### SEMESTER-1

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**GRAND TOTAL** 23 15

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**GRAND TOTAL** 15 13

**NOTE**: THE TOTAL DURATION OF THE INDUSTRIAL TRAINING / PROJECTS SHALL COMprise OF 18 WEEKS OF 8TH SEMESTER.
Course Details of B.Sc. Mechanical Engineering Technology

First Year

1st Semester

1. CH-101  Applied Chemistry

Properties of Solutions and Liquids like Surface Tension, Viscosity, Osmosis, Osmotic Pressure; pH-Buffer Solution; Spectro-photometry; Basic Concepts of Colloidal Chemistry, Classification, Purification (Dialysis); Chemical Thermodynamics, Hess’s Law, Heat of Reaction, Relationship between H and U, Measurement of Heat of Reaction, Bomb Calorimeter; Laws of Electrolysis, Corrosion; Sources of Water, Impurities, Hardness, Water Softening, Purification of Water for Portable and Industrial Purposes, Electro Dialysis; Introduction to Environmental Pollution, Main Sources and Effects of Pollution, Sewerage Treatment.

Recommended Books:

2. MA-101  Applied Mathematics- I

Functions, Even and odd functions, Graphs of functions, Limits and continuity; Derivatives, Rules for differentiation; Derivatives of trigonometric, Exponential and logarithmic functions, Chain rule; Integration and its fundamental formulas, Integration by substitution, by parts, Definite integrals and their simple properties, Area under a curve; Analytical geometry of straight lines, Circles, Determinants, Matrices, Inverse of a matrix, Solutions of systems of linear equation; Complex numbers, Exponential and polar forms, De-Moiver’s theorem.

Recommended Books:
   2. Kreyszing E. Advanced Engineering Mathematics” John Wiley and Sons, USA
3. **CT-101 Computer Fundamentals**

Introduction, History of computers, Hardware/Software, Computer organization, Introduction to operating systems, Introduction to binary, Hexadecimal, Decimal and Octal number systems; Binary arithmetic, Machine language, Assembly language, High-level languages; Structured programming, Object oriented programming; Introduction and basics of a typical C Program development, Some simple C programming examples; Basics of structured programming, Pseudo-code development, if/else statements, Introduction to loops, Counter-controlled repetition, for/while and do-while loops; Introduction to Microsoft Office.

**Recommended Books:**
3. Computer Fundamentals by P K Sinah

4. **MT-101 Technical Drawing**

Introduction to the Drawing, Lettering, dimensioning, Types of line, Isometric and pictorial projection of solid figures, Orthographic projections, Projection of points, lines and planes, Development of Surfaces, Section of solids, Intersection of surfaces and inter-penetration of solids, Preparation of detailed and few assembly drawing.

**Recommended Books:**
2. ND BHATT ”Engineering Graphics “.

5. **HU-101 Communication Skills-I**

Importance, Theories, Barriers and components of communication, The seven C’s of effective communication, Listening skills, Thinking and feeling, Notes taking, Giving feedback, Active reading techniques, Skimming, General and careful reading, Planning, Drafting and editing, Emphasis and connections in writing, Technical and business vocabulary, Constructing formal sentences

**Recommended Books:**
2. Norman S. “We’re in Business” Longman Group Ltd., UK
2nd Semester

1. **MA-102  Applied Mathematics-II**
   Applications of Differentiation: Velocity, Acceleration, Tangents and Normals, Applications of Integration: Plane Areas, Arc lengths, surface areas of solids of revolution, Functions of two or more variables, Partial derivatives, Higher order derivatives, Chain rules, Basics concepts of Ordinary differential equations (ODE), First-order ODE’s, Second-order ODE,s with constant coefficients, Applications to relevant technology problems, Scalars & vectors, Vector algebra, Scalar & vector products, Evaluation of double integrals & their application in finding the areas.

   **Recommended Books:**
   1. John Wiley and Sons, “USA Kreysizing E. ADVANCED ENGINEERING MATHEMATICS”.
   2. Cohen H L. “MATHEMATICS FOR SCIENTISTS AND ENGINEERS. Prentice Hall, UK”.
   3. Irons B M and Shrive N G. NUMERICAL METHODS IN ENGINEERING AND APPLIED SCIENCE. Prentice Hall, UK,

2. **ET-101  Electrical Technology**

   Introduction to DC circuits, series and parallel circuits. Node and loop analysis of DC circuits, Introduction to AC circuits, series and parallel circuits, behavior of resistance, inductance and capacitance in AC circuits, power factor, resonance in RLC circuits, single phase and poly phase circuits, power and power factor measurement, current and voltage relationship in phase and line circuits. Introduction to types, characteristics and testing of AC motors, types of motor starters and switch gears, electric traction and braking. Introduction to transformers, voltage and current relationship in transformers. Losses and efficiency of generators and motors.

   **Recommended Books:**

3. **PHY-101  Applied Physics**

   Concept of conservative & non conservative forces, Potential energy of a system in conservative field, Kinetic energy, Work & power; Oscillations and SHM, Superposition of waves and interference of waves; Heat transfer mechanisms, Mean free path and distribution of molecular speeds; The Carnot Engine, Heat pumps and Refrigerator; Electric field, Coulomb’s law, Gauss’s law, Types of capacitor, Energy stored in a capacitor, Ohm’s law and it’s microscopic view, Dielectrics, Electrostatic Shielding, Impotence of Earthing, Introduction to Lightening protection system.
**Recommended Books:**

1. Physics by Halliday, Resnick, krane
2. Modern physics for scientists & Engineers by Douglas
3. Fundamental of Physics by Resnick, krane

### 4. MT-102 Workshop Practice

Practical which includes the following:
Machining & machine tools, Fitting and fabrication techniques, Basic processes in Wood workshop, Basic Electrical Technology.

**Recommended books**
2. Electrical Wiring by Richter and Schwan

### 5. IS / HU-101 Islamic Studies / Ethics & Pak Studies

Second Year

3rd Semester

1. MT-231 Materials Technology
Crystalline structure of metals, tools for metallurgy, production of iron, wrought iron, cast iron, production of steel and its classification, ferrite, austenite, S-iron, cementite, pearlite, martensite, bainite, etc., iron-iron carbide phase diagram, heat treatment processes, non ferrous metals and alloys, alloys of Cu, Brass & Al, Wear & Corrosion of metals. Polymers: Molecular structure, properties, forming of thermosetting or thermoplastic polymer, Ceramics: Introduction and properties. Material failure analysis.

Recommended Books:
1. Properties and Applications of Metal Alloys by C.P. Sharma.

2. MT-232 Applied Mechanics
Force System, force, rectangular components, moment, couples, resultant of forces, equilibrium, mechanical systems, isolation and equilibrium equations. Free body diagram, two force and three force members, plane trusses, method of joints, method of sections, frames and machine analysis, forces in beams and cables, friction, types of friction, dry friction, application of friction.

Recommended Books:

3. MT-233 Strength of Materials
Introduction, Basic Types of Stress and strain, Hooke’s Law, Factor of Safety, Poisson’s Ratio, Geometrical Properties of Areas 1st Moment of Simple Regular Areas and Composite Areas, Centroid of a Composite Area, 2nd Moment of Regular Simpler Areas, Parallel-Axis Theorem and 2nd Moment of Composite Area, Polar Moment of Inertia and Perpendicular Axis Theorem, Torsion of Circular Shafts, Power transmission through circular shafts, Applications of Torsional Formula, Simple or pure bending Beams and types of beams, Shearing Force and Bending Moments, Introduction to complex stresses and strains.

Recommended Books:
1. Schaum's Outline of Strength of Materials by Willaim A Nash
2. Strength of Materials by Andrew Pytel and Ferdinand L. Singer
4. MT-234  Thermodynamics For Technologists
Thermodynamic systems, Thermodynamic properties, Energy and work, Properties of vapor and steam, Properties of ideal and real fluid and their relationships, Applications of thermodynamic principles to these fluids First Law of Thermodynamics and applications Closed and Open systems, Steady flow energy equation applications to Nozzles, Diffusers, Compressors and, Turbines and Second Law of Thermodynamics, Irreversibility, Application to heat engines’ performance, Entropy Use in heat engines calculations

Recommended Books:
1. Applied Thermodynamics for Engineering&Technologist by T.D.Eastop&A.McConkey 5th Ed.
2. Basic Engineering Thermodynamics by Rayner Joel3rd Ed.

5. HU-201 Communication Skills-II
Preparation and Presentation of reports, analytical reports, informational reports, monthly / annual reports, Conference reports, Progress proposals reports, Formal reports, Project reports, Business Letters: Its parts and requirements; Quotations; Comparative statements, Approval letter, Office memorandum: The Letter of information / inquiry; Letters to newspapers, Writing scientific reports; Foreword, Table of content; Abstract / Synopsis; Introduction; Discussion; Conclusion; Bibliography.

Recommended Books:
2. Norman S. “We’re in Business” Longman Group Ltd., UK

4th Semester

1. MT-241 Fluid Flow Processes
Pressure, variation of pressure in a static fluid, pressure head, review of types of pressures, pressure measurement gauges, Force on plane area, center of pressure, force on curved surface, Buoyancy and stability of submerged and floating bodies, Types of flow, flow rate and mean velocity, equation of continuity, flow net, velocity and acceleration in steady and unsteady flow, Development of fluid dynamics, distinction between solid and fluid, gas and liquid, properties of fluids, Density, specific weight, volume, gravity, compressible and incompressible fluids, ideal fluids, viscosity and its units, surface tensions, vapor pressure of liquids etc. Reynolds'transport theorem, Bernoulli’s theorem, energy equations and their applications, Cavitations. Steady & Incompressible Flow in Pressure conduit, Open channel flow.

Recommended Books:
1. Fluid Mechanics by Irving H. Shames

2. MT-242 Basic Mechanics of Machines

Friction, types and applications of friction, motion on inclined plane, types and uses of bearings, clutches, belts and rope drives, chain and sprockets, working of band and shoe brakes, working principle of governors and their types, types of gears and their applications, condition for transmission of constant velocity ratio, simple and compound gear trains, theory and applications of dynamometers, turning moment diagram, fluctuation of energy and speed, flywheels, steering gears, types of cams and followers, motion for a given cam profile, balancing of rotating masses

Recommended Books:
1. Theory of machines by Hanna
2. Theory of mechanisms and machines by C.S Sharma, Kalmesh Purohit
3. Theory of machines by R.S Khurmi

3. MT-243 Design of Machine Elements

Shaft components, shaft material, shaft design for stresses, setscrews, keys and pins, retaining rings, limits and fits, power screws, welding patterns, Butt welds, fillet welds, stresses in welds, introduction of Rolling contact bearing, bearing life, Journal bearings, types of lubrication, Types of gears, gears nomenclature, concept of gear train and velocity ratio, clutches and brakes, belts, types of belts.

Recommended Books:
1. Mechanical Design by Paul Howard Black.

4. MT-244 Manufacturing Technology

Types of production, casting processes, mould making, sand moulding, special casting processes, investment casting, welding processes and classifications, wire drawing, coining, forging process, forging tools, types of forging, injection moulding, extrusion, extrusion blow molding, compression molding, thermoforming, applications of thermoforming.

Recommended Books:
5. ET-245  **Industrial Electronics Technology**

Semiconductors, Basic operating principles of single-phase and three-phase rectifiers, Introduction to transistor amplifiers. Use of transistor as a switch. Introduction to oscillators, use of 555 as timer, industrial timers and counters. Introduction to SCRs and Triacs with applications. Introduction to operational amplifiers, use of operational amplifiers in signal conditioning and generation of sinusoidal, square, triangular waveforms. Time delay circuits and triggering circuits. Fuses, circuit breakers, magnetic contactors, DC and AC relays. Introduction to DC and AC motor starters and speed control methods. Inverters and VFD’s for AC motor speed control. Basic working principles of Spark Erosion, Wire Cut EDM, etc. Introduction to welding and dielectric heating. Introduction to industrial wiring Ladder diagrams used in start-delta starters for motor control applications. Basic introduction to PLCs and ladder programming.

**Recommended books**

4. Ashfaq Ahmad, “Power Electronics for Technology” …

**Third Year**

**5th Semester**

1. MT-351  **Hydraulics Machinery**


**Recommended Books:**

1. Fluid Mechanics by R.K Rajput.
3. Fluid Mechanics by Bunsun.

2. MT-352  **HVAC Technology**

Basic Concepts, Air refrigeration cycles; Vapour Compression cycle, Vapour Absorption cycle; Types of Refrigerants; Refrigeration components and controls; Psychrometry; Air Conditioning Systems; Air Conditioning Equipment, components and controls; Duct Systems; Fans and Air Distribution Systems; Indoor Air Quality; Heating and Cooling Load Calculations; Maintenance and Repair of Domestic And Commercial Equipments: maintenance of a new installation-sample scheduling, compressor repair and checking the efficiency, descalig of condenser, purging or
removing air from system; Refrigeration and Air conditioning Tools: List of tools, applications of tools, safety precautions.

**Recommended Books**

1. Refrigeration & Air Conditioning by R. K. Rajput
2. Air Conditioning Principals and Systems by Edward G. Pita

3. MT-353  **Instrumentation Technology**

**Recommended books**


4. MT-354  **Machining Technology**
Introduction to rotary and linear machines, lath machine, Types of drilling machine and drills, Milling machine classifications, milling processes, grinder and its types, grinding processes, , planer, slotter, introduction to forming process, Introduction to CNC machines & machining operations CNC machine components, co-orderate systems, working principles of various CNC systems, DNC, constructional features of CNC machines, CNC part programming, tooling & work holding devices.

**Recommended Books:**

1. Materials and Processes in Manufacturing by E. Paul Degarmo, J T. Black
2. Fundamentals of Modern Manufacturing by Mikell P. Groover

5. MT-355  **Inspection & Quality Control**
Inspection techniques, inspection gauges, limit gauges, quality, responsibility of quality, fundamentals of statistics-frequency distribution, measures of central tendency and dispersion, concepts of population and sample, normal curve, Statistical quality control, introduction to control charts- control chart techniques, state of control, specifications, process capabilities, sampling, Introduction to ISO 9000.
**Recommended books**

1. Metrology & Quality Control by Avinash M. Badadhe, Technical Publications Pune
2. Quality control by D.H. Besterfield, Printice Hall

**Third Year**

**6th Semester**

1. **MT-361 IC Engines Operations**


   **Recommended books**

   1. Automotive Engineering Fundamentals by Richard Stone and Jeffrey K.Ball
   2. Internal combustion engine Fundamentals by J.B.Heywood
   3. Service manuals of various cars, buses etc.

2. **MT-362 Condition Monitoring and Maintenance**

   Introduction to process industry, Need for Maintenance, Some Basic concepts; meantime between failures, mean time to repair, Availability, utilization, Types of maintenance, breakdown maintenance, preventive maintenance, objectives of preventive maintenance Benefits of preventive maintenance, Application of preventive maintenance in different industry like power plants, process and Manufacturing industry, Economic aspects of preventive maintenance, Forms of preventive maintenance, Total productive maintenance (T.P.M.), Effect of TPM in modern industry, Role of TPM in using lean manufacturing technique for manufacturing and process industry, Vibration diagnosis and control, introduction, sensing & measurements, vibration nomographs & vibration criterion, vibration analysis, data reduction and corrective action, acoustics and analysis of noise, non-stationary (unsteady) vibrations, Different techniques used for conditioning & monitoring, Different types of Equipment used for vibration analysis,

   **Recommended Books:**

   1. Mechanical vibrations theory and practice by Shrikant Bhave
      Published by Dorling kindersely (India) pvt ltd. (Pearson Education)
3. **MT-363 Industrial Thermal Utilities**
   Introduction to different utilities
   **Boilers:** Types, Properties of steam, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Identifying opportunities for energy savings. Combustion in boilers, Performances evaluation, Analysis of losses, Feed water treatment, Blow down, Energy conservation opportunities, HRSG.
   **Furnaces:** Classification, General fuel economy measures in furnaces, Excess air, Heat distribution, Temperature control, Draft control, Waste heat recovery.
   **Insulation and Refractories:** Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria, Refractory-types, selection and application of refractories, Heat loss.
   **Compressed air system:** Types of air compressors, Compressor efficiency, Efficient compressor operation, Compressed air system components, Capacity assessment, Leakage test, Factors affecting the performance and efficiency
   **Fans and blowers:** Types, Performance evaluation, Efficient system operation, Flow control strategies and energy conservation opportunities
   **Cooling Tower:** Types and performance evaluation, Efficient system operation, Flow control strategies and energy saving opportunities, Assessment of cooling towers

**Recommended Books:**

1. Audel HVAC Fundamentals, Heating Systems, Furnaces and Boilers
2. Service manuals of various Ancillary equipments

4. **MT-364 Heat and Mass flow Applications**
   Basic Concepts; Fourier’s law; heat conduction equation; conduction through geometrical configurations, variable thermal conductivity, overall heat transfer coefficient, extended surfaces, heat flow in an infinitely thick plates; Convection: continuity equation; Forced Convection, boiling & condensation heat transfer; Thermal Radiations, surface emission properties, radiation properties of real surface, radiation heat exchange b/w surfaces, radiation shields; Heat Exchangers, Heat Exchanger Calculations; Modes of mass transfer, mass diffusion coefficient, convective mass transfer.

**Recommended Books:**

1. Heat and Mass Transfer by G. Kamaraj & P. Raveendiran
2. Heat Transfer, A Practical Approach by Y.A. Cengel

6. **MT-365 Energy Technology & Conservation**
   Energy production technologies, Energy Conservation in industry, Energy conservation in power sector, wind energy, solar energy, energy from biomass and coal, hydro electric energy, geothermal, tidal and wave energy, hydrogen gas as Renewable energy resource, energy audit and energy conservation in industry and buildings.

1. Renewable Energy Resources by John Twidell & Tony Weir
2. Renewable energy resources by Tasneem Abbasi
1. **MT-471 Power Plant Technology**


   **Recommended books:**
   1. Power Plant Technology by M. M. El Wekil
   2. Power Plant by F.T. Mose
   4. Basic Engineering Thermodynamics, by Rayner Joel

2. **MT-472 Industrial Energy Management**


   **Recommended books:**
   2. Industrial Energy Management, by Thomas A. Lehr et al.

3. **MT-473 Health, Safety and Environment**:

   Classification of Health hazards (Physical, chemical, biological), Sources of risk (Machinery Noise, Electrical failure, ventilation, lighting, radiation), Dangerous substances (Classification, Entry & Exit routes, safe handling, Health & safety regulation & policy), Safety Machining & Guarding (Preventing Machining accidents, Machine guarding), Equipment & Machine handling (Mechanical & Manual Handling, Access Equipment, Transport, Electricity & Electrical Equipment), Fire (Classification, fire protection, means of Escape, Actions to be taken), Chemical safety, Personal protection, Safety Management (Accident prevention, health & safety training, communicating safety measures), Safety Training, Safety Inspection, Work Permit System, Emergency Plan Response, Waste Management, First Aid, Types of Injuries (Fatality, Lost work injury, Restricted work injury, Occupational illness, Minor injury, First aid case, Near miss), Accident Reporting and Investigation, Introduction to Safety Standards (ISO-14001, QHSAS 18001),
Recommended Books:
3. Safety, Health, and Environment, CAPT (Center for the Advancement of Process Technology), Prentice Hall PTR, 2009

4. MT-474 Machining Technology II:
Introduction to CNC systems, CNC system components, co-ordinate systems, constructional features of CNC systems, CNC Machining center, CNC Turning center, CNC Mill-turn, CNC Tooling and work holding devices, CNC Part Programming, Introduction to Non-conventional operations, Electrical discharge machining (EDM), EDM die sinking and EDM wire cut, Chemical machining, Chemical milling, Chemical Blanking, Chemical Engraving, Electro Chemical machining (ECM), electromechanical machining & grinding, Plasma Arc Cutting, Water Jet Cutting, Abrasive-jet machining, Ultrasonic machining, Laser Beam Machining (LBM), Electron beam machining, Rapid Prototyping

Recommended Books:
4. Technology of Machine Tools by Krar, Gill, Smid
5. Manufacturing and Machine Tool operation by: Pollack
6. Workshop Technology (Vol- I, II and III; SI Version) by: Chapman
7. Fundamentals of Modern Manufacturing, Materials, Processes and Systems by Groover

8th Semester

MT-481 Industrial Training/Projects

Mid and Final terms report submission and presentation by students working on industrial assignments.