Departments of Mechanical Engineering
Class: T.E.

Program Outcome (PO's)

At the end of the program, the graduates of T.E. Mechanical engineering department students have got following knowledge.

1. **Engineering Knowledge:** Utilized the principles of mathematics, science, and engineering fundamentals, along with specialized knowledge in a mechanical engineering field, to address intricate mechanical engineering challenges and devise effective solutions.
2. **Problem analysis:** Employed the skills to identify, formulate, review research literature, and analyze intricate engineering problems, resulting in substantiated conclusions drawn from the foundational principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Crafted solutions for intricate engineering problems and designed system components or processes that fulfilled specified requirements, all while giving due consideration to public health and safety, as well as cultural, societal, and environmental factors
4. **Conduct investigations of complex problems**: Applied research-based knowledge and methodologies, including the design of experiments, analysis and interpretation of data, and synthesis of information, to derive valid conclusions.
5. **Modern tool usage**: Utilized and applied appropriate techniques, resources, as well as modern engineering and IT tools, including prediction and modeling, to conduct complex engineering activities, acknowledging and understanding their limitations.
6. **The engineer and society**: Applied reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues, recognizing the associated responsibilities relevant to professional engineering practice.
7. **Environment and sustainability**: Demonstrated an understanding of the impact of professional engineering solutions in societal and environmental contexts, and exhibited knowledge of the necessity for sustainable development.
8. **Ethics**: Applied ethical principles, committed to professional ethics and responsibilities, and adhered to norms of engineering practice.
9. **Individual and team work**: Functioned effectively as an individual and as a member or leader in diverse teams, as well as in multidisciplinary settings.
10. **Communication**: Effectively communicated on complex engineering activities with the engineering community and society at large, including the ability to comprehend and produce effective reports and design documentation, deliver compelling presentations, and provide and receive clear instructions.
11. **Project management and finance**: Displayed knowledge and understanding of engineering and management principles, applying them to one's own work as a team member or leader to manage projects and contribute to multidisciplinary environments.
12. **Life-long learning**: Acknowledged the need for and demonstrated the preparation and ability to engage in independent and life-long learning within the broad context of technological change in the past.

Subject: DESIGN OF MACHINE ELEMENTS – I
Subject Code: MED 301

Course Outcome (CO's)

1. Student understood meaning of design and design processes.
2. Student understood Design the differnet joints of machine elements for any given application.
3. Student understood the Design of screw and fasteners.
4. Student understood developing the abiltiy to analyze the various criteria of design.
5. Student understood Design the riveted joints abd weldled joints..
6. Student understood the Design the different types of springs for the given application.

Subject: DESIGN OF MACHINE ELEMENTS – I
Subject Code: MED 301

Program Specific Outcome (PSO's)

1. Students understood the design.
2. Students understood Use of Preferred Sizes.
3. Students understood use of the Standards.
4. Students understood the various stresses.
5. Students understood Different Theories of Failure.
6. Students were able to solve numerical on Solve the C clamp & C frame.
7. Students understood Design procedure of Cotter Design.
8. Students understood Design procedure of Knuckle joint.
9. Students studied Design procedure for Lever.
10. Students understood Design of Shafts, Key & Couplings.
11. Students understood Design procedure of Bolted and Threaded joint.
12. Students Design procedure for Power Screw.
13. Students understood the Re-circulating ball screw.
14. Students understood the Stress concentration, Fatigue Failure.
15. Students Explained the Endurance limit and Notch Sensitivity.
16. Students studied the Goodman and Soderberg Diagrams.
17. Students studied the Modified Goodman diagram.
18. Students studied the Fatigue Design under combined stresses.
19. Students understood the Stress concentration, Fatigue Failure.
20. Students understood the Types of Welded joints, eccentrically loaded Joints.
21. Students understood Design Procedure for Welded joints subjected to bending moment.
22. Students understood the Types of Riveted joints.
23. Students understood the Types of Failure of Riveted Joints, Strength Equation.
24. Students understood the Caulking and Fullering of Riveted.
25. Students understood the Types of Springs, Design of Helical Spring against Static loading.
26. Students understood the Surging and Buckling of Spring, Nipping.

Subject: Materials and Metallurgy
Subject Code: MED302

Course Outcome (CO's)

1. Students identified the properties of metals with respect to crystal structure and grain size and understood various strengthening mechanisms with respect to metals.
2. Students interpreted the phase diagrams of materials.
3. Students were able to describe the concept of heat treatment of steels.
4. Students were able to classify and distinguish different types of cast irons, steels and nonferrous alloys.
5. Students identified various non-ferrous alloys
6. Students understood the production and application of advanced materials such as ceramics, composites and Nano materials.

Subject: Materials and Metallurgy
Subject Code: MED302

Program Specific Outcome (PSO's)

1. Students understood Structure of metals unit cell, space lattice, different types of crystal structures and use of miller indices.
2. Students understood crystal growth, equiaxised and columnar grain, dendtric growth, polymorphism and various crystal defects.
3. Students understood Strengthening from grain boundaries, solid solution strengthening, martensite strengthening and their effects.
4. Students understood and identified equilibrium diagram and their types.
5. Students understood Gibbs Phase Rule, Hume rotherys rule, lever rule and Types of solid solution.
6. Students were able to identify phases in Fe C Diagram,transformation reactions, critical temp, TTT and CCT diagram.
7. Students understood Objectives of Heat treatment and types of heat treatment processes.
8. Students understood hardening defects and its effects, effects of retained austenite and sub zero treatment.
9. Students studied tempering, martempering, case hardening, surface hardening and their effects.
10. Students understood Steel classification, types of steel, alloy steels and effects of alloying elements on alloy steel.
11. Students understood tool steels, stainless steels, and their classification.
12. Students understood cast Iron, its production, its classification and application.
13. Students understood Copper alloys and their types& applications.
14. Students understood aluminum and magnesium alloys and their types& applications.
15. Students understood titanium alloys and their types& applications.
16. Students studied Ceramic materials and their major properties.
17. Students studied Composite materials and their major properties.
18. Students studied fabrication of nano materials and their major properties.

Subject: Fluid Mechanics & Machinery
Subject Code: MED303

CO's:

1. Students capable to explain the effect of fluid properties on a flow system.
2. Students understood that how to identify type of fluid flow patterns and describe continuity equation.
3. Students analyzed a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
4. Students got to know to use dimensional analysis to simple problems in fluid mechanics
5. Students understood demonstrate boundary layer concepts
6. Students understood that how to select and analyze an appropriate turbine with reference to given situation in power plants.

Subject: Fluid Mechanics & Machinery
Subject Code: MED303

Program Specific Outcome (PSO's)

1. Students understood Definition of fluids, Properties of fluids Ideal and real fluids, Newtonian and non-Newtonian.
2. Students understood surface tension and capillarity, Pressure in fluids at rest, Pascal's law
3. Students abled to derive Hydrostatics force on immersed plane and curved surfaces
4. Students understood center of pressure, buoyancy, stability of floating bodies Meta centre and Meta centric height
5. Students abled to Describe fluid motion, Velocity of fluid particle Types of fluid flow
6. Students understood different types of flow lines and derive Continuity equation(in Cartesian and polar coordinate)
7. Students abled to explain and discuss Circulation and Vorticity, Velocity potential and stream function
8. Students understood relation between velocity potential and stream function
9. Students abled to derive Euler's equation of motion, Bernoulli's equation & its applictions.
10. Students abled to derive Momentum equation & discuss its applications
11. Students understood Dimensions of different fluid parameters, Buckingham's Pie theorem
12. Students understood calculations of dimensionless groups, physical meaning of important dimensionless groups
13. Students abled to Explain fluid mechanics model anaysis and types of similarities
14. Students understood boundary layer definition and characteristics Define and explain boundary layer thickness displacement thickness, energy thickness
15. Students abled to define and derive momentum thickness, Von- Karman momentum equation, laminar boundary layer
16. Students abled to explain turbulent boundary layer, total drag due to laminar and turbulent boundary layers
17. Students understood boundary layer separation and its control
18. Students understood Calculate Force of jet impinging fixed & moving plate.
19. Students understood classification Hydraulic Turbines. Working principle and design of Pelton wheel, Francis turbine, Kaplan turbine
20. Students understood Function of Draft tube and performance of turbines
21. Students understood classify the different types of Pumps & performance of pump.

Subject: THEORY OF MACHINES – II
Subject Code: MED 304

Course Outcome (CO's)

1. Students understood the gear terminology and different types of Spur Gears.
2. Students understood the gear terminology and different types of Helical and Herringbone gears, Spiral Gears, Bevel Gears & Worm and worm gears.
3. Students understood Gyroscope.
4. Students understood concepts of gyroscopic effects and effect of precision motion on the Stability of moving vehicles.
5. Students understood the importance of turning moment diagrams, flywheels, governors its analysis. And studied the kinematics of chain drives, concept of belts and ropes.
6. Students understood the concepts of vibrations and simple problems on free and forced damped vibrations.

Subject: THEORY OF MACHINES – II
Subject Code: MED 304

Program Specific Outcome (PSO's)

1. Students understood introduction, Gear terminology, types of gears and field of applications, Spur Gears: Law of gearing, conjugate action, involute and cycloidal profile
2. Students understood path of contact, arc of contact, contact ratio, interference, undercutting.
3. Students understood Methods to avoid Interference and undercutting, Minimum Numbers of teeth for interference free motion, Static force analysis.
4. Students understood Helical and Herringbone gears, Their relative merits and demerits over spur gear, Static force analysis.
5. Students understood Spiral Gears- Spiral angle, shaft angle, centre distance & Efficiency of spiral gears.
6. Students understood Bevel Gears & Worm and worm gears, Terminology, geometrical relationships.
7. Students understood Governors- Function, Inertia and centrifugal type governors.
8. Students understood Different types of centrifugal governors (Watt, Porter, Proell and Hartnell only).
9. Students understood Controlling force analysis, Governor Effort and governor power.
10. Students understood sensitivity, stability, Isochronism and hunting, sensitivity, stability, Isochronism and hunting.
11. Students understood Friction, Insensitiveness, Flywheel- Turning moment diagram, Fluctuation of energy and speed.
12. Students understood Determination of flywheel size for different types of engines and machines.
13. Students understood Introduction, Angular acceleration, gyroscopic couple.
14. Students understood Effect of gyroscopic couple on aero plane, naval ship, Stability of vehicles.
15. Students understood Flat and V-belt, Rope, Limiting tension ratio, Power transmitted, Centrifugal effect, Maximum power transmitted by belt, Slip, Creep and Initial tension.
16. Students understood kinematics of chain drives, angular velocity ratio, Construction of Bush and Roller chain, power transmitted by chain
17. Students understood Introduction, Cause, effects and terminology of Single degree of freedom system: undamped tree vibration.
18. Students understood Development of differential equation of motion and its solution for different undamped systems, Computation of natural frequency.
19. Students understood Damped free vibrations: differential equation of motion, Logarithmic decrement damping methods.
20. Students understood Damped natural frequency of vibration (analysis of viscous damping only).
21. Students understood Forced Vibrations: vibration due to harmonic force excitation centric mass excitation.
22. Students understood phase lag angle, Motion and force transmissibility.

Subject: Modern Management Techniques
Subject Code: MED305

Course Outcome (CO's)

1. Students demonstrated the concepts of Management and organizational structure.
2. Students understood the economic and operations management concepts useful in the production process.
3. Students understood Principles of Management and tools used for in it.
4. Students understood Develop the creative thinking ad innovative thinking and its role in industry.
5. Students understood to stay aware of continuous improvement tools.
6. Student understood to develop iterative analysis tools for Quality Management

Subject: Modern Management Techniques
Subject Code: MED305

Program Specific Outcome (PSO's)

1. Students understood Management principles and characteristics, Importance of management.
2. Students Studied the functions of management, Management as a decision making process.
3. Students understood Introduction to Total Quality Management & Basic approach for TQM, Dimensions of Quality.
4. Students understood Methods Engineering: KAIZEN, POKAYOKE, Workplace layout & Work station design, Single Minute Exchange of Dies (SMED).
5. Students understood Just in Time: Basic Elements of JIT, Role of set-up time and lot size in JIT.
6. Students were able to define KANBAN and its principles, Types of Kanban systems – Withdraval Kanban.
7. Students understood Lean Manufacturing: Basic definitions of terms - lean production, value, waste, value steam, TPS.
8. Students understood Value Stream Mapping: Definitions of the basic terms, Creation of the value stream map (steps).
9. Students Studied 4P model (Philosophy, process people and problem solving),.
10. Students understood 5S: Definition, Principles and description of 5S, Implementation of 5S using PDCA cycle.
11. Students understood Evolution of Six Sigma, Phases of Six Sigma and levels of six sigma.
12. Students understood Quality Function Deployment (QFD):- Introduction, Voice of Customer.
13. Students understood eight TPM Pillars, Measure of TPM efficiency – overall equipment efficiency (OEE), six big losses,
14. Students understood use of Reliability centered maintenance (RCM).
15. Students understood use Creativity and Innovation: Definition, Characteristics, and Significance.
16. Students understood Role of management. Types of thinking: Vertical Thinking, Parallel Thinking, Practical Thinking Techniques.
17. Students understood Quality of Work Life (QWL): - Definition, Features, Elements/Factors,
18. Students understood Relationship between QWL and Work Life Balance (WLB).

Subject: DESIGN OF MACHINE ELEMENTS – II
Subject Code: MED 351

Course Outcome (CO's)

1. Student understood the Design considerations of Spur and Helical gears, material selection, types of gear failure.
2. Student understood the Design considerations of bevel, worm gears and differewnt types of gear train
3. Student understood the design of different types of Clutch & friction materials and Torque carrying capacity.
4. Student understood the Design of Belt & Belt drives and design the brake systems for the given application
5. Student understood the Design the sliding contact bearing for any required application from manufacturer's catalogue.
6. Student understood the Design the Rolling contact bearing for any required application and Design for variable load and speed

Subject: DESIGN OF MACHINE ELEMENTS – II
Subject Code: MED 351

Program Specific Outcome (PSO's)

1. Students understood the Basic Concept of Gears and Describe the Terminology, Gear tooth loads, forces analysis.
2. Students understood Derive Beam strength (Lewis equation) equation and Derive Wear strength (Bucking ham's equation).
3. Students understood Helical Gears: Terminology, Force analysis and Explain the procedure of Formative number of teeth in helical gears beams & wears strength of helical gears.
4. Students understood Bevel Gear: Terminology and Design of bevel gears based on beam and wear strength.
5. Students understood Worm Gears: Terminology and Calculate the force and formative number of teeth.
6. Students were able to identify the Gear train Terminology.
7. Students understood know the basic knowledge of types of friction and materials.
8. Students understood design for uniform pressure and wear, Torque carrying capacity
9. Students studied Design of single & multi-plate clutch.
10. Students understood the basic concept of Belt. Design of Flat Belt drives.
11. Students understood Design of V- Belt drives and Design of short shoe brake (single& double).
12. Students understood Design of automotive shoe brake and design internal expanding brake.
13. Students understood Understand Tribological consideration in design and Describe and understood the types of lubrication- hydro dynamic
14. Students understood hydro static and EHD lubrication and To Know the basic of Sliding contact bearing
15. Students Explained the Petroff's equation, Sommerfield Number Reynolds's equation, Describe the Raimondi and Boyd method relating bearing variables, Heat balance in journal bearings.
16. Students studied the Rolling Contact Bearing and its Types and Derive static and dynamic load capacities
17. Students studied Derive tribeck's equation. Equivalent bearing load. Explain load-life relationship, bearing life, load factor
18. Students studied How to select bearing from manufactures catalogue and Design for variable load and speed

Subject : Heat Transfer
Subject Code : MED 352

CO's:

1. Upon successful completion of this course, the student will be able to understand the basic laws of heat transfer & Analyze problems involving steady state heat conduction in simple geometries.
2. Student understood the heat transfer through extended surfaces and concept of unsteady heat conduction.
3. Evaluate heat transfer coefficients for natural convection; evaluate heat transfer coefficients for forced convection inside ducts.
4. Understood the concept of Condensation and boiling and its theoretical concepts
5. Analyze heat exchanger performance by using the method of log mean temperature difference& effectiveness.
6. Calculate radiation heat transfer between black body surfaces and Calculate radiation heat exchange between gray body surfaces

Subject: : Heat Transfer
Subject Code: MED 352

Program Specific Outcome (PSO's)

1. Student understood the different Modes and laws of heat transfer. Thermal conductivity and its variation with temperature. Insulating materials. Generalized heat conduction equation. Fourier, Laplace and Poisson's equation.
2. Students understood Thermal diffusivity.1D, 2D steady state heat conduction - Heat conduction through a plane wall, cylindrical and sphere.
3. Students understood the effect of variable thermal conductivity. Electrical analogy in conduction. Critical radius of insulation, and thermal contact resistance
4. Students understood the one dimensional steady state heat conduction with heat generation for plane wall, cylinder and sphere. (Descriptive and numerical treatment).
5. Students abled to explain and discuss Circulation and Vorticity, Velocity potential and stream function
6. Students abled to understood the Types and applications of fins. Heat transfer through extended surfaces. Derivation of equations for temperature distribution and heat transfer through fins of constant cross-section area. Effectiveness and efficiency of a fin.Errors in the measurement of temperature in a thermo-well
7. Students understood unsteady state heat conduction- System with negligible internal resistance, Biot and Fourier numbers. Lumped heat capacity method. Use of Hiesler and Grober Charts. (Descriptive and numerical treatment)
8. Students understood Local and average convective coefficient. Hydrodynamic and thermal boundary layer.Laminarand turbulent flow over a flat plate and in a pipe. Friction factor, laminar and turbulent flow over a flat plate. Drag and drag co-efficient
9. Students abled to Explain Free and Forced Convection - Dimensional analysis in free and forced convection)
10. Students understood the Physical significance of the dimensionless numbers related to free and forced convection. Empirical correlations for heat transfer in laminar and turbulent flow over a flat plate and in a circular pipe. (Descriptive and numerical treatment
11. Students abled to explain Modes of pool boiling, critical heat flux, burnout point, forced boiling. Film and drop wise condensation. (Descriptive and numerical treatment).
12. Students understood Introduction to radiative heat transfer, Stefan-Boltzmanlaw, Kirchhoff's law, Planck's law and Wein's displacement law radiation heat exchange between two finite surfaces-configuration factor or view factor. (Descriptive and numerical treatment)Students understood classification Hydraulic Turbines. Working principle and design of Pelton wheel, Francis turbine, Kaplan turbine
13. Students understood. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces, effect of radiation shield, intensity of radiation and solid angle, Lambert's law,
14. Students abled to explain Heat exchangers classification, Fouling factor, overall heat transfer coefficient, heat exchanger analysis log mean temperature difference (LMTD) for parallel and counter flow heat exchangers.
15. LMTD correction factor, fouling factor. The effectiveness-NTU method for parallel and counter flow heat exchangers. (Descriptive and numerical treatment)

Subject: TOOL ENGINEERING
Subject Code: MED 353

Course Outcome (CO's)

1. Students understood tool design methods and punch and die manufacturing techniques.
2. Students understood classification various cutting tools and gages and identified their nomenclature.
3. Students understood the principles of clamping, drill jigs and computer aided jig design.
4. Students understood Design of fixtures for milling, drilling; identify fixtures and cutting tools for NC machine tools & explain the principles of dies and moulds design.
5. Students understood concepts of design and development a common milling & drilling fixture for multiple operations.
6. Students analyzed the Press tool designed with the help of modeling and analysis

Subject: TOOL ENGINEERING
Subject Code: MED 353

Program Specific Outcome (PSO's)

1. Students understood Introduction, Mechanics of Machining - Geometry of single point cutting tool, Single point cutting tool. Designation of cutting tools, ORS and ASA system.
2. Students understood Importance of Tool angles, Mechanism of chip formation, Orthogonal and oblique cutting, Use chip breakers, Machining, Heat Generation.
3. Students understood Cutting Temperature in forces and Merchant's Circle Diagram.
4. Students understood Machining, Cutting fluid, Concept of machinability and its improvement, Failure of cutting tool and tool Life
5. Students understood Common use and advanced cutting tools materials. Study of various cutting tool inserts (carbide and CBN), their coatings and importance.
6. Students understood Introduction, types, geometry, nomenclature and design of Drills.
7. Students understood milling cutters, Reamers, Taps and broaches.
8. Students understood Introduction, process planning, need of fixtures, locating & clamping - principle of location, locating elements principle for clamping purposes.
9. Students understood clamping devices, design principles common to jigs & fixtures.
10. Students understood Drilling Jigs :- Design principles, drill bushes, design principles for drill bushings.
11. Students understood Types of drilling jigs - Template jig, plate type jig, swinging leaf jig, Box type jig, channel type jig, Milling.
12. Students understood Fixtures: - Essential features of milling fixtures, Design principles for milling fixtures, Indexing jig & fixtures, turning fixtures, Automatic clamping devices.
13. Students understood introduction of Press operations, Press working equipment - Classification, Rating of a press, Press tool equipment's.
14. Students understood arrangement of guide posts. Press selection, press working terminology
15. Students understood types of dies -Simple dies, inverted die, compound dies, combination dies, progressive dies, Transfer dies, multiple dies.
16. Students understood principle of metal cutting, strip layout, clearance, angular clearance, cutting forces, method of reducing cutting forces, Die block, Die block thickness, Die opening, Fastening of die block.
17. Students understood Bending Terminology, V- Bending, Air bending, bottoming dies, Wiping dies, spring back & its prevention, channel dies.
18. Students understood design Principles - Bend radius, Bend allowance, width of die opening, bending pressure.
19. Students understood Forming Dies- Introduction, Types - solid form dies, pad type form dies, and Embossing dies, Drawing Dies coining dies,

Subject: COMPUTER AIDED DESIGN / COMPUTER AIDED MANUFACTURING (CAD/CAM)
Subject Code: MED 354

Course Outcome (CO's)

1. Student understood CAD CAM CAE technology in industries.
2. Student understood the use of computers product design and manufacturing.
3. Student understood 3D modeling skills for product design.
4. Student understood programming skills required for NC & CNC manufacturing.
5. Student understood Manufacturing Automation.
6. Student understood the Robotics and Rapid Prototyping.

Subject: COMPUTER AIDED DESIGN / COMPUTER AIDED MANUFACTURING (CAD/CAM)
Subject Code: MED 354

Program Specific Outcome (PSO's)

1. Students understood the history of CAD/CAM.
2. Students understood the PLM.
3. Students understood the use of concurrent engineering.
4. Students understood the Application of CAAP, CAI.
5. Students understood Application of RP & CAPP.
6. Students understood the Need of Hardware configuration.
7. Students understood the "To understand Ground rules for selection of graphics software"
8. Students studied the 2D transformations.
9. Students understood the 3D transformations.
10. Students understood the Use of Composite transformations.
11. Students understood the 3D Projections.
12. Students understood the design modeling.
13. Students understood To use Modern solid modeling techniques.
14. Students Explained feature based modeling, parametric modeling, constraint based modeling.
15. Students studied Creation of Solid Representation.
16. Students studied the Beizer curve & B-Spline curve.
17. Students studied the use of different design software.
18. Students understood the Basic components of NC, CNC and DNC system.
19. Students understood NC motion control systems.
20. Students understood the "Knowledge of drive of NC systems, Coordinate System of CNC Lathe Machine".
21. Students understood the program for CNC Drilling, Milling.
22. Students understood Different CNC Machining Centers like three, four and five axes.
23. Students understood the Flexible Manufacturing System (FMS).
24. Students understood the Robotics and Rapid Prototyping.

Subject: INDUSTRIAL HYDRAULICS AND PNEUMATICS
Subject Code: 355 – ELECTIVE I

CO's:

1. Student understood and analyze the similarities and differences of the electrical, pneumatic and hydraulic systems,
2. Student understood hydraulic and pneumatic symbols and its uses
3. Design a hydraulic or pneumatic system and its accessories
4. Student understood Electro-Hydraulics and Electro-Pneumatics.
5. Student understood the electro hydraulic and pneumatic circuits
6. Student understood the different logic controllers.

Subject : : INDUSTRIAL HYDRAULICS AND PNEUMATICS
Subject Code : 355 – ELECTIVE I

Program Specific Outcome (PSO's)

1. Students understood the Fluid technology, fluid statics and fluid kinetics. Laws governing these systems, Pascal's law, Bernauli's equation. Force and work in fluid devices.
2. Students understood the Displacement actions Fluids used in Hydraulics and pneumatics. Essential properties of oils used in hydraulic systems.
3. Students understood the Oils used in hydraulic systems, oil additives. Air filter, regulator and lubricator unit. Introduction of Hydraulic and pneumatic, basic circuits (in block diagram).
4. Students understood the study the ASME and DIN ISO standard symbols for hydraulics and pneumatics and their applications. Composite symbols. Use of symbols. General rules.
5. Students abled to explain Composite symbols. Use of symbols. General rules.
6. Students abled to understood the Construction, principle of working, applications of various hydraulic Pump and motors,
7. Students understood the pneumatic compressors and motors (linear, rotary, and oscillating) their characteristics; Types: Piston cylinder, rotary vane, gear, lobe, gerotor, rotary piston, screw etc. Hydraulic sump, types and construction, air reservoir.
8. Students understood the study of pneumatic and hydraulic control valves; Pressure control valves, flow control valves, direction control valves; study of all the types, different constructions, valve actuators, applications.
9. Students Study of the different piping, couplings, and pipe accessories used in hydraulic and pneumatic systems. Study of accessories in hydraulic and pneumatic systems; like accumulators, pressure boosters, filters, seperators, air driers, heat exchangers. Seals- static, sliding and rotary, packings (types, material application).
10. Students abled to Explain Review of components of hydraulic and pneumatic system –pumps, motors, cylinders, different types of control valves –designation methods of actuation, power supply system, hoses, filters etc., circuit diagram with technical data. Study of the logics to develop a circuit.
11. Students understood the placements of components. Details of drawing of pneumatic and hydraulic circuits. Designing and drawing of circuits. Design of different circuit's basic circuit, speed control circuit, force control circuit, various actuators. Special circuits like sequencing, counter balancing, unloading, variable operation circuit, circuit with air/hydraulic pilot operated valves
12. Students abled to explain Typical industrial application circuits including synchronizing circuit, fail safe circuit, and two hand safety circuit, machine applications like clamps, machine feed and other applications, material moving equipment's, cranes, jacks, press etc.
13. Students understood the Review of components in electrical control of hydraulic and pneumatic systems, valve actuators used in these systems. Control switches, Limit switches, reed switches, proximity switches (capacitive, inductive & optical).
14. Students understood pressure switches, relays & contactors, solenoid operated direction control valves, symbols, performance data,
15. Students abled to explain ladder diagram, programmable logic controllers, input and output elements. Metering devices. Advantages limitations and applications.