DEPARTMENT OF MECHANICAL ENGINEERING

7th Semester

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1733	CAD / CAM / CIM	3-0-0	6
2.	MEL1734	Power Plant Technology	3-0-0	6
3.	MEL17XX	Elective – I	3-0-0	6
4.	MEP17XX	Elective – II	3-0-0	6
5.	MEP1743	Project-I	0-0-6	6
6.	MEP1744	Thermal Laboratory- III	0-0-3	3
7.	MEP1745	Instrumentation & Metrology Laboratory- III	0-0-3	3
		Total		**36**

Elective-I

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1735	Fluidization Engg	3-0-0	6
2.	MEL1736	Refrigeration & Air Conditioning	3-0-0	6
3.	MEL1737	Vibration	3-0-0	6
4.	MEL1738	Convective Heat & Mass Transfer	3-0-0	6

Elective-II

SL.No	Course code	Course Title	L-T-P	Credits
1.	MEL1739	Combustion	3-0-0	6
2.	MEL1740	Advance Machining Science	3-0-0	6
3.	MEL1741	Hydraulic Circuit & Control	3-0-0	6
4.	MEL1742	Renewable Energy	3-0-0	6

Course code	Course Title	Semester	L-T-P	Credits
MEL1733	CAD/CAM/CIM	7th	3-0-0	6

Introduction: Introduction to CAD/CAM, need of CAD/CAM, product cycle, automation in CAD/CAM and CAD/CAM integration.

Computer Aided Design: Computer graphics, principles of geometric modeling, transformations, wire frame, surface and solid modeling, Rapid Prototyping and tooling.

Group Technology (GT): Introduction, part families, parts classification and coding systems, GT machine cells, benefits of GT.

Process Planning: Basic concepts of process planning, computer aided process planning (CAPP), Retrieval or variant and generative approach of CAPP, Implementation consideration of CAPP.

Numerical Control of Machine Tools: Principles of Numerical control (NC), Computer Numerical control (CNC), Direct Numerical control (DNC), comparison between conventional and CNC systems, Classification of CNC system, NC coordinate system, positional control, system devices, interpolators, adaptive control system.

NC Part Programming: Concept, format, preparatory and miscellaneous codes, manual part programming, APT programming.

FMS and CIM: Introduction to flexible manufacturing system (FMS), the manufacturing cell, tool management and workpiece handling system, transfer lines, types and application of industrial robots, end effectors and grippers of robots, types of manufacturing systems, components of computer integrated manufacturing (CIM), hierarchical computer system, benefits of CIM.

Books:-

SL.No	Name of the book	Author	Publication
1	Machine Tools Design and Numerical Control	Mehta	Tata McGraw Hill.
2	Computer control of manufacturing system	Yoram Koren	Mc Graw Hill Book Co.
3	Computer Numerical Control	B. L. Jones	John Wiley and Sons.

Course code	Course Title	Semester	L-T-P	Credits
MEL1734	Power Plant Technology	7th	3-0-0	6

Economics of Power Generation: Introduction to Economics of Power Generation, Load-duration Curves, Location of Power Plants, Power Plant Economics, Indian Energy Scenario, Cold-fuelled Electricity Generating Unit.

Analysis of Steam Cycles: Steam Power Plant, Rankine Cycle, Carnot Cycle, Mean Temperature of Heat Addition, Effect of Variation of System Condition on Thermal Efficiency of Steam Power Plant, Reheating of Steam, Regeneration, Regenerative Feed water Heating, Feed water Heaters, Carnotization of Rankine Cycle, Optimum Degree of Regeneration, Supercritical Pressure Cycle, Steam Power Plant Appraisal, Deaerator, Typical Layout of Steam Power Plant, Efficiencies in a Steam Power Plant, Cogeneration of Power and Process Heat.

Combine Cycle Power Generation: Flaws of Steam as Working Fluid in Power Cycle, Characteristics of Ideal Working Fluid for vapour Power Cycle, Binary Vapour Cycle, Coupled Cycles, Combined Cycle Plants, Gas Turbine-Steam Turbine Power Plant.

Fuel and combustion: Coal, Coal Analysis, Fuel Oil, Natural and Petroleum Gas, Emulsion Firing, Coal-Oil-Coal Water Mixtures, Industrial Wastes and Byproducts, Synthetic Fuels, Biomass, Thermodynamic View, Combustion Reactions, Mass Balance of a Steam Generator, Energy Balance of a Steam Generators, Heat of Combustion, Heating Values: Enthalpy of Combustion, Theoretical Flame Temperature, Free Energy of Formation, Equilibrium Constant, Effect of Dissociation, Kinetic of combustion Reactions, Mechanism of Fuel Combustion, Kinetic and Diffusion Control Combustion of Fuel Oil, Combustion of Gas.

Ash handling plant: Ash Handling and Dust collection System, Feed water Treatment, Deaeration, Insulation.

Nuclear plant: Structure of the Atom, Chemical and Nuclear Reactions, Nuclear Stability and Binding Energy, Radioactive Decay and Half Life, Nuclear Fission, Chain Reaction, Neutron Energies, Nuclear Cross-Sections, Neutron Flux and Reaction Rates, Moderating Power and Moderating Ratio, Variation of Neutron Cross- Section with Neutron Energy, Neutron Life Cycle, Reflectors, Heat Transfer and Fluid flow in Nuclear Reactors, Types of Reactors, Pressurized Water Reactor, Boiling Water Reactor, Gas-Cooled Reactors, Liquid Metal Fast Breeder Reactor, Heavy Water Reactors, Fusion Power Reactors.

Diesel Engine Power Plant: Application of diesel Engines in Power Field, Advantages and Disadvantage of Diesel Engine Power Plant, Types of Diesel Plants.

Gas Turbine Power Plant: Introduction**,** Components of Gas Turbine Plant, Gas Turbine Fuels.

Books:-

SL.No	Name of the book	Author	Publication
1	Power Plant Engineering	P.K. Nag	Tata McGraw Hill.

2	Power Plant Technology	M.M. El Wakil	Tata McGraw Hill.
3	Power Plant Engineering	Black and Veatch	CBS Publication.

Elective-I

Course code	Course Title	Semester	L-T-P	Credits
MEL1735	Fluidization Engineering	7th	3-0-0	6

Fluidization Engineering (6-0-0)

Principle of Fluidization; Applications of fluidized beds: Introduction, Industrial application of fluidized beds, Physical operations and reactions; Fluidization and analysis of different phases: Gross behavior of fluidized beds, Bubbles in dense beds, the emulsion phase in dense bubbling beds, flow pattern of gas through fluidized beds; Heat and Mass transfer in fluidized bed systems: Mass and heat transfer between fluid and solid, Gas conversion in bubbling beds, Heat transfer between fluidized bed and surfaces; Elutriation and entrainment: TD and also distribution of solid in a fluidized bed, Circulation systems; Design of fluidized bed systems: design of fluidization columns for physical operations, catalytic and non-catalytic reactions, three phase fluidization.

Books:-

SL.No	Name of the book	Author	Publication
1	Fluidization Engg	DiazoKunji and O. Levenspiel	Butterworth Heinemann.
2	Fluidization	J. F. Davidson and Harrison	Academic Press, London.
3	The Dynamics of Fluidized Particles	Jackson, R	Cambridge University Press, New York
4	Principles of Gas-Solid Flows	Fan, L.-S. and C. Zhu	Cambridge University Press, New York

Course code	Course Title	Semester	L-T-P	Credits
MEL1736	Refrigeration & Air Conditioning	7th	3-0-0	6

Introduction to Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P. Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature.

Vapour Compression System: Single stage system, Analysis of vapour compression cycle, use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Different configuration of multistage system, Cascade system.

Vapour Absorption system: Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Ammonia – Water vapour absorption system, Lithium-Bromide water vapour absorption system.

Refrigerants: Classification, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipments e.g. compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

Books:-

SL.No	Name of the book	Author	Publication
1	Refrigeration and Air conditioning	C.P Arora.	Tata McGraw Hill.
2	Refrigeration and Air conditioning	Manohar Prasad	New Age International Publishers.
3	Refrigeration and Air conditioning	stoecker & Jones.	McGraw hill international.

Course code	Course Title	Semester	L-T-P	Credits
MEL1737	Vibration	7th	3-0-0	6

Introduction: Basic Concepts, Classification of Vibrations and vibrating Systems, Importance and scope ,Free and forced Vibrations, Linear and Non linear Vibrations, Deterministic and random Vibrations, Elementary Parts Of Vibrating Systems, Examples of harmonic motion, Periodic motion, Discrete and Continuous Systems,

Single Degree Of Freedom System: Free vibration Undamped – D.Alembert`s principle and energy method, Natural frequency, Response of equivalent systems and torsional systems. Energy method, Rayleigh's Method.

Damped Free vibration with viscous damping – Logarithmic decrement ,torsion System with Viscous damping, Free vibration with Coulomb damping, damped torsional vibrations, Equivalent Viscous damping, overdamped, critically damped and underdamped vibration.

Forced Vibration: Undamped Systems and Damped Systems, Steady state forced vibration, Source of excitation, Impressed harmonic force due to unbalance and motion excitation, Rotating and reciprocating Unbalance, Whirling of Rotating Shafts, Vibration Isolation and Force Transmissibility, Response of vibrating Systems under Coulomb and hysteresis damping, Vibration Measuring instruments, Accelerometer and vibrometer.

Two Degree of Freedom System: Free vibrations of Undamped Systems, torsional Systems, Coordinate Coupling and Principal Coordinates, damped free Vibrations, Forced vibrations of Undamped Systems, Forced vibrations with harmonic excitation, Dynamic Vibration Absorber, Orthogonality principle, Generalized co-ordinates

Multi degree of Freedom System: Undamped free vibration of multidegree of freedom system, Classical method, flexibility influence coefficients and stiffness Influence coefficients, Stiffness matrix, Matrix iteration method, Adjoint of Matrix Method, Orthogonality Principle, Analysis of multi degree of freedom system by numerical method, Rayleigh`s upper bound approximation and Dunkerley`s lower bound approximation.

Critical speed of shafts: Whirling of uniform shaft, Critical speed of a light shaft with single disc without Damping, Critical speed of shaft with multiple discs, Secondary critical speed.

Books:-

SL.No	Name of the book	Author	Publication
1	Mechanical Vibrations	Kelley	(SIE) (Schaum's Outline)
2	Mechanical	G. K. Grover	New Chand & Brothers, Roorkee
3	Mechanical Vibrations	Rao V. Dukkipati, J. Srinivas	Prentice Hall India

Course code	Course Title	Semester	L-T-P	Credits
MEL1738	Convective Heat & Mass	7th	3-0-0	6

	Transfer			

Conservation equations and boundary conditions, One-dimensional solutions, Heat transfer in laminar developed and developing duct flows, Laminar boundary layers, Similarity and integral solutions, Turbulence fundamentals and modeling, Heat transfer in turbulent boundary layers and turbulent duct flows, Laminar and turbulent free convection, Fundamentals of boiling and condensation, Numerical methods.

Books:-

SL.No	Name of the book	Author	Publication
1	Convective Heat & Mass Transfer	W. M. Kays & E. M. Crawford	McGraw Hill.
2	Convective Heat Transfer	Louis C Burmeister	McGraw Hill.