

**ME-601- OPERATIONS MANAGEMENT**

UNIT	COURSE CONTENT
1	<p><b>Production Management:</b> Integrated Production Management, System Productivity, Capital Productivity, Labour Productivity, Personnel Productivity, Training <b>Operations Management:</b> Introduction, Operations Management and Strategy, Tools for Implementation of Operations, Industry Best Practices Operations Strategy: Operations Strategy, Competitive Capabilities and Core Competencies, Operations Strategy as a Competitive Weapon, Linkage Between Corporate, Business, and Operations Strategy, Developing Operations Strategy, Elements or Components of Operations Strategy, Competitive Priorities, Manufacturing Strategies, Service Strategies, Global Strategies and Role of Operations Strategy, Case-lets</p>
2	<p><b>Forecasting:</b> Introduction, The Strategic Importance of Forecasting, Benefits, Cost implications and Decision making using forecasting, Classification of Forecasting Process, Methods of Forecasting, Forecasting and Product Life Cycle, Selection of the Forecasting Method, Qualitative Methods of Forecasting, Quantitative Methods, Associative Models of Forecasting, Accuracy of Forecasting <b>Total Quality Management:</b> Introduction, Meaning and Dimensions of Quality, Quality Control Techniques, Quality Based Strategy, Total Quality Management (TQM), Towards TQM – ISO 9000 as a Platform – Working with Intranet, Total Productive Maintenance (TPM)</p> <p><b>Supply Chain Management :</b> Introduction, Domain Applications, SCM– The Breakthrough Article, Supply Chain Management, Views on Supply Chain, Bullwhip Effect in SCM, Collaborative Supply Chain, Inventory Management in Supply Chain, Financial Supply Chain – A New Revolution within the SCM Fold</p>
3	<p><b>Location Strategies:</b> Introduction, Location Planning Process Facility or Layout Planning and Analysis: Introduction, Objectives of Layout, Classification of Facilities, Basis for Types of Layouts, Why Layout decisions are important, Nature of layout problems, Redesigning of a layout, Manufacturing facility layouts, Types of Layouts, Layout Planning, Evaluating Plant Layouts, Assembly Line Balancing, Material handling</p>
4	<p><b>Project Management :</b> Planning Process: Introduction, need, Project Management Principles, Essentials of Project Management Philosophy, Project Planning, Project Process Flows .<b>Project Implementation:</b> Control and Closure: Introduction, Project Management Life Cycle, Project Monitoring and Control, Change Control, Risk Management, Project Closure <b>Aggregate Planning:</b> Introduction, Requirement of Aggregate Plan, Steps in Developing an Aggregate Plan, Advantages of Aggregate Plan, Aggregate Planning Strategies, Planning Options. Selecting the Method in Aggregate Planning, Aggregate Planning in Services</p>

5	<b>Value Engineering:</b> Introduction, Value Engineering/Value Analysis, Relevance of VE in Modern Manufacturing, Process of Value Analysis, VE – Approaches and Aim, Providing Value to the Customers, Benefits . <b>Just-In-Time</b> : Introduction, Characteristics of JIT, Key Processes to Eliminate Waste, Implementation of JIT, Prerequisites for implementation, JIT Inventory and Supply Chains . <b>Operations Scheduling:</b> Introduction, Purpose of Operations Scheduling, Factors Considered while Scheduling, Scheduling Activity under PPC, Scheduling Strategies, Scheduling Guidelines, Approaches to Scheduling, Scheduling Methodology [Quantitative], Scheduling in Services
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**REFERENCES:**

1. Chary SN; Production and Operations Management; TMH
2. Hopp W and Spearman M; Factory Physics; TMH
3. Gitlow Howard et al; Quality Management; TMH

**ME-602-POWER PLANT ENGINEERING**

<b>UNIT</b>	<b>COURSE CONTENT</b>
<b>1</b>	<b>INTRODUCTION TO POWER PLANTS AND POWER FROM RENEWABLE ENERGY</b> Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas turbine Power Plants. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.
<b>2</b>	<b>STEAM POWER PLANT</b> Fuel and ash handling, Combustion Equipment for burning coal, Mechanical Stokers. Pulveriser, Electrostatic Precipitator, Draught- Different Types, Surface condenser types, cooling Towers.
<b>3</b>	<b>NUCLEAR POWER PLANT</b> Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR),. Safety measures for Nuclear Power plants, Importance of nuclear power development in the world and Indian context, Review of atomic structure and radio activity, binding energy concept, fission and fusion reaction.
<b>4</b>	<b>HYDRO-POWER STATION</b> Elements of Hydrological computations, rainfall run off, flow and power duration curves, mass curves, storage capacity, salient features of various types of hydro stations, component such as dams, spillways, intake systems, head works, pressure tunnels, penstocks, reservoir, balancing reservoirs, selection of hydraulic turbines for power stations, selection of site.
<b>5</b>	<b>POWER STATION ECONOMICS</b> Estimation and prediction of load. Maximum demand, load factor, diversity factor, plant factor and their influence on plant design, operation and economics; comparison of hydro and nuclear power plants typical cost structures, simple problems on cost analysis, economic performance and tariffs, interconnected system and their advantages, elements of load dispatch in interconnected systems.

**REFERENCES**

- 1- Nag PK; Power plant Engg; TMH
- 2- Al-Wakil MM; Power plant Technology; TMH
- 3- Sharma PC; Power plant Engg; Kataria ansons, Delhi.
- 4- Domkundwar; Power Plant Engg; Dhanpatrai & sons.
- 5- Rajput RK; A text book of Power plant Engg.; Laxmi Publications.
6. Arora S.C and Domkundwar S, “A Course in Power Plant Engineering”, Dhanpat Rai, 2001

**ME 603- MC & CNC MACHINES**

<b>UNIT</b>	<b>COURSE CONTENT</b>
<b>1</b>	<b>Introduction: Lathe:</b> Machining Processes , Classification of machine tools and their basic components; Engine lathe- Size and specification, components & accessories, various operations and Attachments on lathes, capstan & turret lathes, Common tool and attachment s used on turret and capstan lathes , methods of thread production, Automatic Lathe , single point cutting tools, tool signature and nomenclature
<b>2</b>	<b>Grinding And Finishing Process :</b> - Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding. Finishing Process Honing . Lapping , Super Finishing Polishing and Buffing , Comparison of Grinding and Finishing Process
<b>3</b>	<b>Drilling , Broaching &amp; Milling:</b> Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters. Drilling & Broaching: Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines.
<b>4</b>	<b>Shapers &amp; Gear Cutting :</b> Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time. Surface qualities, equipment used for rating surfaces, rms. CLA value, causes for surface irregularities. Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing.
<b>5</b>	<b>Numerical Control of Machine Tools And Mechatronics:</b> Introduction to control systems, analog control, transfer function, procedure for writing transfer function, Introduction of NC & CNC Machines, specifications and classifications of NC & CNC machines, different Types, Advantages and Disadvantages, Comparison of NC & CNC Machine,

**REFERENCES:**

1. Rao P.N. Manufacturing Technology Vol – I & III, TMH.
2. Hazra Chaudhary, Workshop Technology – II, Meida Promoter & Publisher.
3. Raghuvanshi, B.S.; Workshop Technology Vol- I & II, Dhanpat Rai Publication, Delhi.
4. Lindberg RA ; Processes & Materials of Manufacturing, PHJ.

**LIST OF EXPERIMENTS:** Write the name of experiments

1. To Find First cutting speed feed, and depth of cut on plain turning on a lathe machine .
2. To form taper on 20 mm x 100 mm work piece.
3. To perform step turning and facing.

**ME 604 INTERNAL COMBUSTION ENGINES**

UNIT	COURSE CONTENT
1	<p><b>Introduction:</b> Internal and external combustion engine ,four stroke cycle S.I. and C.I. engine, two stroke engine, classification of I.C. Engine on various basis Valve timing diagram for S.I. and C.I. engines, , determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, <b>Fuel-air cycles and actual cycle:</b> Reasons for deviation of actual cycle from air standard cycles, Reasons of ignition advance and injection advance</p>
2	<p><b>a) Combustion in S.I. engine:</b> stages of combustion, factor influencing the flame speed, the phenomenon of knock in S.I. engine, effect of engine variable on knock &amp; detonation, Pre-ignition, effect of pre ignition, firing order. <b>Combustion in C.I. engine:</b> stages of combustion, factor influencing the delay period,, the phenomenon of knock in C.I. engine, effect of engine variable on knock, comparison between knock in S.I. and C.I. engine, octane number, knock inhibitors. <b>Fuels:</b> effect of volatility on engine performance - cold starting, hot starting, vapour lock, acceleration, Antiknock rating of fuels, CCR, HUCR, Octane number, performance number, Cetane number, Dopes.</p>
3	<p><b>Carburetion:</b> Properties of air-petrol mixtures, mixture requirement, simple carburetor, Nozzle, calculation of fuel jet and venturi throat diameter for given air fuel ratio. Idling system, power enrichment system, acceleration pump and cold starting system.</p>
4	<p><b>Injection System for C.I. Engines:</b> type of injection systems, injection pump, fuel injector, nozzle, and atomization, spray penetration and spray direction. Electronic diesel injection System, MPFI &amp; TBI.</p> <p><b>Ignition System:</b> Battery and magneto ignition system and their comparative study, spark plug heat range, electronic ignition system, firing order, Ignition timing, centrifugal and vacuum ignition advance.</p> <p><b>Cooling System:</b> air &amp; liquid cooling, advantage and disadvantage, Antifreeze mixture.</p> <p><b>Lubrication System:</b> Function &amp; Classification of lubricating system, mist lubrication system, dry sump lubrication, wet sump lubrication-splash, and modified and full pressure system.</p>
5	<p><b>Testing and Performance:</b> measurements of brake power, indicated power, friction power, fuel consumption and air consumption, Morse test, motoring test, heat balance sheet, Performance curves of S.I. and C.I. Determination of engine dimensions, speed, fuel consumption, output, mean effective pressure and volumetric efficiency.</p> <p><b>Supercharging:</b> Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.</p>

**REFERENCES:**

1. A Course in Internal Combustion Engines – M.L. Mathur & R.P. Sharma – Dhanpat Rai & Sons, Delhi

2. Internal Combustion Engine – V. Ganeshan – TMH, New Delhi
3. Internal Combustion Engines Theory & Practice by G.F. Taylor
4. Introduction to IC Engines by Richard Stone.
5. Internal Combustion Engines by DomKundwar Dhanpat rai Publications .
7. Engineering Fundamentals of the Internal Combustion Engine- Pulkrabek, Willard WPHI Delhi
8. Elements of Internal Combustion Engines- A R Rogowski- TMH. New Delhi

**LIST OF EXPERIMENTS:** Write the name of experiments

1. Determination of Valve timing diagram
2. Load test on Petrol Engine
3. Heat Balance of SI engine
4. Heat Balance of CI Engine
5. Study of Battery Ignition system and Electronic Ignition System
6. Study of Diesel fuel pump
7. Study of Diesel fuel injectors
8. Study of a Carburetors
9. Study of Fuel Injection system in SI Engine
10. Study of lubricating system in CI Engines

**ME 605 – HEAT & MASS TRANSFER**

UNIT	COURSE CONTENT
1	<p><b>Introduction:</b> Heat transfer, Difference between heat transfer and thermodynamics, Various modes of heat transfer, Fourier’s, Newton’s and Stefan Boltzmann’s Law, Combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient. The thermal conductivity of solids, liquids and gases, factors influencing conductivity.</p> <p><b>Conduction:</b> Derivation of general differential equation of heat conduction in Cartesian co-ordinate. One dimensional steady state conduction, linear heat flow through a plane and composite wall, heat conduction without heat generation in cylinder and sphere, critical thickness of insulation. Conduction with heat generation in flat wall and solid cylinder.</p>
2	<p><b>Fins:</b> Heat transfer from a straight and annular fin (plate) for a uniform cross section; error in measurement of temperature in a thermometer well, fin efficiency, fin effectiveness, applications; Unsteady heat conduction: Transient and periodic conduction, heating and cooling of bodies with known temperatures distribution, systems with infinite thermal conductivity, response of thermocouples.</p>
3	<p><b>free &amp; Forced Convection:</b> Physical Mechanism of Natural Convection &amp; Forced Convection, Buckingham ‘pie’ theorem, Dimensional analysis for forced convection, velocity and Thermal Boundary layer, Flow over plates, Flow across cylinders and spheres, Flow in tubes, Reynold’s analogy.</p>
4	<p><b>Introduction to Mass Transfer:</b> molecular diffusion, eddy diffusion, Molecular diffusion, mass transfer in laminar and turbulent convection Combined heat and mass transfer. <b>Heat Exchangers:</b> Different types of heat exchangers (parallel flow, counter flow); heat exchanger performance, Heat exchanger transfer units, Analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method).</p>
5	<p><b>Thermal radiation:</b> Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Planck’s distribution law, radiation from real surfaces; radiation heat exchange between black and gray surfaces, shape factor, analogical electrical network, radiation shields. <b>Boiling and condensation:</b> Film wise and drop wise condensation; Nusselt theory .</p>

**REFERENCES:**

1. Heat Transfer – S.P. Sukhatme – TMH, Delhi
2. Heat & Mass Transfer – D.S. Kumar – S.K. Kataria & Sons, Delhi
3. Heat transfer- C P Arora, TMH, Delhi
4. Heat & Mass Transfer – R, Yadav, Central Publishing House, Allahabad
5. Heat & Mass Transfer – R.K. Rajput, S.Chand, Delhi

**LIST OF EXPERIMENTS:**

- 1 Conduction through a rod to determine thermal conductivity of material

- 2 Forced and free convection over circular cylinder
- 3 Free convection from extended surfaces
- 4 Parallel flow and counter flow heat exchanger effectiveness and heat transfer rate
- 5 Calibration of thermocouple
- 6 Experimental determination of Stefan-Boltzmann constant



**ME- 606 – COMPUTER AIDED ENGINEERING (CAE)**

UNIT	COURSE CONTENT
1	<b>Methods to solve engineering problems-</b> analytical, numerical, experimental, their merits and comparison, discretization into smaller elements and effect of size/ shape on accuracy ,importance of meshing, boundary conditions, Computer Aided Engineering (CAE) and design, chain-bumping-stages Vs concurrent-collaborative design cycles, computer as enabler for concurrent design and Finite Element Method (FEM), degree of freedom (DOF), mechanical systems with mass, damper and spring, stiffness constant K for tensile, bending and torsion; Practical applications of FEA in new design.
2	<b>Types of analysis in CAE:</b> static (linear/ non linear), dynamic, buckling, thermal, fatigue,crash NVH and CFD, review of normal, shear, torsion, stress-strain; types of forces and moments, tri-axial stresses, moment of inertia, how to do meshing.
3	<b>Two-dimension meshing and elements for sheet work and thin shells:</b> effect of mesh density and biasing in critical region, comparison between tria and quad elements, quality checks, jacobian, distortion, stretch, free edge, duplicate node and shell normal.
4	<b>Three-dimension meshing and elements:</b> only 3 DOF, special elements and techniques, introduction to weld, bolt, bearing and shrink fit simulations, CAE and test data correlations, post processing techniques
5	<b>Review of linear optimization:</b> process and product optimization, design for manufacturing (DFM) aspects in product development, classical design for infinite life and design for warranty life, warranty yard meetings and functional roles, climatic conditions and design abuses, case studies.

**REFERENCES:**

1. Gokhle Nitin etal; Practical Finite Element Analysis,Finite to Infinite, 686 Budhwar Peth, Pune.
2. Logan DL ; A First Course in Finite element Method; Cengage
3. Krishnamoorthy; Finite Element Analysis, theory and programming; TMH
4. Buchanan; Finite Element Analysis; Schaum series; TMH
5. Seshu P; Textbook of Finite Element Analysis; PHI.
6. Chennakesava RA; Finite Element Methods-Basic Concepts and App; PHI Learning
7. Reddy JN; An introduction to finite element method; TMH
8. Desai Chandrakant S et al; Introduction to finite element Method; CBS Pub
9. Hutton D; Fundamentals of Finite Element Analysis; TMH
10. Zienkiewicz; The finite element Method; TMH
11. Martin and Graham; Introduction to finite element Analysis (Theory and App.)
12. Rao, S.S., The Finite Element Method in Engineering; Peragamon Press, Oxford.
13. Robert DC., David DM et al, Concepts and Application of Finite Element Analysis; John