nut, and Split pin lock nut. Locking by spring washers, Locking plates. **5. Screws, Studs and Washers (01 sheet)** Drawing of various types of machine and set screws. Drawing of various types' of studs, through bolt, tap bolt and stud bolt. **6. Keys and Cotters (03 sheets)** Various types of keys and their application. Preparation of drawings of various keys and cotters. Various types of joints (a) Gib and Cotter joint (b) Knuckle joint (c) Spigot and Socket joint	Upto-24-04-2024
3rd Sessional Exam 2024 **7. Rivets and Riveted Joints (02 sheets)** Types of general purpose rivet heads (Snap Head, Pan Head , Flat and counter sunk). Types of riveted joints – lap (single and double riveted), butt (single cover plate and double cover plate), chain and zig-zag riveting (Double riveted). Caulking and fullering operation of riveted joints. **8. Shaft Coupling (02 sheets)** Introduction to coupling, their uses and types, Muff Coupling, Protected type flange coupling. Flexible or non-rigid coupling **9. Computer Aided Drafting (CAD) (04 sheets)** Introduction, Various 2 D commands – Draw, modify and option commands, Prepare at least 4 sheets using CAD software – one drawing each from wooden joint, threads, nut and bolts, coupling.	Upto-25-05-2024

WORKSHOP TECHNOLOGY-

1St Sessional Exam 2024 **UNIT I** **1. Hand Tools** Chisels – Types and uses of chisels, wood working chisels, metal working chisels – cold chisel, hard chisel, stone chisel, masonry chisel. Hammers – Types, Basic design and variations, Physics of hammering, Hammer as force multiplier, effect of head's mass, effect of handle. Saw – Saw terminology, types of saws, types of saw blades, material used for saw, Hacksaw frame and its types. Pliers – Function and types. Wrenches/ Spanners – Common General wrenches/spanners, Specialized wrenches/spanners, Surface plate, V block, files, Surface Gauge. **UNIT II** **3. Cutting Tools and Cutting Materials** Cutting Tools - Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect. Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **4. Welding** Welding Process - Principle of welding, Classification of welding processes, Advantages and limitations of welding, Industrial applications of welding, Welding positions and techniques, symbols. Safety precautions in welding. Gas Welding - Principle of operation, Types of gas welding flames and their applications, Gas welding equipment - Gas welding torch, Oxygen cylinder, acetylene cylinder, cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes and personal safety equipment for welding. Arc Welding - Principle of operation, Arc welding machines and equipment. A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes: Classification, B.I.S. specification and selection, Flux for arc welding. Requirements of pre heating, post heating of electrodes and work piece. Welding defects and their testing methods. **UNIT IV** **5. Lathe** Principle of turning, Description and function of various parts of a lathe. Classification and specification of various types of lathe, Drives and transmission, Work holding devices. Lathe tools: Parameters/Nomenclature and applications. Lathe operations - Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning. Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time. Speed ratio, preferred numbers of speed selection. Lathe accessories:- Centers, dogs, different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower	Upto-24-04-2024

3rd Sessional Exam 2024 **UNIT V** **6. Drilling** Principle of drilling. Classification of drilling machines and their description. Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping. Speeds and feeds during drilling, impact of these parameters on drilling, machining time. Types of drills and their features, nomenclature of a drill. Drill holding devices. Types of reamers. **7. Boring** Principle of boring, Classification of boring machines and their brief description. Specification of boring machines. Boring tools, boring bars and boring heads. Description of jig boring machine. **8. Cutting Fluids and Lubricants** Function of cutting fluid, Types of cutting fluids, Difference between cutting fluid and lubricant, Selection of cutting fluids for different materials and operations, Common methods of lubrication of machine tools, Certifying Organizations (such as SAE, ASTM) for rating standards of lubricants..	Upto-25-05-2024

APPLIED MECHANICS

1St Sessional Exam 2024 UNIT 1 **1. Introduction** Concept of mechanics, Classification of mechanics, utility of mechanics in engineering field, Concept of rigid body, scalar and vector quantities. **2. Laws of forces** Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force, Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition, Free body diagram, Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, parallelogram law of forces (with derivation), triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components, Lami's theorem, Simple numericals, Equilibrium of forces and its determination. **UNIT II** **3. Moment** Concept of moment, Moment of a force and units of moment, Varignon's theorem (definition only), Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve), Simple numericals. Parallel forces (like and unlike parallel force), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces, Position of	Upto-14-03-2024

resultant force by moment.	
2nd Sessional Exam 2024 **UNIT III** **4. Friction** Definition and concept of friction, types of friction, force of friction, Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction, Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane. Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force acting along the inclined plane and subjected to a force acting at some angle with the inclined plane, Simple numericals. **UNIT IV** **5. Centre of Gravity and Centroid** Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Axis of symmetry, Reference axis. Determination of centroid of plain and composite lamina (T, L, C and I shape) using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed. **6. Laws of Motion** Newton's laws of motion and their applications, Concept of momentum. Derivation of force equation from second law of motion, numerical problems on second law of motion. Bodies tied with string, Newton's third law of motion, numerical problems, conservation of momentum, impulse and impulsive force.	Upto-24-04-2024
3rd Sessional Exam 2024 **UNIT V** **7. Simple Machines** Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples). Definition of ideal machine, reversible and self-locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency, Simple numerical System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle,	Upto-25-05-2024

Weston’s Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application	

Lession Plan 2024-25

Mechanical-4th Semester

ENGLISH AND COMMUNICATION SKILLS - II

1St Sessional Exam 2024 **UNIT I** **Reading** 1.1 All The World's A Stage – W. Shakespeare 1.2 Life Sketch of Dr. Abdul Kalam 1.3 The Portrait of a Lady - Khushwant Singh 1.4 The Doctor's Word by R K Narayan 1.5 Speech by Dr Kiran Bedi at IIM Indore2007 Leadership Concepts 1.6 The Bet - by Anton Chekov **UNIT II** **Effective Communication Skills** 2.1 Modern means of Communication (Video Conferencing, e- mail, Teleconferencing) 2.2 Effective Communication Skills: 7 C's of Communication 2.3 Non-verbal Communication – Significance, Types and Techniques for Effective Communication 2.4 Barriers and Effectiveness in Listening Skills 2.5 Barriers and Effectiveness in Speaking Skills	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **Professional Writing** 3.1 Correspondence: Enquiry letters, placing orders, complaint letters 3.2 Report Writing 3.3 Memos 3.4 Circulars 3.5 Press Release 3.6 Inspection Notes and tips for Note-taking 3.7 Corrigendum writing 3.8 Cover Letter 3.9 Drawing inferences **UNIT IV** **Grammar and Vocabulary** 4.1 Prepositions 4.2 Conjunctions 4.3 Punctuation 4.4 Idioms and Phrases 4.5 Pairs of words (Words commonly misused and confused) 4.6 Translation of Administrative and Technical Terms in Hindi or Mother	Upto-24-04-2024

3rd Sessional Exam 2024 **UNIT V** **Employability Skills** 5.1 Presentation Skills: How to prepare and deliver a good presentation 5.2 Telephone Etiquettes 5.3 Importance of developing employable and soft skills	Upto-25-05-2024

MATERIALS AND METALLURGY

1St Sessional Exam 2024 **UNIT I** **1. Introduction** Material: Engineering materials, Overview of different engineering materials and applications, Importance, Classification of materials, Difference between metals and non-metals, Overview of Biomaterials and semi-conducting materials **UNIT II** **2. Crystallography** Fundamentals: Crystalline solid and amorphous solid, Unit Cell, Space Lattice, Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals, Number of atoms per unit Cell, Atomic Packing Factor, coordination number (without derivation), Defects/Imperfections, types and effects in Solid materials. Deformation: Overview of deformation behaviour and its mechanisms, Elastic and Plastic deformation. Failure Mechanisms: Overview of failure modes, fracture, fatigue and creep. **3. Metallurgy** Introduction, Cooling curves of pure metals, dendritic solidification of metals, effect of grain size on mechanical properties, Binary alloys, Thermal equilibrium diagrams, Lever rule, Solid Solution alloys	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **4. Metals and Alloys** Ferrous Metals: Different iron ores, Flow diagram for production of iron ,steel and stainless steel, allotropic forms of iron- Alpha, Delta, Gamma. Basic process of manufacturing of pig iron and steel-making. Cast Iron: Properties, types of Cast Iron, manufacture and their use. Steels: Plain carbon Steels and alloy steel, Classification of plain carbon steels, Properties and application of different types of Plain Carbon Steels, Effect of various alloying elements on properties of steel, Uses of alloy steels (high speed steel, silicon steel, spring steel) Stainless steel: Definition, importance and criticality (Life cycle cost, Corrosion impact; difference with Steel, Per Capita consumption; growth rate of SS vs other materials, World vs India). Various grades of SS and their nomenclature, Effect of alloying elements, Unique characteristics of various grades of SS Manufacturing of SS: Process flow, Raw materials for SS manufacturing functions of each processing unit, Downstream facilities, Various finishes of SS. Fabrication and testing of SS: Stud welding method, Weldability and effect of welding on various types of SS, Defects like Sensitization and microfissure, Relative observations and precautions while performing the processes: cutting , Buffing, Bending, Roll forming, Embossing, Polishing of Stainless steel. Chemical treatment like pickling and passivation for SS.. **UNIT IV** **5. Heat Treatment** Definition and objectives of heat treatment, Iron carbon equilibrium diagram, different microstructures of iron and steel. Formation and decomposition of Austenite, Martensitic Transformation. Various heat	Upto-24-04-2024

treatment processes- hardening, tempering, annealing, normalizing, surface hardening, carburizing, nitriding, cyaniding. Hardenability of Steels Types of heat treatment furnaces (only basic idea), measurement of temperature of furnaces. Physical metallurgy of Stainless Steel; Various phases in SS, Chromium-Nickel diagram, Schaeffler Diagram	
3rd Sessional Exam 2024 **UNIT V** **6. Advanced Materials** Heat Insulating materials- Asbestos, glasswool, thermocole. Refractory materials –Dolomite, porcelain. Glass – Soda lime, borosil. Materials for bearing metals Materials for Nuclear Energy Smart materials- properties and applications.	Upto-25-05-2024

HYDRAULICS AND PNEUMATICS

1St Sessional Exam 2024 **UNIT I** **1. Properties of fluid** Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility. Fluid Pressure & Pressure Measurement: Fluid pressure, of Pascal's law and its applications Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Piezometer, Simple U- tube Manometer and differential manometers, Bourdan's pressure gauge, Concept of Total pressure on immersed bodies, center of pressure, Simple problems on fluid properties and Manometers. **UNIT II** **2. Fluid Flow** Types of fluid flows, Path line and Stream line, Continuity equation, Bernoulli's theorem, Principle of operation of Venturimeter, Orifice meter and Pitot tube, Derivations for discharge, coefficient of discharge and numerical problems. Flow Through Pipes: Laminar and turbulent flows; Darcy's equation and Chezy's equation for frictional losses, Minor losses in pipes, wetted perimeter, Hydraulic gradient and total gradient line, Reynold's number and its effect on pipe friction; Water hammer. Simple numerical problems to estimate major and minor losses	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **3. Hydraulic Turbines** Impact of jet on fixed vertical and moving vertical flat plates, Hydraulic Turbines: Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available, Construction and working principle of Pelton wheel, Francis and Kaplan turbines. other Machines working construction and applications of hydraulic press, hydraulic jack, hydraulic accumulator and hydraulic ram. **UNIT IV** **4. Pumps** Centrifugal Pumps: Principle of working and applications, Types of casings and impellers, Concept of multistage, Priming and its methods, Cavitation, Manometric head, Work done, Manometric efficiency, Overall efficiency. Reciprocating Pumps: Construction, working principle and applications of single and double acting reciprocating pumps, Concept of Slip, Negative slip, Cavitation and separation.	Upto-24-04-2024
3rd Sessional Exam 2024 **UNIT V** **5. Hydraulic and Pneumatic systems** Introduction to oil power hydraulic and pneumatic system. Relative Merits and Demerits of oil power hydraulic and pneumatic system. Basic	Upto-25-05-2024

components of hydraulic system, function of each component in a hydraulic circuit such as Oil reservoirs, connectors, pipes, motors and pumps(power pack), Filters, etc. Components of Pneumatic Systems : Basic components – function of each component such as Air compressors, Air cylinder and their types (single acting, double acting, piston type, diaphragm type, tandem cylinder, double ended cylinder). Air filter, regulator and lubricator – their necessity in pneumatic circuit. common faults in hydraulic system and pneumatic systems and remedial action.	

WORKSHOP TECHNOLOGY - III

1St Sessional Exam 2024 **UNIT I** **1. Gear Manufacturing** Gear materials and specifications, Gear manufacturing by Casting, Moulding, Stamping, Machining; Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; **UNIT II** **2. Grinding** Principles of metal removal by Grinding; Abrasives – Natural & Artificial; Bonds and binding processes: Vitrified, silicate, shellac, rubber, bakelite; Factors affecting the selection of grind wheels: size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of bind material; Standard marking systems: Meaning of letters & numbers sequence of marking, Grades of letters; Truing, dressing, balancing and mounting of wheel. Selection of grinding wheel. Grinding machines classification: Cylindrical, Surface, Tool	Upto-14-03-2024
2nd Sessional Exam 2024 **UNIT III** **3. Modern Machining Processes** Introduction – comparison with traditional machining; Ultrasonic Machining: principle, Description of equipment, applications; Electric Discharge Machining (EDM): Principle, Description of equipment, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, applications. Wire cut EDM: Principle, Description of equipment, Controlling parameters; applications; Abrasive Jet Machining: principle, description of equipment, application; Laser Beam Machining: principle, description of equipment, application; Electro Chemical Machining: description of equipment, application. **UNIT IV** **4. Metal Forming Processes** Press Working - Types of presses, type of dies and punches, selection of press die, die material. Press Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping. Forging - Open die forging, closed die forging, Press forging, upset forging, swaging, up setters, roll forging, Cold and hot forging. Rolling - Elementary theory of rolling, Types of rolling mills, Thread rolling, roll passes, Rolling defects and remedies. Extrusion and Drawing - Type of extrusion- Hot and Cold, Direct and indirect. Pipe drawing, tube drawing, wire drawing	Upto-24-04-2024

3rd Sessional Exam 2024 **UNIT V** **5. Metal Finishing Processes** Purpose of finishing surfaces. Surface roughness-Definition and units, Honing Process, its applications, Description of hones. Brief idea of honing machines. Lapping process, its applications. Description of lapping compounds and tools. Brief idea of lapping machines. Polishing, Buffing, Burnishing and super finishing **6. Metallic Coating Processes** Metal spraying – Wire process, powder coating process, applications, Electroplating: Basic principles, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing. Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating; Finishing specifications.	Upto-25-05-2024

MACHINE DESIGN

1St Sessional Exam 2024 **UNIT I** **1. Introduction** 1.1 Design – Definition, Type of design, necessity of design, Comparison of designed and undesigned work, Design procedure, Characteristics of a good designer 1.2 Design terminology: stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, creep and tenacity, endurance limit. SN Curve and its significance 1.3 General design consideration, Selection of materials, criteria of material selection, Codes and Standards (BIS standards) 1.4 Various design failures- maximum normal stress theory, maximum stress theory, maximum strain theory **UNIT II** **2. Design of Shaft** 2.1 Type of shaft, shaft materials, Type of loading on shaft, standard sizes of shaft available 2.2 Shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of : - Strength criterion - Rigidity criterion 2.3 Determination of shaft diameter (hollow and solid shaft) subjected to bending 2.4 Determination of shaft diameter (hollow and solid shaft) subjected to combined torsion and bending	Upto-14-03-2024

2nd Sessional Exam 2024 **UNIT III** **3. Design of Key** 3.1 Types of key, materials of key, functions of key 3.2 Failure of key (by Shearing and Crushing). 3.3 Design of key (Determination of key dimension) 3.4 Effect of keyway on shaft strength. (Figures and problems). **4. Design of Coupling** Necessity of a coupling, advantages of a coupling, types of couplings, design of muff coupling, design of flange coupling. (Both protected type and unprotected type). **UNIT IV** **5. Design of Joints** Types of joints - Temporary and permanent joints, utility of various joints 5.1 Design of Temporary Joints: Knuckle Joints – Different parts of the joint, material used for the joint, type of knuckle Joint, design of the knuckle joint. (Figures and problems). Cotter Joint – Different parts of the spigot and socket joints, Design of spigot and socket joint. 5.2 Design of Permanent Joint: Riveted Joints. : Rivet materials, Rivet heads, leak proofing of riveted joint – caulking and fullering. Different modes of rivet joint failure. Design of riveted joint – Lap and butt, single and multi riveted joint. Welded Joint - Welding symbols. Type of welded joint, strength of parallel and transverse fillet welds.	Upto-24-04-2024
3rd Sessional Exam 2024 **UNIT V** **6. Design of Screwed Joints and Springs** 6.1 Design of screw: Introduction, Advantages and Disadvantages of screw joints, location of screw joints. Important terms used in screw threads, designation of screw threads, Initial stresses due to screw up forces, stresses due to combined forces, Design of Screw jack 6.2 Design of Spring: Classification and applications of sprigs, spring terminology, Stresses in springs, Wahl's correction factor, design of open coil helical spring subjected to uniform applied load under tension and compression	Upto-25-05-2024

THERMODYNAMICS-II

1St Sessional Exam 2024 **UNIT I** **1. IC Engines** 1.1 Introduction and classification of IC engine 1.2 Description of Carnot cycle, Otto cycle, diesel cycle with PV and TS diagram 1.2 Working principle of two stroke and four stroke cycle, SI engines and CI engines 1.3 Location and functions of various parts of IC engines and materials used for them 1.4 Basic terms such as bore, TDC, BDC, Stroke, Crank throw, piston speed and compression ratio 1.5 Valve timing diagram for four stroke CI and SI engines 1.6 Comparison between SI and CI engines, comparison between two stroke and four stroke engines **2. Fuel Supply and Ignition System in Petrol Engine** 2.1 Concept of carburetion 2.2 Air fuel ratio, mixture required at different conditions and loads on engine. 2.3 Simple carburetor and its limitations and application. Working of Solex carburetor. 2.4 Description of petrol injection system (MPFI) 2.5 Description of battery coil and electronic ignition system **UNIT II** **3. Fuel System of Diesel Engine** 3.1 Components of fuel supply system of Diesel engine 3.2 Description and working of fuel feed pump, Fuel injection pump, fuel injectors and fuel filters 3.3 Types of Fuel injection systems in diesel engine **4. Cooling and Lubrication** 4.1 Function of cooling system in IC engine 4.2 Air cooling and water cooling system, use of thermostat and radiator. 4.3 Function and types of coolant 4.4 Function of lubrication 4.5 Lubrication system of IC engine	Upto-14-03-2024

2nd Sessional Exam 2024 **UNIT III** **5. Testing of IC Engines** 5.1 Engine power - indicated and brake power 5.2 Efficiency - mechanical, thermal. relative and volumetric 5.3 Methods of finding indicated and brake power 5.4 Morse test for petrol engine 5.5 Heat balance sheet, simple numerical problems 5.6 Concept of pollutants in SI and CI engines, pollution control, norms for two or four wheelers. Bharat stage emission standards (BS Norms), Methods of reducing pollution in IC engines **UNIT IV** **6. Steam Turbines and Steam Condensers** 6.1 Introduction, main parts, uses and classification of steam turbine 6.2 Construction and working principle of impulse and reaction steam turbines and comparison 6.3 Governing of steam turbines 6.4 Steam nozzles - types and applications 6.5 Function of a steam condenser, elements of condensing plant and types of steam condenser (Jet and surface). 6.6 Comparison between jet condenser and surface condenser 6.7 Cooling pond and cooling towers	Upto-24-04-2024
3rd Sessional Exam 2024 **UNIT V** **7. Gas Turbines and Jet Propulsion** 7.1 Classification, open cycle gas turbine and closed cycle gas turbine, comparison of gas turbines with reciprocating IC engines, applications and limitations of gas turbine 7.2 Open cycle constant pressure gas turbines - general layout, PV and TS diagram and working of gas turbine 7.3 Closed cycle gas turbines, PV and TS diagram and working 7.4 Principle of operation of ram-jet engine and turbo jet engine - application of jet engines 7.5 Supercharger and turbocharger engine	Upto-25-05-2024

Lession Plan 2024-25

Mechanical-6th Semester

AUTOMOBILE ENGINEERING

1St Sessional Exam 2024 1. Introduction (04 Periods) 1.1 Automobile and its development 1.2 Various types of automobiles manufactured, their manufacturer and location of their manufacturing unit. 1.3 Classification of automobiles 1.4 Layout of chassis 1.5 Types of drives-front wheel, rear wheel, four wheel. 1.6 Introduction to electric and hybrid vehicles. 1.7 Governing of fuel- carburettor, electronic control module (ECM i.e, 8 bit, 16 bit and 32 bit computers) 1.8 Concept of single overhead cam, double overhead cam, Twin cam 16 valve technology in 4 cylinder engine. 2. Transmission System (12 Periods) 2.1 Clutch - Functions, Constructional details of single plate and multi plate friction clutches, Centrifugal and semi centrifugal clutch, Cone clutch, Hydraulic clutch 2.2 Gear Box - Functions, Working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive, Introduction to Automated Manual Transmission, Automatic transmission and Continuously Variable Transmission. 2.3 Propeller shaft and rear axle - Functions, Universal joint, Differential, Different types of rear axles and rear axle drives. 2.4 Wheels and Tyres - Types of wheels, Types and specifications of tyres used in Indian vehicles, Toe in, Toe out, camber, caster, kingpin inclination, Wheel balancing and alignment, Factors affecting tyre life.	Upto-14-03-2024

2nd Sessional Exam 2024 3. Steering System (04 Periods) Function and principle, Ackerman and Davis Steering Mechanism. Types of steering gears - worm and wheel, rack and pinion, Power steering- Hydraulic and Electrical. 4. Braking system (06 Periods) Constructional details and working of mechanical, hydraulic, air and vacuum brake, Relative merits and demerits. Details of master cylinder, wheel cylinder, Concept of brake drum, brake lining/pad and Brake adjustment, Introduction to Anti-lock Brake System and its working. 5. Suspension System (06 Periods) Function and types of Coil spring, leaf spring, Air suspension, Shock Absorber (Telescopic type) –Function, construction and working..	Upto-24-04-2024
3rd Sessional Exam 2024 6. Battery (8 Periods) Constructional details of lead acid cell battery, Specific gravity of electrolyte, effect of temperature on specific gravity, Specification of battery-capacity, rating , number of plates, selection of battery for particular use, Battery charging, chemical reactions during charge and discharge, Maintenance of batteries, Checking of batteries for voltage and specific gravity. Batteries for electric and hybrid vehicles. 7. Dynamo and Alternator (8 Periods) 7.1 Dynamo - Function and details, Regulators - voltage current and compensated type, Cutout - construction, working and their adjustment, 7.2 Alternator - Construction and working, Charging of battery by alternator. Introduction to Integrated starter-alternator, wiring Diagram of an Automobile.	Upto-25-05-2024

INSPECTION AND QUALITY CONTROL

1St Sessional Exam 2024 1. Elements of Engineering Seismology (08 Hours) General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Seismic zoning map of India, Static and Dynamic Loading, Fundamental period. 2. Seismic Behaviour of Traditionally-Built Constructions of India (07 Hours) Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)	Upto-14-03-2024
2nd Sessional Exam 2024 3. Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building. 4. Introduction to seismic zone of India and factors related to IS:1893 and IS: 13920 (latest edition)	Upto-24-04-2024
3rd Sessional Exam 2024 5. Seismic provision of strengthening and retrofitting measures for traditionally-built constructions (08 Hours) 6. Provision of reinforcement detailing in masonry and RCC constructions (06 Hours) 7. Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casuality management. (06 Hours)	Upto-25-05-2024

ESTIMATING AND COSTING

1St Sessional Exam 2024 **1. Introduction** (06 Periods) Definition of estimation, Importance, aims and functions of estimating; cost accounting, purposes of cost accounting, Comparison of estimating and costing, estimating procedure, cost estimators and their qualifications, types of estimates, constituents of job estimates, cost of production, selling price, capital investment, rate of return(ROR) on investment **2. Elements of Costing** (08 Periods) Definitions, objectives, elements of costs, components of costs, overhead expenses:: factory expenses, depreciation-causes; methods of calculation of depreciation, obsolescence, interest on capital, idleness costs, repairs and maintenance cost, selling and distribution overheads and methods of allocation of overhead charges, procedure for costing	Upto-14-03-2024
3. Cost Accounting (08 Periods) Objectives of cost accounting, difference between financial accounting and cost accounting, advantages of cost accounting, methods of costing; unit costing, batch costing, departmental costing, process costing, multiple and composite costing **4. Fundamentals of Estimating** (08 Periods) Objectives of cost estimating, functions of cost estimating, organization of estimating department, principal factors in estimating, miscellaneous allowances, estimating procedures, qualities of estimator. **5. Estimation of Material Cost** (10 Periods) Estimation of volumes, weights and cost of material for items like pulley, spindle, lathe centre, fly wheel, crank shaft and similar items. Simple numericals on the above, budgets and types of budgets	Upto-24-04-2024
3rd Sessional Exam 2024 **6. Estimation of Machine Shop** (14 Periods) Set up time, operation time, handling time, machining time, tear down time, allowances; personal, fatigue, tool checking/sharpening/changing, unit operation time, cycle time and total time, full depth of cut, cutting speeds for various operations for different tool materials and product materials, estimation of time for various machining operations - turning, drilling, boring, tapping, shaping, planning, milling and grinding. **7. Estimation of Other Shops** (10 Periods) Estimation of cost of different products produced in welding- gas and electric welding, forging and foundry shops.	Upto-25-05-2024

ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

1St Sessional Exam 2024 **SECTION – A ENTREPRENEURSHIP** 1. Introduction (10 Periods) □ Concept /Meaning and its need □ Qualities and functions of entrepreneur and barriers in entrepreneurship □ Sole proprietorship and partnership forms and other forms of business organisations □ Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks 2. Market Survey and Opportunity Identification/Ideation (08 Periods) □ Scanning of the business environment □ Salient features of National and Haryana State industrial policies and resultant business opportunities □ Types and conduct of market survey □ Assessment of demand and supply in potential areas of growth □ Identifying business opportunity □ Considerations in product selection □ Converting an idea into a business opportunity 3. Project report Preparation (06 Periods) □ Preliminary project report □ Detailed project report including technical, economic and market feasibility □ Common errors in project report preparations □ Exercises on preparation of project report □ Sample project report	Upto-14-03-2024
2nd Sessional Exam 2024 **SECTION –B MANAGEMENT** 4. Introduction to Management (04 Periods) □ Definitions and importance of management □ Functions of management: Importance and process of planning, organising, staffing, directing and controlling □ Principles of management (Henri Fayol, F.W. Taylor) □ Concept and structure of an organisation □ Types of industrial organisations and their advantages □ Line organisation, staff organisation □ Line and staff organisation □ Functional Organisation 5. Leadership and Motivation (03 Periods) a) Leadership	Upto-24-04-2024

□ Definition and Need □ Qualities and functions of a leader □ Manager Vs leader □ Types of leadership □ Case studies of great leaders β) Μοτιϖατιον • Δεφινιτιον ανδ χηαραχτεριστιχσ • Ιμπορτανχε οφ σελφ μοτιϖατιον • Φαχτορσ αφφεχτινγ μοτιϖατιον • Τηεοριεσ οφ μοτιϖατιον (Μασλοω, Ηερζβεργ, Δουγλασ, ΜχΓρεγορ) 6. Management Scope in Different Areas (06 Periods) a) Human Resource Management □ Introduction and objective □ Introduction to Man power planning, recruitment and selection □ Introduction to performance appraisal methods b) Material and Store Management □ Introduction functions, and objectives □ ABC Analysis and EOQ c) Marketing and sales □ Introduction, importance, and its functions □ Physical distribution □ Introduction to promotion mix □ Sales promotion d) Financial Management □ Introductions, importance and its functions □ knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST	
3rd Sessional Exam 2024 7. Work Culture (04 Periods) 7.1. Introduction and importance of Healthy Work Culture in organization 7.2. Components of Culture 7.3. Importance of attitude, values and behaviour Behavioural Science – Individual and group behavior. 7.4. Professional ethics – Concept and need of Professional Ethics and human values. 8. Basic of Accounting and Finance (04 Periods) a) Basic of Accounting: - Meaning and definition of accounting - Double entry system of book Trading account, PLA account and balance sheet of a company b) Objectives of Financial Management - Profit Maximization v/s Wealth Maximization 9. Miscellaneous Topics (03 Periods) a) Total Quality Management (TQM) □ Statistical process control □ Total employees Involvement □ Just in time (JIT)	Upto-25-05-2024

b) Intellectual Property Right (IPR) • Introduction, definition and its importance • Infringement related to patents, copy right, trade mark	

PLANT MAINTENANCE AND MATERIAL HANDLING

1St Sessional Exam 2024 **1. Introduction** Necessity and advantages of testing, repair and maintenance, common instruments required for testing, significance of B-T curve in life span of machine tool, Acceptance test for machine tools, Economic aspects, manpower planning and materials management Fits and tolerances – common fits and tolerances used for various machine parts 2. Plant Layout, Erection and Commissioning of Machines (Installation) Location, layout of machines in Plant Layout, Principles of Plant layout, types of plant layout and positioning of machines, grouping of machines. Foundation – types of foundation, various considerations for machine foundations, foundation plan, types of foundation bolts, erection and leveling, grouting Vibration, damping, vibration isolation – methods of isolation, anti vibration mounts. 3. Testing of Machines Testing equipment – dial gauge, mandrel, spirit level, straight edge, auto collimator Recalibration of measuring instruments like vernier calliper Testing methods – geometrical/alignment test, performance test, testing under load, run test, vibrations, noise	Upto-14-03-2024
2nd Sessional Exam 2024 **4. Maintenance** Definition, advantages, limitations, functions and types of maintenance organisation. Types of maintenance viz. emergency, preventive, breakdown/corrective, predictive Introduction to computerized maintenance record like facility register, maintenance request. ISO standards for maintenance documentation Introduction to machine history card – purpose and advantages Preparation of scheduled yearly plan for preventive maintenance, difference of work content of servicing, repairs and overhauling. MTBF and MTTR. Maintainability Spare parts- Need of frequently needed spare parts inventory, Make provision of spares for parts not available in market **5 Repairing** Common parts which are prone to failure, reasons of failure Repair schedule Parts that commonly need repair such as belts, couplings, nuts, and bolts repairing the engines, compressors and boilers.	Upto-24-04-2024

3rd Sessional Exam 2024 **6 Lubrication Systems** Lubrication methods and periodical lubrication chart for various machines (daily, weekly, monthly) Handling and storage of lubricants Lubricants conditioning and disposal Lubricant and their grades needed for specific components such as gears, bearings, and chains Purpose and procedure of changing oil periodically (like gear box oil) **7 Material Handling Systems** Basic principles of material handling, Basic types of material handling equipments and its characteristic, Uses and limitations, forklift trucks, Selection of material handling equipment, Unit load: pallet sizing and loading. Conveyor models, AGV Systems, Automated Storage & Retrieval System (ASRS), Carousels,	Upto-25-05-2024