GOVERNMENT COLLEGE UNIVERSITY FAISALABAD
BACHELORS DEGREE PROGRAM IN MECHANICAL ENGINEERING TECHNOLOGY
SCHEME OF STUDIES

SEMESTER-1

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	CH-101	APPLIED CHEMISTRY	3	2	3	1
2	MA-101	APPLIED MATH-1	3	0	3	0
3	CT-101	COMPUTER FUNDAMENTALS	3	2	3	1
4	MT-101	TECHNICAL DRAWINGS	2	3	2	1
5	HU-101	COMMUNICATION SKILLS-1	0	3	0	1
		TOTAL	11	10	11	4
		GRAND TOTAL		**21**		**15**

SEMESTER-2

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MA-102	APPLIED MATH-2	3	0	3	0
2	ET-101	ELECTRICAL TECHNOLOGY	3	2	3	1
3	PHY-101	APPLIED PHYSICS	3	2	3	1
4	MT-102	WORKSHOP PRACTICE	0	6	0	2
5	IS/HU-101	ISLAMIC STUDIES/ETHICS AND PAK. STUDIES	3	0	3	0
		TOTAL	12	10	12	4
		GRAND TOTAL		**22**		**16**

SEMESTER-3

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MT-231	MATERIALS TECHNOLOGY	2	0	2	0
2	MT-232	APPLIED MECHANICS	3	2	3	1
3	MT-233	STRENGTH OF MATERIALS	3	2	3	1
4	MT-234	THERMODYNAMICS FOR TECHNOLOGISTS	3	2	3	1
5	HU-201	COMMUNICATION SKILLS-2	0	3	0	1
		TOTAL	11	9	11	4
		GRAND TOTAL		**20**		**15**

SEMESTER-4

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MT-241	FLUID FLOW PROCESSES	3	2	3	1
2	MT-242	BASIC MECHANICS OF MACHINES	3	2	3	1
3	MT-243	DESIGN OF MACHINE ELEMENTS	3	2	3	1
4	MT-244	MANUFACTURING TECHNOLOGY	3	2	3	1
5	ET-245	INDUSTRIAL ELECTRONICS TECHNOLOGY	3	2	3	1
		TOTAL	15	10	15	5
		GRAND TOTAL		**25**		**20**

SEMESTER-5

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MT-351	HYDRAULICS MACHINERY	3	2	3	1
2	MT-352	HVAC TECHNOLOGY	3	2	3	1
3	MT-353	INSTRUMENTATION TECHNOLOGY	2	2	2	1
4	MT-354	MACHINING TECHNOLOGY-1	3	2	3	1
5	MT-355	INSPECTION & QUALITY CONTROL	3	2	3	1
		TOTAL	14	10	14	5
		GRAND TOTAL		**24**		**19**

SEMESTER-6

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MT-361	IC ENGINE OPERATION	3	2	3	1
2	MT-362	CONDITION MONITORING AND MAINTENANCE	3	2	3	1
3	MT-363	INDUSTRIAL THERMAL UTILITIES	3	2	3	1
4	MT-364	HEAT AND MASS FLOW PROCESSES	3	2	3	1
5	MT-365	ENERGY TECHNOLOGY AND CONSERVATION	3	2	3	1
		TOTAL	15	10	15	5
		GRAND TOTAL		**25**		**20**

SEMESTER-7

Sr#	Course Code	Subject	Contact Hours		Credit Hours	
			Theory	Practical	Theory	Practical
1	MT-471	POWER PLAN TECHNOLOGY	3	2	3	1
2	MT-472	INDUSTRIAL ENERGY MANAGEMENT	3	0	3	0
3	MT-473	HEALTH SAFETY AND ENVIRONMENT	3	0	3	0
4	MT-474	MACHINING TECHNOLOGY-2	3	2	3	1
		TOTAL	12	4	12	2
		GRAND TOTAL		**16**		**14**

SEMESTER-8

Sr#	Course Code	Subject	Credit Hours	
			Theory	Practical
1	MT-401	INDUSTRIAL TRAINING/PROJECTS	0	12
		TOTAL	0	12
		GRAND TOTAL	**0**	**12**

GRAND TOTAL	**153**	**131**

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:

1. Robert Mortimer "Applied Chemistry 3rd Edition "

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:

1. Thomas G.B. and Finney R.L. "Calculus and Analytic Geometry"
2. Kreyszing E. Advanced Engineering Mathematics" John Wiley and Sons, USA
3. Cohen H.L. "Mathematics for Scientists and Engineers". Prentice Hall, UK

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:

1. Gottfried R. S. "Programming With Basic". Schaum's Outline Series.
2. User's Manuals for Word Processing Software, Spreadsheet software and technology specific software.
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, Inter-section of surfaces and inter-penetration of solids, Preparation of detailed and few assembly drawing.

Recommended Books:

1. Mitchel & Spencer, "Technical Drawing" (Latest Edition)
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:

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. "Effective Business Communications". McGraw Hill, USA
2. Norman S. "We're in Business" Longman Group Ltd., UK
3. Thomson A. J. and Martinet A.V. "A practical English Grammar" Oxford University Press, 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:

1. Hughs, "Electrical Technology", Prentice-Hall.
2. McGraw Hill,UK "Schuler C.A. MODERN INDUSTRIAL ELECTRONICS".
3. McGraw Hill, UK "Ryder, ENGINEERING ELECTRONICS".

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

1. Workshop Technology Part-I by W.A.J. Chapman.
2. Electrical Wiring by Richter and Schwan

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

Islamic Studies(Textual Study of Surah Al-Hujrat, Surah Al-Maidah and Surah Al-Furqan, Textual Study of Hadith (Arbain-e-Navavi, 1-21) , Study of Cardinals Articles of faith like Touheed, Prophet Hood and its Finality and the Day of Judgment, Serah-tun-Nabi: Life of the Holy Prophet Muhammad (Peace Be upon Him) from Prophet Hood to Hijrah, Islam and Modern Science), Ethics(Surah Al-Baqra, Al-Ana'am, Al-Tauba, Younus, Hood, Al-Nahal and Al-Mutafefeen, Moral Values in the light of Hadith: Baloogh-al-Maram, Kitab-al-Jamae, Babul Tarheeb Min , Ethics & Character Building in the light of Seerah: Ethical behavior of the Prophet Muhammad (Peace Be upon Him), Significance of Moral Values like Truth, Honesty, Taqwa, Brotherhood and Patience, Pakistan Studies(Ideology of Pakistan in the light of the Sayings and Speeches of Allama Iqbal and Quaid-e-Azam, A Brief History of Muslim Society in Subcontinent: the Down Fall of Muslim-Rule and Renaissance of Muslim Rule in Sub Continent, Ideology of Pakistan, Educational Efforts: Ali Garh, Dew Band, Nadwa, Anjaman Humat-e-Islam, Sind Madrassa, The Pakistan Movement: Evolution of the Two-Nation Theory, Independence of Pakistan and India, Presidential Address of Allama Iqbal at Illah Abad in 1930, Elections of 1937, Congress' Behavior, The Pakistan Resolution, Elections of 1946 & Transfer of Power and how to safeguard the ideological state in present Era.)

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. Materials by Robert Snedden.
3. Avner MECHANICAL METALLURGY. McGraw Hill Book Company, UK.

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:

1. Merriam J. L. and Kraige L.G. ENGINEERING MECHANICS (Vol-I & II) John Wiley Inc., USA.
2. Beer F. P. and Johnston R. MECHANICS FOR ENGINEERS (Vol. I & II) McGraw Hill Book Company, UK.

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
3. Strength of Materials by R.S Khurmi

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 Joel3rdEd.

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:

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. "Effective Business Communications". McGraw Hill, USA
2. Norman S. "We're in Business" Longman Group Ltd., UK
3. Thomson A. J. and Martinet A.V. "A practical English Grammar" Oxford University Press, 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. Reynold's transport theorem, Bernoulli's theorem, energy equations and their applications, Cavitations. Steady & Incompressible Flow in Pressure conduit, Open channel flow.

Recommended Books:

1. Fuid Mechanics by Irving H. Shames

2. Fluid Mechanics by R.K Rajput.
3. Fluid Mechanics by Khurmi.

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, KalmeshPurohit
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.
2. Machine Design by R.S. Khurmi

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:

1. Manufacturing Technology by R.K Rajput.
2. Manufacturing Technology By C. Elanchezhian, B. Vijaya Ramanath.

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. Iverters 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

1. Petruzella, "Industrial Electronics", McGraw-Hill.
2. Petruzella, "Electric Motors and Control Systems" Career Education.
3. Thomas A . Kissel, "Industrial Electronics" , Prentice-Hall.
4. Ashfaq Ahmad, "Power Electronics for Technology" …
5. Timothy J. Maloney, "Modern Industrial Electronics", Prentice-Hall.

Third Year

5th Semester

1. MT-351 **Hydraulics Machinery**

Hydraulic Turbines, pelton wheel, Francis Turbine, Kaplan turbine, Draft Tubes, performance curves, specific speed, Pumps, Reciprocating pumps, centrifugal pump, turbine pump, selection of pump. Hydraulic Equipment: Hydraulic press and ram, hydraulic crane, hydraulic accumulator and intensifier, hydraulic lifts, hydraulic circuits and their applications.

Recommended Books:

1. Fluid Mechanics by R.K Rajput.
2. Fluid Mechanics by Khurmi.
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; Psychrometery; 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

Basics of Instrumentation, Electronics and Computers, Noise, interference and grounding, System Identification and Parameter Estimation, Spatial Variables Measurement, Time and Frequency Measurement, Solid Mechanical Variables Measurement, Fluid Mechanical Variables Measurement, Thermal Variables Measurement, Electrical/Electronic Variables Measurement, Optical Variables Measurement, Radiation Measurement, Chemical Variables Measurement, Actuators/Motors

Recommended books

1. John P. Bentley, *Principles of Measurement Systems*, Pearson Prentice Hall, 4th edition 2005.
2. Johnson C.D., *Process Control Instrumentation Technology*, Pearson Prentice Hall, 8th edition, 2006.
3. Alan S. Morris, *Measurement and Instrumentation Principles*, Butterworth-Heinemann, 3rd edition, 2001.
4. Walt Boye, Instrumentation Reference Book, Butterworth-Heinemann 4th edition, 2010

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-ordinate 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

Introduction, History and development of I.C. Engines, Classification of l.C. Engines, Working Cycles, Fuel air mixing, Carburetion, Carburetion performance, E.F.I. Engines, CNG Engines, Fuel injection in CI engines, Fuel injection system performance, Spark ignition systems, Ignition advance and ignition retard, Engine cooling and lubrication, Turbocharged engines, Servicing and overhauling, Engine Tuning & Diagnostics.

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, break-down 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)
2. Conditioning monitoring & Control for intelligent Manufacturing (Springer series in advanced manufacturing) by Lihui Wang and Robert X Gao (Dec 8, 2010)
3. Handbook of condition Monitoring by B.K.N Rao (Dec 6, 1996)

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

7th Semester

1. MT-471 **Power Plant Technology**

Power Plant Cycles (Rankine cycle, Regeneration cycle, Co-generation cycle, Brayton cycle, Combined cycle), 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), Fuels and Combustion, Turbines, The Condensate Feedwater System, The Circulating Water system, Introduction to Nuclear Energy, Engine and Plant Trials (Ch 17 of Rayner Joel)

Recommended books:

1. Power Plant Technology by M. M. El Wakil
2. Power plant by F.T. Morse
3. Applied Thermodynamics for Engineering Technologist by T. D. Eastop & J McConkey
4. Basic Engineering Thermodynamics, by Rayner Joel

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

Introduction, Energy Auditing, Boilers and Fired systems, Steam and Condensate systems, Co-Generation, Waste heat recovery, Building Envelop, HVAC systems, Electric Energy Management, Lighting, Commissioning,

Recommended books:

1. Energy Management Handbook, by Steve Doty, Wayne C. Turner
2. Industrial Energy Management, by Thomas A. Lehr et.al
3. Renewable Energy: Power for a Sustainable Future, by Godfrey Boyle
4. Guide to Energy Management, by Barney L. Capehart, Wayne C. Turner, and William J. Kennedy

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, OHSAS 18001),

Recommended Books:

1. Holt A.S.J, Principle of Health & safety at work. The institution of occupational safety & health. The caverdish press Limited. UK 1999.

2. Patty F.A "Industrial Hygiene & Toxicology Vol-1 General Principles" Inter science Publishers New York.

3. Safety, Health, and Environment, CAPT (Center for the Advancement of Process Technology), Prentice Hall PTR, 2009

4. Health & Safety, Environment and Quality Audits, by Stephen Asbury

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:

1. Elements of Workshop Technology Vol. II by SK Hajra Choudry.
2. Manufacturing Processes BH Amstead & PF Ostwald.
3. Machine Tools Practice by Kibbe, Meyer, Neely, White
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 Versions) 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.