**TILAK MAHARASHTRA VIDYAPEETH,PUNE**

**TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSE**

**COURSE NAME : MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**DURATION OF COURSE : 6 SEMESTERS**

**SEMESTER :FOURTH** **DURATION:- 18 WEEKS**

**FULL TIME**

| SR. NO. | SUBJECT TITLE | SUBJECT CODE | TEACHING SCHEME | | EXAMINATION SCHEME | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TH | PR | PAPER HRS | TH | | INT | TOTAL | | PR | | OR | | TW | |
| | | | | | | Max | Min | | Max | Min | Max | Min | Max | Min | Max | Min |
| 1 | Theory of Machines & Mechanisms | ME4001 | 03 | 02 | 03 | 80 | 32 | 20 | 100 | 40 | 25* | 10 | -- | -- | -- | -- |
| 2 | Basics of Electronics | ME4002 | 03 | 02 | 03 | 80 | 32 | 20 | 100 | 40 | 25* | 20 | -- | -- | -- | -- |
| 3 | Production Processes | ME4003 | 02 | 04 | 03 | 80 | 32 | 20 | 100 | 40 | 25* | 10 | -- | -- | -- | -- |
| 4 | Thermal Engineering | ME4004 | 04 | 02 | 03 | 80 | 32 | 20 | 100 | 40 | -- | -- | 25** | 10 | -- | -- |
| 5 | Fluid Mechanics & Machinery | ME4005 | 04 | 02 | 03 | 80 | 32 | 20 | 100 | 40 | -- | -- | 25** | 10 | -- | -- |
| 6 | Computer Programming | ME4006 | 01 | 02 | -- | -- | -- | -- | -- | -- | 50* | 20 | -- | -- | -- | -- |
| 7 | Professional Practices-III | ME4007 | -- | 02*** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50* | 20 |
| 8 | Development of Generic Skills-I | ME4011 | 01 | -- | -- | 40 | 16 | 10 | 50 | 40 | -- | -- | -- | -- | -- | -- |
| **TOTAL** | | | **18** | **16** | -- | **440** | **--** | **110** | **550** | **--** | **125** | **--** | **50** | **--** | **50** | **--** |

STUDENT CONTACT HOURS PER WEEK(FORMAL TEACHING) : **34 HRS; Theory and Practical periods of 60 minutes each**

* - INTERNAL ASSESSMENT , ** - EXTERNAL ASSESSMENT,*** - TUTORIAL

**TOTAL MARKS – 775**

ABBREVIATIONS : TH – THEORY , INT-INTERNAL , PR – PRACTICALS , OR –ORAL, TW – TERMWORK

**All Practical, orals and Term Work assessments are to be done as per the prevailing norms for implementation and assessment**

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : THEORY OF MACHINES AND MECHANISMS**

**SUBJECT CODE : ME4001**

**TEACHING AND EXAMINATION SCHEME:**

| Teaching Scheme | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **Total** |
| 03 | 02 | 03 | 80 | 20 | 25 | -- | -- | 125 |

**Pre-requisites:** The student must know the following concepts:

1. Basic physics and mechanics.

**Objectives:** The student will be able to

1. Know different machine elements and mechanisms.
2. Understand kinematics and dynamics of different machines and mechanisms.
3. Select suitable drives and mechanisms for a particular application.
4. Appreciate concept of balancing and vibration.
5. Develop ability to come up with innovative ideas.

**Subject Title: THEORY OF MACHINES AND MECHANISMS** **Subject Code: ME4001**

**Contents: Theory**

| Unit | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **FUNDAMENTALS AND TYPES OF MECHANISMS**<br>Kinematics of Machines: Definition of kinematics, dynamics, statics, kinetics, kinematic link, kinematic pair and its types, constrained motion and its types, kinematic chain and its types, mechanism, inversion, machine and structure.<br>Inversions of kinematic chain, inversion of four bar chain, coupled wheels of locomotive & pantograph, inversion of single slider crank chain-inversion of double slider crank chain. Common mechanisms such as bicycle free wheel, sprocket mechanism. Geneva mechanism, Ackerman's steering gear mechanism, foot operated air pump mechanism. | **09** | **16** |
| **02** | **VELOCITY AND ACCELERATION IN MECHANISM**<br>Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity and acceleration.<br>Drawing of velocity and acceleration diagrams of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method. | **07** | **10** |
| **03** | **CAMS AND FOLLOWERS**<br>Concept, definition and application of Cams and Followers.<br>Classification of Cams and Followers.<br>Different follower motions and their displacement diagrams like uniform velocity, SHM (Simple harmonic Motion), uniform acceleration and retardation.<br>Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method). | **07** | **10** |

| | | | |
|---|---|---|---|
| **04** | **POWER TRANSMISSION**<br>Types of Drives: Belt, Chain, Rope, Gear drives & their comparison.<br>Belt Drives - Flat belt, V–belt & their applications, materials for flat and V-belt, angle of lap, belt length, slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical) Chain Drives – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. Gear Drives – Spur gear terminology, types of gears and gear trains, and their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train, methods of lubrication, Law of gearing. Rope Drives – Types, applications, advantages & limitations of Steel ropes. | **10** | **16** |
| **05** | **FLYWHEELS AND GOVERNORS**<br>Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no numerical). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance.<br>Governors - Types, concept, function and application & terminology of governors. Comparison between Flywheel and Governor. | **05** | **08** |

| | | | |
|---|---|---|---|
| **06** | **BRAKES, DYNAMOMETERS, CLUTCHES & BEARINGS**<br>Function of brakes and dynamometer, types of brakes and dynamometers, comparison between brakes and dynamometer. Construction and working of i) Shoe brake ii) Band brake, iii) Internal expanding shoe brake iv) Disc Brake. Concept of self locking & self energizing brakes. Construction and working of i) Rope Brake Dynamometer ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. Clutches - Uniform pressure and Uniform Wear theories. Function of Clutch and its application, Construction and working of i) Single plate clutch ii) Multi-plate clutch iii) Centrifugal Clutch iv) Cone clutch v) Diaphragm clutch. (Simple numerical on single and multi-plate clutch). Bearings: i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot.<br>Torque & power lost in friction (no derivation). Simple numerical. | **09** | **16** |
| **07** | **BALANCING & VIBRATIONS**<br>Concept of balancing, Balancing of single rotating mass. Graphical method for balancing of several masses revolving in same plane. Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies. | **03** | **04** |
| | **TOTAL** | **50** | **80** |

**Practical:**

**Skills to be developed:**

**Intellectual Skills:**

1. Understand working of free wheel mechanism of a bicycle, Geneva mechanism, steering gear mechanism etc.
2. Determine velocity and acceleration of links in a given mechanism.
3. Analyze balancing of rotating masses in a single plane
4. Interpret interrelationship between components of various braking mechanisms
5. Understand concepts of vibrations in various machineries, their harmful effects and remedies.
6. Compare various power transmission devices

**Motor Skills:**

1. Drawing of velocity and acceleration diagrams
2. Assembly and dismantling of brakes and clutches
3. Drawing of cam profiles from a given data for an IC Engine
4. Drawing of velocity and acceleration diagram

**List of Practical:**

1. Find the ratio of time of cutting stroke to the time of return stroke for quick return mechanism of a shaper machine.
2. Sketch & describe working of bicycle free wheel sprocket mechanism.
3. Determination of velocity and acceleration by relative velocity method (four problems).
4. Determination of velocity and acceleration of piston of an I.C. engine's Slider Crank mechanism by Klein's construction, for different position of crank in between $0^0$ and $360^0$. Represent graphically velocity verses crank angle and acceleration verses crank angle.
5. Draw the profile of radial cam for the given motion of follower. (At least four problems)
6. Determine the radius of rotation of fly ball for different speed of governor and draw a graph between radius of rotation versus speed.
7. Dismantling and assembly of mechanically operated braking mechanism for two wheelers.
8. Determination of power transmitted by any belt drive using any one dynamometer.
9. Dismantling and assembly of multi-plate clutch of two-wheeler.
10. To generate gear tooth profile using gear profile generator.

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Theory of machines | Khurmi Gupta | Eurasia publishing House Pvt. Ltd. 2006 edition |
| 02 | Theory of machines | S.S. Rattan | McGraw Hill - II Edition |
| 03 | Theory of machines: a textbook for engineering students | P.L. Ballaney | Khanna Publication |
| 04 | The theory of machines: a textbook for engineering students | TimosBevon | Wiley Eastern |
| 05 | Theory of machines & mechanisms | Jagdish Lal | Bombay Metropolitan Book Ltd. |
| 06 | Theory of mechanisms and machines | Ghosh - Mallik | Affiliated East West Press |
| 07 | Theory of machines | Beven T. | CBS Publication |
| 08 | Theory of machines & mechanisms | J.E. Shigley | McGraw Hill |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : BASICS OF ELECTRONICS**

**SUBJECT CODE : ME4002**

## TEACHING AND EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 03 | 02 | 03 | 80 | 20 | 25* | --- | -- | 125 |

**Pre-requisites:** The student must know the following concepts:

1. Basics of semiconductors.
2. Classification of semi conductor devices.
3. Diode & formation of PN-junction.

**Objectives:** The **s**tudent will be able to

1. Identify and test different components.
2. Use principles of circuit operations and its applications.
3. Distinguish various elements in digital electronics.
4. Understand working of different types of power supplies.
5. Use test instruments.

**Subject Title: BASICS OF ELECTRONICS** **Subject Code: ME4002**

**Contents: Theory**

| Unit | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **ELECTRONIC DEVICES**<br>Introduction to electronic devices, their symbols, working principles and testing procedures of - Diode, Zener diode, Power diode, Varactor diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET) - JFET & MOSFET, Uni-junction Transistor (UJT), power devices - DIAC, TRIAC, SCR, Photo devices, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display (LCD) | **12** | **15** |
| **02** | **POWER SUPPLY**<br>Circuit diagram and operation - Half wave, full wave & bridge rectifier. Filters - L, C, L-C, π filter Concept of unregulated power supply, regulated power supply- line regulation & load regulation. Principle of operation, block diagram and application of shunt regulated power supply, series regulated power supply; switch mode power supply (SMPS), 3-pin IC regulated, IC-723 adjustable power supply.<br>Block diagram of UPS, Concept of online and off line UPS.<br>Concept of constant current limiting and fold back current limiting, concept of constant voltage source, constant curr ent source. | **07** | **10** |
| **03** | **TRANSISTORS**<br>Transistor as a switch and amplifier, single stage transistor amplifier, CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application.<br>Power amplifiers: Class A, Class B, Class C, Class AB, their comparison on operating point, conduction cycle, efficiency, application (No circuits expected).<br>Oscillators - Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator. | **10** | **20** |

| | | | |
|---|---|---|---|
| **04** | **OP AMP**<br>Block diagram, configurations and use of op amp as - Inverting, Non-inverting, Summing, Voltage to current converter, current to voltage converter, differentiator, Comparator, Wienbridge oscillator, Schmitt's trigger. | **04** | **10** |
| **05** | **DIGITAL ELECTRONICS**<br>Number system- Decimal, Binary, Hexadecimal, BCD, Decimal to Binary conversion, Decimal to Hexadecimal conversion.<br>Study of logic gates, Symbol, Truth Table and IC numbers -<br>NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate.<br>Flip Flops - Block diagram of flip flop, RS flip flop, D flip flop, Toggle, JK flip flop, Master Slave JK flip flop, Clocked flip flop - level triggered and edge triggered, Application of flip flop - Frequency divider, Ring counter, Shift register.<br>Seven segment driving circuit, Encoder, Decoder, Multiplexer. | **09** | **10** |
| **06** | **IC 555**<br>Block diagram, Multi-vibrator circuit diagram and working for Mono-stable, Bi-stable and Astable Multi-vibrator.<br>Analog to Digital Converters, Digital to Analog converter.<br>Block diagram and working of Welding control circuits -sequential timer, Temperature control circuits using SCR, FWR.<br>Speed control circuits, Level control circuit using variable capacitor and Potentiometer. | **06** | **15** |
| | **TOTAL** | **48** | **80** |

**Practical:**

**Skills to be developed:**

**Intellectual Skills:**

1. Identification and selection of components.
2. Interpretation of circuits.
3. Understand working of various types of power supplies.

**Motor skills:**

1. Drawing of circuits.
2. Measurement of various parameters using multimeter.
3. Testing of components using LCR meter.
4. Follow standard test procedure.

**List of Practical:**

1. Use of multimeter (analog and digital) for current, voltage and resistance measurement (Use of colour code for resistors).
2. Study of front panel of CRO and measurement of frequency and voltage.
3. I) Measurement of L, C, R on LCR meter
   II) Testing of an IC using IC tester
4. Testing of components like diode, FET, MOSFET, LED, SCR, diac, triac, Zener diode
5. Inductor, capacitor using a multimeter - Line and load regulation of un-regulated power supply and regulated power supply.
6. To plot the frequency response of single stage RC coupled amplifier and calculate band width.
7. Verification of Op-Amp as inverting and non-inverting amplifier.
8. To generate a square wave by using Schmitt trigger.
9. Verify truth tables for logic gates- NOT, AND, OR, NAND, NOR, XOR, XNOR
10. Construct a ring counter using JK flip-flop and verify count sequence.
11. Design a square wave oscillator for 100 Hz using IC 555.(Use astable multivibrator).
12. Speed control of AC/DC motor by using SCR, UJT.

**Note**:

1. Teachers are expected to make students familiar with the Data Books and Operation Manuals and also encourage them to visit related websites.
2. At least one practical from the above list be performed by using simulation software.

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Principles of Electronics | V.K. Mehta | S. Chand & Company Ltd. New Delhi |
| 02 | Electronic Principles | Paul Malvino | Tata McGraw Hill Publishers |
| 03 | Electronic Devices & Components' | A. Mottershead | Prentice Hall of India |
| 04 | Modern Digital Electronics | R.P. Jain | Tata McGraw Hill Publishers |
| 05 | Basic Electronics | Grob Bernard Paul B. ZBar, Albert | Tata McGraw Hill Publishers |
| 06 | Basic Electronics - a Text Lab Manual | P. Malvino, Michael A. Miller | Tata McGraw Hill Publishers |
| 07 | Industrial Electronics - a Text Lab Manual | Paul B. Zbar | Tata McGraw Hill Publishers |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : PRODUCTION PROCESSES**

**SUBJECT CODE : ME4003**

## TEACHING & EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 03 | 04 | 03 | 80 | 20 | 25* | --- | -- | 125 |

**Pre-Requisites:** The student must know the following concepts:

1. Basic manufacturing processes
2. Engineering Materials
3. Engineering Drawing

**Objectives:** The student will be able to

1. Use the basic machine tools like lathes, drilling and milling machines.
2. Know about broaching machine and its applications.
3. Understand the importance of surface finish and related surface finishing methods.
4. Program and use CNC machines.
5. Understand and select the gear cutting processes.
6. Understand and select plastic molding processes.

**Subject Title: PRODUCTION PROCESSES** **Subject Code: ME4003**

**Contents: Theory**

| Unit | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **TURNING**<br>**Introduction to lathe machine**<br>Angle calculations for taper turning.<br>Cutting tool nomenclature and tool signature.<br>Cutting parameters and machining time calculation.<br>**CNC Lathe**<br>Introduction, classification, advantages, positioning system, constructional features.<br>Part programming: programming format, word, statement, block. Preparatory and miscellaneous code, Fixed cycles in programming - canned cycle, do-loop, subroutines | **12** | **20** |
| **02** | **DRILLING**<br>Twist drill nomenclature.<br>Cutting parameters, machining time calculation,<br>Deep hole drilling. | **07** | **10** |
| **03** | **MILLING AND GEAR CUTTING**<br>**Milling**<br>Cutting parameters, machining time calculation.<br>Milling operations - plain milling, side and face milling, form milling, gang milling, end milling, face milling, T-slot milling, slitting.<br>**Gear cutting**<br>Gear cutting on milling machine -Dividing head and Indexing methods<br>Gear hobbing, Principles of operation, Advantages and limitations.<br>Hobbing techniques - climb and conventional, Gear shaping - Principles of operation, advantages, disadvantages, Gear finishing processes - Gear shaving , Gear grinding, Gear burnishing, gear lapping . | **11** | **20** |
| **04** | **GRINDING**<br>Classification of machines ,<br>Grinding wheel composition, types and shapes, Designation.<br>Types of grinding operations. | **06** | **10** |

| | | | |
|---|---|---|---|
| **05** | **SUPER FINISHING PROCESSES**<br>Honing,<br>Lapping,<br>Burnishing,<br>Buffing and polishing. | **06** | **10** |
| **06** | **PLASTIC MOULDING**<br>Types of plastics, Compression molding, Transfer moulding, Injection moulding, Blow molding, Vacuum Forming, Extrusion, Calendaring, Rotational moulding. | **06** | **10** |
| | **TOTAL** | **48** | **80** |

**Practical:**

**Skills to be developed:**

**Intellectual skills:**

1. Understand the axis identification of CNC lathe
2. Understand the various types of preparatory and miscellaneous codes.
3. Calculate machining time for different operations.
4. Identify cutting tool nomenclature / marking systems.
5. Know the significance of various super finishing methods.
6. Understand the different processes of gear cutting.
7. Understand various plastic molding methods.
8. Write programs for CNC Lathe.
9. Understand the plastic as a material.

**Motor Skills:**

1. Operate lathe, CNC lathe, drilling and milling machines.
2. Execute part programming.
3. Operate grinding machine.
4. Use the indexing mechanism.

**List of Practical:**

1. One assignment on cutting tool nomenclature and tool signature of single point cutting tool.
2. Industrial visit to observe plastic processing shop and report on the visit.
3. One job on lathe consisting of operations like plain turning, threading, boring, taper turning.

4. One job on CNC lathe consisting of operations like plain turning, taper turning and curvature. (Group of two students, each group must use different program for different job dimensions )
5. One job consisting of drilling, milling, reaming, gear cutting (spur gear) per job maximum two students.
6. One job consisting of surface grinding / cylindrical grinding for tolerances ±30 microns, (For the job already made on milling machine /lathe).
7. One assignment on accessories & attachment - chucks, mandrels, carrier and catch plates rests; face plate and angle plate, grinding attachment used on lathe.
8. One assignment on accessories & attachment, work holding & tool holding devises used on milling machine.
9. One assignment each on shaper, planer, boring machine, broaching machine.
10. One assignment each on tool nomenclature & geometry of boring tool, broaching tool, milling cutters.
11. One assignment on types of grinding wheels.

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Elements of workshop Technology-Volume I & II | S. K. Hajra Chaudary, Bose, Roy | Media Promoters and Publishers Limited. |
| 02 | Production Technology Volume- I & II | O. P. Khanna & Lal | Dhanpat Rai Publications. |
| 03 | Workshop Technology-Volume -I,II & III | Chapman & Martin | Viva Books (p) Ltd. |
| 04 | A text book of Foundry Tech. Production Technology Workshop | O.P. Khanna | Dhanpat Rai Publications. |
| 05 | Technology Volume-I& II Introduction to | R.B. Gupta | Satya Prakashan New Delhi |
| 06 | Manufacturing Processes | H.S.Bawa | Tata McGraw-Hill |
| 07 | Manufacturing Technology | John A. Schey M. Adithan | McGraw-Hill |
| 08 | CNC machines | A. B. Gupta Pabla B. S. | New age International |

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 09 | Fundamental of metal cutting and machine tools | M. Adithan | New age international limited. |
| 10 | Technology of Machine Tools. | B. L. Juneja | New age international limited. |
| 11 | CAD/CAM Principals and | Steve Krar, Albert Check | McGraw-Hill International. |
| 12 | Applications Manufacturing Technology | P. N. Rao | Tata McGraw-Hill |
| 13 | Metal Cutting & Machine tools | P. N. Rao | Tata McGraw-Hill |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : THERMAL ENGINEERING**

**SUBJECT CODE : ME4004**

**TEACHING AND EXAMINATION SCHEME:**

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 04 | 02 | 03 | 80 | 20 | -- | 25** | | 125 |

**Pre-Requisites:** The student must know the following concepts:

1. Definition and types of energy.
2. Concept of heat transfer.

**Objectives:** The students will be able to

1. Know various sources of energy & their applications.
2. Apply fundamental concepts of thermodynamics to thermodynamic systems.
3. Understand various laws of thermodynamics.
4. Apply various gas laws & ideal gas processes to various thermodynamic systems.
5. Calculate properties of two phase system by using steam tables/ Mollier charts.
6. Explain construction & working of boilers, mountings & accessories.

**Subject Title: THERMAL ENGINEERING** **Subject Code: ME4004**

**Contents: Theory**

| Unit | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **SOURCES OF ENERGY**<br>Brief description of energy sources<br>• Classification of energy sources<br>• Renewable, Non-Renewable<br>Fossil fuels, including CNG, LPG.<br>Solar<br>• Flat plate and concentrating collectors & its application.<br>• Solar Water Heater<br>• Photovoltaic Cell, Solar Distillation.<br>Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel<br>Hydraulic, Nuclear<br>Fuel cells - list of fuel cells | **08** | **08** |
| **02** | **FUNDAMENTALS OF THERMODYNAMICS**<br>Concepts of pure substance, types of systems, properties of systems, Extensive and Intensive properties with units and conversion like P, V, ρ and temperature. Point function and path function<br>Work and Energy - Thermodynamic definition of work, heat, difference between heat and work, P.E.(Potential Energy), K.E (Kinetic Energy), Internal Energy, Flow work, concepts of enthalpy, entropy.<br>Laws of Thermodynamic- Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2.<br>Application of Thermodynamic laws<br>- Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser.<br>Application of Second law to Heat Engine,<br>Heat Pump and Refrigerator. | **10** | **16** |
| **03** | **IDEAL GASES**<br>Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant.<br>Ideal gas processes: - Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic,<br>Isentropic with representation of the processes on P-V and T-S diagram (only simple numerical) | **08** | **08** |

| | | | |
|---|---|---|---|
| **04** | **STEAM AND STEAM BOILER**<br>Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam table, Quality of steam and its determination with separating, throttling and combined separating & throttling calorimeter (no numericals).<br>Vapour process:<br>- constant pressure, constant volume, constant enthalpy, constant entropy (numericals using steam table and Mollier chart), Rankine Cycle<br>Steam Boilers: -<br>- Classification of boilers.<br>- Construction and working of Cochran, Babcock & Wilcox, Lamont and Loeffler boiler. Boiler draught natural and mechanical.<br>Boiler mounting and accessories [to be covered in practical]. | **12** | **16** |
| **05** | **STEAM TURBINES AND CONDENSERS**<br>Steam nozzle: Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.<br>Steam turbines: Classification of turbines, Construction and working of Impulse and Reaction turbines.<br>Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing (no velocity diagrams and numericals).<br>Steam condenser: Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers.<br>Sources of air leakage, concept of condenser efficiency, vacuum efficiency (no numerical).<br>Cooling Towers - Forced draught, natural draught and induced draught. | **12** | **16** |
| **06** | **HEAT TRANSFER**<br>Modes of heat transfer:<br>Conduction, convection and radiation.<br>Conduction by heat transfer, Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical)<br>Heat transfer by Radiation: Thermal Radiation, Absorptive, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzmann law.<br>Heat Exchangers: Shell and tube, plate type, multiphase heat exchangers. Materials used and applications of heat exchangers. | **10** | **16** |
| | **TOTAL** | **60** | **80** |

**Practical:**

**Skills to be developed:**

**Intellectual Skill:**

1. Understand different sources of energy and their applications.
2. Understand various concepts and fundamentals of thermodynamics.
3. Understand concepts and laws of ideal gasses.
4. Understand vapour processes, steam boilers and different mountings and accessories.
5. Understand modes of heat transfer and concept of heat exchanges.
6. Interpret steam tables, Mollier chart and relationship between different thermo dynamic properties.

**Motor Skills:**

1. Collect and write technical specifications of photovoltaic cells and identify different components on panels of photovoltaic cells.
2. Conduct trial on the setup for calculation of thermal conductivity of metal rod
3. Trace path of flue gases and water steam circuit in a boiler.
4. Conduct trial on solar water heating system.

**List of practical:**

1. Collection of technical data and specification of photovoltaic cell by referring to manufacturers' catalogues.
2. Study and trial on solar water heating system.
3. Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
4. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
5. Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories.
6. Calculation of thermal conductivity of a solid metallic rod.
7. Verification of Stefan-Boltzmann’s law
8. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
9. Numerical on vapour processes and ideal gas processes (minimum two problems on each)

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | A Course in Thermal Engineering | Domkundwar V. M. | Dhanpat Rai & Co. |
| 02 | A Course in Thermal Engineering | P. L. Ballaney | Khanna Publishers |
| 03 | A text book of Thermal Engineering. | R. S. Khurmi | S. Chand & co. Ltd. |
| 04 | A Course in Thermal Engineering | R. K. Rajput | Laxmi Publication, Delhi |
| 05 | Engineering Thermodynamics | P. K. Nag | Tata McGraw Hill |
| 06 | Thermal Engineering | B. K. Sarkar | Tata McGraw Hill |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : FLUID MECHANICS & MACHINERY**

**SUBJECT CODE : ME4005**

## TEACHING AND EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 04 | 02 | 03 | 80 | 20 | -- | 25** | | 125 |

**Pre-requisites:** The **s**tudent must know the following concepts:

1. Properties of fluids
2. Types of fluids

**Objectives:** The student will be able to

1. Measure various properties such as pressure, velocity, flow rate using various instruments
2. Calculate different parameters such as co-efficient of friction, power, efficiency etc of various systems
3. Describe the construction and working of turbines and pumps
4. Test the performance of turbines and pumps
5. Plot characteristics curves of turbines and pumps

**Subject Title: FLUID MECHANICS & MACHINERY** **Subject Code: ME4005**

**Contents: Theory**

| Unit | Name of he Topic | Hours | Marks |
|---|---|---|---|
| **01** | **PROPERTIES OF FLUID**<br>Density, Specific gravity, Specific Weight, Specific volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity<br>Vapour Pressure, Compressibility | **04** | **04** |
| **02** | **FLUID PRESSURE & PRESSURE MEASUREMENT**<br>Fluid pressure, Pressure head, Pressure intensity Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. Simple and differential manometers, Bourdon pressure gauge. Concept of Total Pressure, center of pressure of plane, regular surfaces immersed in liquid Horizontally, vertically and inclined.<br>**Note:** Numerical on Manometers, Total Pressure & Centre of pressure | **08** | **12** |
| **03** | **FLUID FLOW**<br>Types of fluid flows, Continuity equation, Bernoulli's theorem.<br>Venturi-meter - Construction, principle of working, Coefficient of discharge, Derivation for discharge through Venturi-meter.<br>Orifice meter - Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter.<br>Pitot tube - Construction, Principle of working<br>**Note :-** Numerical on Venturi-meter, orifice meter, Pitot tube | **08** | **12** |
| **04** | **FLOW THROUGH PIPES**<br>Laws of fluid friction (Laminar and turbulent), Darcy's equation and Chezy's equation for frictional losses.<br>Minor losses in pipes, Hydraulic gradient and total gradient line.<br>Hydraulic power transmission through pipe<br>**Note:** Numerical to estimate major and minor losses | **06** | **08** |

| | | | |
|---|---|---|---|
| **05** | **IMPACT OF JET**<br>Impact of jet on fixed vertical, moving vertical flat plates.<br>Impact of jet on curved vanes with special reference to turbines & pumps<br>**Note -** Simple numerical on work done and efficiency | **08** | **10** |
| **06** | **HYDRAULIC TURBINES**<br>Layout of hydroelectric power plant.<br>Features of Hydroelectric power plant.<br>Classification of hydraulic turbines.<br>Selection of turbine on the basis of head and discharge available. Construction and working principle of Pelton wheel, Francis and Kaplan turbines. Draft tubes - types and construction, concept of cavitation in turbines.<br>Calculation of work done, power, efficiency of turbine. | **08** | **10** |
| **07** | **PUMPS**<br>**a] Centrifugal Pumps**<br>Construction, principle of working and applications. Types of casings and impellers.<br>Concept of multistage Priming and its methods, Cavitation, Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH Performance Characteristics of Centrifugal pumps Trouble Shooting Construction, working and applications of submersible, jet pump<br>Numerical on calculations of overall efficiency and power required to drive pumps. | **08** | **24** |

| | | | |
|---|---|---|---|
| | **b] Reciprocating Pump**<br>Construction, working principle and applications of single and double acting reciprocating pumps. Concept of Slip, Negative slip, Cavitation and separation, Use of Air Vessel.<br>Indicator diagram with effect of acceleration head & frictional head.<br>Note: No Derivations and Numerical on reciprocating pumps. | | |
| | **TOTAL** | **50** | **80** |

**Practical:**

**Skills to be developed:**

**Intellectual Skills:**

1. Select and use appropriate flow measuring device.
2. Select and use appropriate pressure measuring device.
3. Analyze the performance of pumps and turbines.

**Motor Skills:**

1. Use flow measuring device
2. Use pressure measuring device.
3. Operate pumps and turbines.

**List of Practical:**

1. Calibration of Bourdon pressure gauge with the help of Dead Weight Pressure gauge.
2. Verification of Bernoulli's Theorem.
3. Determination of Coefficient of Discharge of Venturi-meter.
4. Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of orifice meter.
5. Determination of coefficient of friction of flow through pipes.
6. Trial on Pelton wheel to determine overall efficiency.
7. Trial on centrifugal pump to determine overall efficiency.
8. Trial on reciprocating pump to determine overall efficiency.

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Hydraulic, fluid mechanics & fluid machines | Ramamrutham S. | Dhanpat Rai and Sons, New Delhi |
| 02 | Hydraulics and fluid mechanics including Hydraulic machines | Modi P. N. and Seth S. M. | Standard Book House, New Delhi |
| 03 | Fluid Mechanics | Streeter Victor, Bedford K.W., Wylie E.B | McGraw Hill Int. |
| 04 | One Thousand Solved Problems in Fluid Mechanics | K. Subramanya | Tata McGraw Hill |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : COMPUTER PROGRAMMING**

**SUBJECT CODE : ME4006**

## TEACHING AND EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **PR** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 01 | 02 | -- | -- | -- | 50* | -- | -- | 50 |

**Pre-requisites:** The student must know the following concepts:

1. Computer Concepts
2. Logical Skills

**Objectives:** The student will be able to

1. Break a given task into subtasks.
2. Enhance logical thinking.
3. Develop ‘C’ programs for simple applications.

**Subject Title: COMPUTER PROGRAMMING** **Subject Code: ME4006**

**Contents: Theory**

| Unit | Name Of The Topic | Hours |
|---|---|---|
| **01** | **INTRODUCTION**<br>Problem, definition and analysis, algorithm, flow charts, tracing and dry running of algorithms. Introduction to 'C' programming, simple program using Turbo 'C' compiler and execution of 'C' program | **02** |
| **02** | **C FUNDAMENTALS**<br>Character set, constants, data types, identifiers, key words, variable declarations<br>Types of Operators - unary, binary, arithmetic, relational, logical, assignment.<br>Hierarchy of operators, expressions, library functions, use of input/output functions viz. printf(), scanf( ), getch( ), putch( ) | **03** |
| **03** | **USE OF CONTROL STATEMENTS**<br>If-else, while loop, do - while loop, for loop, switch, break and continue. Writing, Compiling, Executing and Debugging programs | **05** |
| **04** | **ARRAYS**<br>Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, concept of string | **03** |
| **05** | **FUNCTIONS**<br>Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes<br>storage classes: automatic, external, static variables | **03** |
| **06** | **STRUCTURE**<br>Concept of structure, Declaration and initialization of structure, array of structures | **03** |
| | **TOTAL** | **19** |

**Practical:**

**Intellectual Skills:**

1. Prepare and interpret flow chart of a given problem.
2. Represent data in various forms.
3. Use various control statements and functions

**Motor Skills:**

1. Write program in 'C' language.
2. Run and debug 'C' program successfully.

**List of Practical:**

To write simple programme having engineering application involving following statements

1. Use of Sequential structure
2. Use of if-else statements
3. Use of for statement
4. Use of Do-While Statement
5. Use of While statement
6. Use of brake and Continue statement
7. Use of multiple branching Switch statement
8. Use of different format specifiers using Scanf( ) and Printf( )
9. Use of one dimensional array e.g. String, finding standard deviation of a group data
10. Use of two dimensional array of integers/ reals
11. Defining a function and calling it in the main

**Recommended Books:**

| Sr. No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Introduction to 'C' programming | Byron Gottfried | Tata McGraw Hill |
| 02 | Let us 'C' | Yashwant Kanitkar<br>Denis Ritchie | BPB publications |
| 03 | Introduction to 'C' programming | Kerninghan | Prantice Hall Publications |
| 04 | Programming in 'C' | Balguruswamy | Tata Mc- Graw Hill |

**COURSE NAME : DIPLOMA IN MECHANICAL ENGINEERING**

**COURSE CODE : ME**

**SEMESTER : FOURTH**

**SUBJECT TITLE : PROFESSIONAL PRACTICES-III**

**SUBJECT CODE : ME4007**

## TEACHING AND EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **TUT** | **PAPER HRS.** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| -- | 02*** | -- | -- | -- | -- | -- | 50* | 50 |

**Pre-requisites:** The students must know the following concepts:

1. Communication Skills.
2. Basic technological concept.

**Objectives:** The student will be able to

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture

**Subject Title: PROFESSIONAL PRACTICES-III** **Subject Code: ME4007**

**Contents:**

| Sr.No. | Activity | Hours |
|---|---|---|
| **01** | **INDUSTRIAL VISITS**<br>Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.<br>The industrial visits may be arranged in the following areas / industries :<br>Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant.<br>i) Machine shop having CNC machines.<br>ii) ST Assembly shops in industries.<br>iii) Refrigeration and A/C<br>iv) Manufacturing unit to observe centralized A/C system plant. | **08** |
| **02** | **GUEST LECTURES**<br>Lectures by professional / industrial expert lectures to be organized from any two of the following areas:<br>i) Interview Techniques.<br>ii) Modern Boilers – Regulation certification, standards (API) (American Petroleum Institute)<br>iii) Applications of Sensors and Transducers<br>iv) Alternate fuels - CNG / LPG , Biodiesel, Ethanol, hydrogen<br>v) Piping design and standards. | **06** |
| **03** | **INFORMATION SEARCH**<br>Information search can be done through manufacturers' catalogues, websites, magazines, books etc. and submit a report any one topic.<br>following topics are suggested**:**<br>i) Engine lubricants & additives<br>ii) Automotive gaskets and sealants<br>iii) Engine coolants and additives<br>iv) Two and Four wheeler carburetor.<br>v) Power steering<br>vi) Filters<br>vii) Different drives/Transmission systems in two wheelers.<br>viii) Types of bearings - applications and suppliers.<br>ix) Heat Exchangers<br>x) Maintenance procedure for solar equipment.<br>xi) Tool holders on general purpose machines and drilling machines. | **08** |

| | | |
|---|---|---|
| **04** | **SEMINAR**<br>Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes) | **04** |
| **05** | **MINI PROJECT / ACTIVITIES (Any One)**<br>i)Prepare one model out of card board paper / acrylic / wood / thermocole / metal such as:<br>a) Elliptical Trammel b) Pantograph<br>c) Coupling d) Cams and Followers e) Geneva mechanism<br>ii) Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts.<br>iii) Make a small decorative water fountain unit.<br>iv) Toy making with simple operating mechanisms. | **10** |
| | **TOTAL** | **36** |

**COURSE NAME : ALL BRANCHES OF DIPLOMA IN ENGINEERING**

**COURSE CODE : ET/ME/CO**

**SEMESTER : FOURTH**

**SUBJECT TITLE : DEVELOPMENT OF GENERIC SKILLS-I**

**SUBJECT CODE : ME4011**

## TEACHING AND EXAMINATION SCHEME:

| Teaching Scheme | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TH** | **TUT** | **PAPER HRS** | **TH** | **INT** | **PR** | **OR** | **TW** | **TOTAL** |
| 01 | -- | 02 | 40 | 10 | -- | -- | -- | 50 |

**Pre-requisites:** The student must know the following concepts:

1. Communication Skills.

**Objectives:** The student will be able to

1. Develop reading skills
2. Use techniques of acquisition of information from various sources
3. Write the notes from the text for better learning.
4. Apply the techniques of enhancing the memory power.
5. Develop assertive skills.
6. Prepare report on industrial visit.
7. Apply techniques of effective time management.
8. Set the goal for personal development.
9. Enhance creativity skills.
10. Develop good habits to overcome stress.
11. Face problems with confidence.

**Subject Title: DEVELOPMENT OF GENERIC SKILLS-I** **Subject Code: ME4011**

**Contents: Theory**

| Unit | Name of the Topic | Hours | Marks |
|---|---|---|---|
| **01** | **IMPORTANCE OF DEVELOPMENT OF GENERIC SKILLS**<br>Introduction to subject, importance in present context, application | **01** | **05** |
| **02** | **INFORMATION SEARCH**<br>Information source – Primary, secondary, tertiary print & non-print, documentary, electronic information center, Library, exhibition, Government Departments. Internet Information search – Process of searching, collection of data - questionnaire, taking interview, observation method. | **02** | **10** |
| **03** | **WRITTEN COMMUNICATION**<br>Methods on taking notes<br>Report writing – Concept, types and format. | **02** | **05** |
| **04** | **SELF ANALYSIS**<br>Understanding self, Attitude, aptitude, assertiveness, self esteem, confidence building Concept of motivation | **02** | **05** |
| **05** | **SELF DEVELOPMENT**<br>Stress Management – Concept, causes, effects, remedies to avoid/ minimize stress. Health Management – Importance, dietary guidelines and exercises. Time management - Importance, process of time planning, urgent vs. importance, factors leading to time loss and ways to handle it, tips for effective time management. Emotions, types, controlling, emotional intelligence, creativity – concept, factors enhancing creativity, goal setting – concept, setting smart goals. | **06** | **10** |
| **06** | **STUDY HABITS**<br>Ways to enhance memory and concentration.<br>Developing reading skill<br>Organization of knowledge model and methods of learning | **03** | **05** |
| | **TOTAL** | **16** | **40** |

**Recommended Books:**

| Sr.No. | Title | Author | Publisher |
|---|---|---|---|
| 01 | Adams Time management | Marshall Cooks | Viva Books |
| 02 | Basic Managerial Skills for All | E.H. McGrath, S.J. | Prentice Hall of India, Pvt Ltd |
| 03 | Body Language | Allen Pease | Sudha Publications Pvt. Ltd. |
| 04 | Creativity and problem solving | Lowe and Phil | Kogan Page (I) P Ltd |
| 05 | Decision Making & Problem Solving | Adair, J | Orient Longman |
| 06 | Develop Your Assertiveness | Bishop, Sue | Kogan Page (I) P Ltd |
| 07 | Make Every Minute Count | Marion E Haynes | Kogan Page (I) P Ltd |
| 08 | Organizational Behavior | Pearson Education Asia | Tata McGraw Hill |
| 09 | Presentation Skills | Michael Hatton (Canada – India Project) | ISTE New Delhi |
| 10 | Stress Management through Yoga and Meditation | Pandit Shambhu Nath | Sterling Publisher Pvt Ltd |
| 11 | Target Setting and Goal Achievement | Richard Hale, Peter Whilom | Kogan Page (I) P Ltd |
| 12 | Time Management | Chakravarty, Ajanta | Rupa and Company |
| 13 | Working in Teams | Harding ham .A | Orient Longman |