DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Fluid Mechanics

PAPERCODE: DME- 401

RATIONAL

This course is intended to introduce basic principles of fluid mechanics. It is further extended to cover the application of fluid mechanics by the inclusion of fluid machinery especially water turbine and water pumps. Now a day the principles of fluid mechanics find wide applications in many situations directly or indirectly. The use of fluid machinery, turbines pumps in general and in power stations in getting as accelerated fill up. Thus there is a great relevance for this course for mechanical technicians. The Mechanical technicians have to deal with large variety of fluids like water, air, steam, ammonia and even plastics. The major emphasis is given for the study of water. However the principle dealt with in this course will be applicable to all incompressible fluids.

CO'S of Fluid Mechanics

CO1: Study of manometers and Bourdon gauge to measure pressure

CO2: Use flow meters to measure the rate of flow

CO 3: Analyze flow through pipes

CO4: Analyze impact of jet on various types of vanes for optimum efficiency

CO5: Analyze performance of hydraulic turbine

CO6: Analyze performance of hydraulic pump

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Fluid Mechanics

PAPERCODE: DME- 401

Unit No.	**COURSE CONTENT**
1	**Properties of Fluid and Fluid Pressure:** Properties of Fluid: Density, Specific Gravity, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface Tension, Capillarity, Vapor Pressure, Compressibility. Fluid Pressure and Pressure Measurement: Fluid Pressure, Pressure Head, Pressure Intensity, Absolute Vacuum, Gauge Pressure, Atmospheric Pressure, Absolute Pressure, Manometers (Simple & Differential), Bourdon's Tube Pressure Gauge,
2	**Fluid Flow:** Types of Fluid Flow: Laminar, Turbulent, Steady, Unsteady, Uniform, Non-uniform, Rotational, Irrotational, One/Two/Three Dimensional. Continuity Equation, Bernoulli's Theorem, Venturimeter: Construction, Working Principle, Coefficient of Discharge, Derivation of Discharge, Orifice Meter: Construction, Working Principle, Hydraulic Coefficients, Derivation of Discharge Pitot Tube: Construction, Working Principle
3	**Flows Through Pipes:** Laws of Fluid Friction: Darcy's & Chezy's Equations, Minor Losses in Pipe Fittings and Valves, Hydraulic Gradient Line and Total Energy Line, Hydraulic Power Transmission, Water Hammer: Causes and Remedial Actions. **Impact of Jets:** Impact on Fixed & Moving Vertical Flat Plates, Impact on Curved Vanes
4	**Hydraulic Turbines:** Layout & features of hydroelectric power plant. Classification of hydraulic turbines. Construction & working principle of Pelton wheel Turbine, Francis Turbine, Kaplan Turbine. Draft tubes- types and construction, Concept of cavitations in turbine. Simple Calculation of work done & power efficiency of turbine.
5	**Hydraulic Pumps:** Centrifugal Pumps: Construction, Working Principle, Priming, Cavitation, Types of Casing & Impellers, Manometric Head, Work Done, Efficiencies (Manometric, Mechanical, Overall), , Reciprocating Pumps: Construction, Cavitation, Separation, Air Vessel, Pump Selection Criteria.

LIST OF EXPERIMENTS

1 To measure the pressure of water in pipe by (a) Piezometer (b) Different types of monometers
2 To verify Bernaulli's equation.
3 To determine discharge through a given venturimeter.
4 To determine discharge through a given orifice meter.
5 To determine discharge through a Pitot tube.
6 To determine Cc, Cv and Cd for different types of orifices and mouth pieces.
7 To determine loss of head due to: (a) Sudden enlargement. (b) Friction in pipes.
8 To determine discharge through different types of notches.
9 Study of Pelton wheel, Francis turbine, and Kaplan turbines and their performance characteristics..
10 Study of reciprocating pump and Determining its H.P.
11 Study of centrifugal pump.
12 To determine operating characteristics of centrifugal pump.

REFERENCE BOOKS

1 A text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines. By Khurmi (S. Chand & Co.)
2 Fluid Machines by M. Manohar
3 Hydraulics & Hydraulic Machines by Dr. Jagdish Lal (Metropolitan)
4 Hydraulics & Hydraulic Machines by Priyani.
5 Fluid Machines with Engineering Applications by R.L. Draught lery & A.C. Jugersoll. (Mc Graw Hills)
6 Journal of experiments in Hydraulic Laboratory by V. N. Rao & Husan New Heights.
7 Fluid Mechanics by Dr. M.L. Mathur (Std. Publications).
8 Taral Yantriki Avum Machinery by G.B. Bamanker. (Deepak Prakashan, Gwalior).

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Thermal Engineering

PAPER CODE: DME- 402

RATIONAL

Mechanical engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors, pumps etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the subject of Thermal Engineering which is a core subject. It includes the study of various sources of energy, basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries. Steam turbines and condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices.

CO's of Thermal Engineering

CO1: Describe components of energy sources.

CO2: Describe the basic concepts of thermodynamics.

CO3: Describe various thermodynamic reversible processes, Apply gas laws for given processes.

CO4: Apply first and second law for the thermodynamic systems.

CO5: Describe the working, construction and applications of steam boilers.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Thermal Engineering

PAPER CODE: DME- 402

Unit No	COURSE CONTANT
1	**Definition and Classification of energy sources**- Renewable and Non-Renewable, Examples of renewable and non renewable sources. Flat plate and concentrating solar collectors, their application. Photovoltaic Cell, Solar Distillation system, solar cooker. Wind energy horizontal and vertical wind mill, site selection for wind energy power plants, introduction to Tidal energy, Geothermal energy, Biogas energy, Bio-gas plant..
2	**Fundamental Concepts:** Thermodynamic state and system, boundary, surrounding, universe. Thermodynamic systems-closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic. Properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes. Zeroth Law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy and internal energy.
3	**Thermodynamic Processes on Gases:** Types of thermodynamic processes – isochoric, isobaric, isothermal, hyperbolic, isentropic, poly tropic and throttling processes, Equations representing the processes Derivation of work done. **Ideal Gases:** Definition of an ideal gas, explanation of ideal gas laws – Boyle's law, Charle's law, Gay-Lussac's Law, Avogadro's law. Universal gas constant, Characteristic gas constants, Specific heat at constant pressure, specific heat at constant volume of gas, simple problems on gas equation.
4	**Laws of Thermodynamics:** Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Limitations of first law of thermodynamics, Application of first law of thermodynamics to non-flow systems -Constant volume, constant pressure, Adiabatic and poly tropic processes. Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck's statement, Clasius statement, Perpetual motion Machine of first kind, second kind, third law of thermodynamics, concept of irreversibility, entropy. Carnot engine, Introduction to Internal combustions.
5	**Properties of Steam& Steam Generators:** Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of steam, Mollier diagram (H – S Chart), (Numerical) Steam Generators : Uses of steam, classification of boilers, comparison of fire tube and water tube boilers. Construction features of Simple vertical, Cochran, Lancashire boiler, Babcock & Wilcox Boiler,. Boiler mountings and accessories.

LIST OF EXPERIMENTS

1. To study the function and working of various mounting and accessories in a boiler.
2. To study the construction and working of some low pressure boiler.
3 .To study the construction and working of some high pressure boiler
4. To study the basic element of a power plant.
5. Study of separating and throttling calorimeter.
6 Study of steam turbine.
7 Study of different types of I.C. engines (four stroke and two stroke C.I. and S.I.)
8 Study of various systems of I.C. engines.
(a) Fuel supply system
(b) Cooling system
(c) Ignition system
(d) Governing system.
(e) Lubrication system
9 Study of
(a) Fuel pump
(b) Fuel injector
(c) Carburetor.
10 Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.

REFERENCE BOOK

1 Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill Ltd.
2 Engineering Thermodynamics, C. P. Gupta, Rajendra Prakash
3 Thermal Engineering by P.L. Ballani. (Khanna Publisher's N. Delhi)
4 A Course in thermodynamics And Heat Engines by Kothanandran, Khajuria and Arora (Dhanpat Rai & Sons Delhi)
5 Treatise On Heat Engineering by Vasandani & Kumar (Metropocitan Book Co. Ltd, New Delhi)
6 Thermodynamics by G.T. Van Wylen (John Wiley & Sons)
7 Thermodynamic and Heat Engines Vol . I & II by R. Yadav. (Central Book Depot, Allahabad)
8 Heat Power by Kashitish Chandra Pal (Orient Longman Hyderabad).

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

NAME OF THE COURSE: Engineering Measurements and Maintenance Practices

PAPERCODE: DME- 403

RATIONAL

To ensure the safety, efficiency and reliability of mechanical systems and manufactured goods. By combining precise measurement techniques with proactive and data-driven maintenance strategies, engineers can extend asset lifespan, minimize costly downtime, and continuously improve performance. Measurement ensures components are manufactured to exact dimensions and tolerances, allowing for proper fit and interchangeability. Metrology, the science of measurement, is a crucial part of quality control. It provides a means to assess the suitability of manufactured components, as deviations from specifications can result in significant costs.

CO's of Engineering Measurements and Maintenance Practices

CO1: Demonstrate knowledge of engineering measurement principles and units.
CO2: Select and use precision measuring instruments for linear, angular, and mechanical quantities.
CO3: Perform calibration and alignment of engineering measuring tools.
CO4: Apply preventive and corrective maintenance practices in mechanical systems.
CO5: Interpret and record measurement data for engineering decision-making.
CO6: Understand maintenance safety norms and standard practices in workshops.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Engineering Measurements and Maintenance Practices

PAPERCODE: DME- 403

Units No	COURSE CONTENT
1	**Basics of Engineering Measurements:** Introduction to measurement systems and their significance in engineering applications. Units of measurement and conversion. Accuracy, precision, and repeatability of measurements. Types of errors: systematic, random, and gross errors; methods to minimize errors. Tolerance, limits, and fits: concepts and standard practices. Calibration fundamentals: purpose, procedures, and standards. Measurement standards and traceability.
2	**Linear & Angular Measurements:** Linear measurement instruments: Vernier calipers, micrometers (screw, digital, and dial). Height gauges, dial gauges, and comparators. Angular measurement instruments: bevel protractors, sine bars, sine centers, angle gauges. Slip gauges (gauge blocks) and their applications in precision measurement. Applications of instruments in workshop and inspection. Care, handling, and calibration of measuring instruments.
3	**Mechanical Measurements** Measurement of force, torque, power, speed, strain, pressure, flow, and vibration. Instruments and devices: dynamometers, load cells, tachometers, strain gauges, pressure transducers, flow meters, and accelerometers. Selection of measurement devices based on accuracy and application. Data acquisition methods and interpretation of measurement results. Industrial applications of mechanical measurements.
4	**Instrumentation & Electrical Measurement Basics** Introduction to electrical measurement instruments: ammeter, voltmeter, multimeter, wattmeter. Measurement of displacement, force, temperature using electrical sensors. Signal conditioning basics: amplification, filtering, and analog-to-digital conversion. Introduction to PLCs and data logging for measurements. Safety considerations while using electrical measuring devices.
5	**Maintenance Practices**: Types of maintenance: preventive, predictive, and corrective maintenance. Lubrication systems: types of lubricants, lubrication methods, and schedules. Alignment and balancing of rotating machines: shafts, pulleys, couplings, and motors. Inspection of mechanical components and assemblies. Tools and equipment used in maintenance work. Fault diagnosis, troubleshooting, and recording maintenance activities.
6	**Safety & Workshop Practices:** Safety procedures in measurement laboratories and workshops. Use of Personal Protective Equipment (PPE). Handling, storage, and maintenance of precision instruments. Calibration schedules and record keeping. Environmental and health aspects: disposal of waste, ergonomics, fire safety, and emergency procedures. Best practices for workshop discipline and quality assurance in measurements.

LIST OF EXPERIMENTS

1. Study of measurement systems, units, and standard conventions.
2. Calibration of measuring instruments and demonstration of limits, fits, and tolerances.

3. Linear measurements using vernier calipers, micrometers, and height gauges.
4. Angular measurements using bevel protractors, sine bars, and slip gauges.
5. Measurement of force using load cells and proving rings.
6. Torque measurement using torsion dynamometer.
7. Measurement of speed and power using mechanical/electrical dynamometers.
8. Measurement of strain using strain gauges and pressure using pressure gauges.
9. Measurement of flow rate and vibration using appropriate transducers.
10 .Measurement of voltage, current, and resistance using ammeter, voltmeter, and multimeter.
11. Measurement of displacement and temperature using sensors and signal conditioning setup.
12. Demonstration of preventive, predictive, and corrective maintenance practices on rotating machines.
13. Lubrication of bearings and machine parts; study of different lubrication systems.
14. Alignment and balancing of shafts, pulleys, and couplings.
15. Inspection and fault diagnosis of a mechanical system.
16. Safety practices: use of PPE and safe handling of precision instruments.
17. Workshop practice: calibration schedule maintenance and record keeping.
18. Environmental and health aspects: safe disposal of workshop waste, fire safety, and ergonomics.

REFERENCE BOOKS

1. A Course in Mechanical Measurements R.K. Jain Khanna Publishers
2. Mechanical Measurements Beckwith & Buck (Indian Edition)Tata McGraw-Hill
3. Engineering Metrology & Measurements R.K. Rajput S. Chand & Co.
4. Mechanical Measurements P.C. Sharma S. Chand & Co.
5. Workshop Technology & Maintenance Practices B.S. Raghuvanshi Dhanpat Rai & Sons
6. Mechanical Measurements and Metrology U.C. Jindal Katson Publications
7. Maintenance Engineering R.C. Mishra S.K. Kataria & Sons
8. Industrial Maintenance H. P. Garg S. Chand & Co.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: Industrial Management

PAPER CODE: DME- 404

RATIONAL

Diploma pass-outs are generally engaged in middle level management. It is found necessary to impart the diploma pass-outs at final year level certain concepts, principles, procedures and understanding of management techniques so that he is brought out to a fairly high level of competency in "supervisor-ship."The course has two aspects - behavioral science and mathematical approach towards management. Behavioral science includes communication skills, grievance handling, motivation, morale and leadership. Mathematical approach includes PPC, CPM, PERT and Inventory management. It has been felt necessary to provide the students knowledge about newer trends in management like TQM, JIT, ISO and role of Computers. It is hoped that the course will help the students to be successful in middle management role.

CO'S of Industrial Management

CO1: Interpret production systems and productivity and plant layout.

CO2: Prepare the process plan for given job

CO3: Describe the production planning and control functions and modern techniques of production control.

CO4: Apply the techniques and tools for method study

CO5: Apply the techniques and tools for time study

CO6: Describe the principles of motion economy & ergonomics

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: RENEWABLE ENERGY TECHNOLOGIES

PAPER CODE: DME- 404

RATIONAL

Diploma pass-outs students them for a shift toward sustainable, decentralized, and environmentally friendly power solutions, aligning with global efforts to reduce dependence on fossil fuels. As technical technicians, diploma students need to understand how to design, install, and maintain solar, wind, biomass, and hybrid systems.

CO'S of RENEWABLE ENERGY TECHNOLOGIES

CO1: Understand present and future energy scenario of the world.

CO2: Understand various methods of solar energy harvesting

CO3: Identify various wind energy systems.

CO4: Evaluate appropriate methods for Bio energy generations from various Bio wastes.

CO5: Identify suitable energy sources for a location.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: RENEWABLE ENERGY TECHNOLOGIES

PAPER CODE: DME- 404

Unit No.	**COURSE CONTANT**
1	**UNIT-I: Introduction:** World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems
2	**Unit-II: Solar energy:** Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.
3	**Unit-III**: Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects
4	**Unit-IV**: Bio-Energy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.
5	**Unit-V**: Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

Reference Books:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)

2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.

3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.

4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.

5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.

6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: CAD-CAM-CIM

PAPER CODE: DME- 405

RATIONAL

Manufacturing of this century belongs to computerized equipment & machine tools to manufacture a variety of components with high quality, high precision & low cost at a faster rate. Commuter Aided Designing (CAD), Computer Aided Manufacturing (CAM), Numerical Control Machine Tools, Commuter Aided Process Planning (CAPP), Automated Guided Vehicles & Flexible Manufacturing Systems-all are the part of Computer Integrated Manufacturing (CIM) which help to achieve the desired goals in manufacturing. After studying the subject, the students will be able to know about these integrated techniques which help a manufacturer to achieve his goal with in stipulated time.

CO's of CAD-CAM-CIM

CO1: Understand basic components and networks involved in CIM.

CO2: Understand hardware, software and product modeling at industry level

CO3: Understand process planning and program coding of task.

CO4: Design a manufacturing cell and cellular manufacturing system.

CO5: Design automated material handling and storage systems for a typical production system..

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FOURTH SEMESTER

NAME OF THE COURSE: CAD-CAM-CIM

PAPER CODE: DME- 405

Unit No.	**COURSE CONTENT**
1	**UNIT-I:** Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.
2	**UNIT-II: Computer Aided Design (CAD):** CAD hardware and software; product modelling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.
3	**Unit-III: Computer Aided Manufacturing (CAM),** Computer assisted NC part programming,Computer assisted robot programming; computer aided process planning (CAPP); computer aided material requirements planning (MRP)
4	**Unit-IV: Computer aided production scheduling;** computer aided inspection planning; computer aided inventory planning, Flexible manufacturing system (FMS); concept of flexible manufacturing.
5	**Unit-V**: Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting; office automation.

LIST of EXPERIMENTS:

1. Creating parts:

Sketching, selection of sketch plane, creating feature on work plane, extrude, dimensioning sketches, constraining sketches.
- Create Rectangle, Circle, and Polygons. Extrude these to make box, cylinder &prism and dimension the above part, change size by editing dimensions & using constraints.

2. Creating Drawing Views:

Planning and setting of drawings, creating drawing views, Hiding extraneous dimensions.
- Create various drawing views of the 3-D parts.

3. **Advanced Modeling Techniques**

Extrudes to face/plane, intersect, face draft, 3D rounds, 3D fillets & 3D chamfers, setting &modifying feature dimensions, history based part modification.
- Use extrude commands to make holes through the above objects. Also face drafts a part on another part.
- Create 3-D rounds and fillets on box corners and Use history to modify above feature and their dimensions.

4. **Assembly of Parts**

Basic concepts, starting assembly design, creating part instances, assembling the parts, checking for interference.
- Make cylinder and piston and assemble them.

References:

1. Bhatt, ND; Machine Drawing; Charotar Publication
2. K C John, Machine Drawing, PHI
3. Singh A; Machine Drawing; TMH publication
4. Narayana and Reddy; Machine Drawing; New age, Delhi.
5. Shigley JE et al; Mechanical Engineering Design, TMH

6. “Computer Aided Manufacturing” By Surinder Kumar, Aditya Shah; Satya Parkashan, NewDelhi
7. Numerical Control & Computer Aided Manufacturing” By T.K. Kundra, P.N.Rao & N.K. Tewari; Tata McGraw Hills Pub. Co. New Delhi.
8. “System Approach to Computer Integrated Design & Manufacturing” By N.Singh; John Willey& Sons Inc.
9. “Computer Integrated Manufacturing Hand Book” By Teicholz, Orr; McGrawHillBook Co.