VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B.E- IV

Mechanical

Semester -VII

MED 701 M Machine Design II

	Lectures	Tutorial	Practical
Teaching Hours	3	1	4
Examination scheme Marks	100	25	Continuous Evaluation 40 Examination 60

1. Design of power transmission elements: Design of belt drives, selection of flat and V-belts, design of pulleys and flywheels. Design of gear drives-spur, helical, bevel and worm gear drives. Design of single and multistage speed reducers. Rating of gears as per I.S. and AGMA standards.
2. Design of gear boxes. Types of gear boxes, design of machine tool gear boxes using preferred numbers.
3. Design of clutches and brakes, types of clutches, design of single & multiple clutches, cone clutch and centrifugal clutch. Design of block brake, pivoted shoe brake, long shoe brake, internal shoe brake. Simple and differential band brake.
4. Design of bearings: Design of hydrodynamic journal bearings – Classification, material selection, Summerfield number and use of charts for the estimation of minimum film thickness, temperature rise, flow quantity etc. design of pressure fed and self contained bearings. Rolling contact bearings – classification and selection, factors affecting bearing life, bearing assembly and lubrication.
5. Load Lifting Devices: Selection of steel wire rope for hoists and cranes, crane hooks, design of hook block, sheaves and rope winding drums.
6. Introduction to pressure vessels: Thin and thick cylinder, classification of pressure vessels, loads, stresses and types of failures.
7. Statistical Consideration in machine Design: - Statistical analysis of tolerances, reliability, statistical factor of safety, MTBF, reliability of systems in series and parallel.

Practical: Based on the above syllabus each student has to submit at least two Major designs along with assembly and detail drawings for each and design report along with at least ten small design problems as tutorials.

References:

1. V.B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Publishing Co., (1994).
2. Joseph Shigley, Mechanical Engineering Design, McGraw Hill Book Co., (1989).
3. R.C. Patel et. Al, Machine Design, Vol. & II, C. Jamnadas & Co., (1992).
4. Various Indian Standards and Design Data Books.

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B.E- IV

Mechanical

Semester -VII

MED 702 M Energy Systems

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Introduction: Sources of energy, conventional and non conventional energy systems. Types of power plants. Like combined cycle and cogeneration plants, Thermal power stations.
2. Steam Generation: Types & steam generators, Natural circulation and its limitations. Critical pressure and forced circulation. High pressure boilers such as La Mont, Benson, shmidt, velox. Boiler accessories, Furnaces, performance of boilers. Fuel handling systems.
3. Steam Turbines: Classification and general constructional features, compounding of turbines. Basic thermodynamics cycles. Rankine cycle regenerative, reheat and combined regenerative and reheat and cycles. Steam nozzles, flow through nozzles, nozzle efficiency. Super saturated flow in nozzles.
4. Impulse steam turbine: Velocity diagrams, forces on blades, blade efficiency. Gross stage efficiency of multistage turbines. Blade height calculations, carry over factor, blade velocity coefficient, reheat factor.
5. Impulse reaction turbines: Degree of reaction, Parson's reaction turbine, height of blade, stage efficiency, carries over factor.
   Internal losses in steam turbines, governing.
6. Introduction to non-conventional energy systems such as solar, wind, tidal, wave, OTEC Bio-mass etc.

References:

1. M, M + WA-KIL, Power plant technology Mc. Graw-Hill.
2. Strields boiler, F. ro, Dodge corporation, newgozle
3. Chrrocch, Turbines, McGaw-Hill.

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B.E- IV

Mechanical

Semester -VII

MED 703 M Production Technologies I

	Lectures	Tutorial	Practical
Teaching Hours	3	1	2
Examination scheme Marks	100	25	Continuous Evaluation 20 Examination 30

Mechanics of metal cutting, tool materials, tool angels, chip formation, Merchant's theory, shear plane angle, shear stress and shear strain, tool forces, toll wear, tool life, temperature in machining, surface roughness, economics of machining, cost estimation, Els and B.E.P.
Introduction to thread and gear manufacturing process like hobbing, shaping rolling etc.
Introduction to unconventional machining process like EDM, ECM, AJM, USM, etc.
Introduction to kinematics of machine tools like lathe, milling machine, hobbing machine, shaping machine etc. Machine tool control and hydraulic circuits. Introduction to automates, tool layout for automates.

Tutorials and at least eight experiments based on above syllabus are to be performed by each student.

References:

1. A. Ghosh, A.K. Mallik, "Manufacturing science", East – West Press, 1988.
2. HMT, "Production Technology", Tata MC Graw Hill, 1980.
3. P.C. Pandey, H.S. Shah, "Modern Manufacturing Process", Tata MC Graw Hill, 1995.
4. B.P. Sinha, "Mechanical Estimating & Costing", Tata Mc Graw Hill, 1995.
5. N.K. Mehta, "Machine Tool Design", Tata MC Graw Hill, 1992.

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B.E- IV

Mechanical

Semester -VII

MED 704 M CAD-CAM

	Lectures	Tutorial	Practical
Teaching Hours	3	1	2
Examination scheme Marks	100	25	Continuous Evaluation 30 Examination 45

A: COMPUTER AIDED DESIGN (CAD)

1. Principles of computer aided design: Computer configuration for CAD applications. Computer peripherals for CAD.
2. Fundamentals of computer graphics: Two dimensional transformation, three dimensional transformation and projections.
3. Plane curves and space curves: Surfaces description and generation. Hidden line algorithms for wire frame modeling, surface modeling, and solid modeling.
4. Introduction to computer aided drafting and analysis software such auto CAD, PRO-ENGINEER, ANSYS, etc. CAD system utilization application.

B: COMPUTER AIDED MANUFACTURING (CAM)

5. Introduction, Numerical control of m/c tools nomenclature, types features, MCU, actuations systems.
6. Transducers, tooling for N.C. Machines ISO G & M codes N.C. part programming, tool setting, cutter compensation, parametric programming, APT language structure APT Geometry, motion commands, post processor commands, respective programming, compilation and control commands.
7. Introduction & Group Technology, coding methods, CAPP, FMS scheduling and sequencing.

At least eight experiments are to be performed based on the above syllabus.

References:

1. David F. Rogers & J. Alan Adams Mathematical Elements for Computer Graphics Mc Graw Hill International Edition, 1990.
2. T.K. Kundra, P.N. Rao, M.K. Tewari Numerical control and Computer Aided Manufactures pub Tata Mc Graw Hill International Edition, 1990.
3. M.P. Groover, Automation, Production Systems & Computer Integrated Manf., Prentice Hall, 1989.
4. C.S. Krishnamoorthy and S. Rajeev, Computer Aided Design, Narosa Publishing House, 1991.
5. M.P. Goover and E.W. Zimmers, Computer Aided Design and Manufacturing, Prentice Hall of India Pvt., New Delhi, 1997.

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B.E- IV

Mechanical

Semester -VII

MED 705 M Project Preliminaries

	Lectures	Tutorial	Practical
Teaching Hours	0	0	3
Examination scheme Marks	0	0	Continuous Evaluation 20 Examination 30

This shall consist of preliminary work pertaining to project, such as study of literature, design calculations, sketches & drawings, material procurement, preparations for fabrication planning and preparation of experiments, additions and alternations of existing test rigs, industrial visits etc.

The work done shall be compiled in form of a brief report and shall be submitted to the head of the department at end of the semester VII for purpose of evaluation.

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B.E- IV

Mechanical

Semester -VII

MED 710 M (Elective I) Microprocessor Application Mechanical Engineering

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Introduction to microprocessors and microcomputers review of digital logic, Boolean algebra and numbering systems.
2. Combinational and sequential logic, Boolean functions of two, three and four variables, karnaugh maps, Elementary ideas about logic circuits of interest such as half and full adder, magnitude comparator, decoders, encoders, multiplexers, demultiplexers, flip-flops counters, and timers.
3. 8085 microprocessors architecture and its operations, instruction set, memory, input-output, interfacing devices, instruction timing and operation status.
4. Assembly language programming, elementary ideas of other microprocessors and micro controllers, programmable logic controllers.
5. Application of microprocessors to mechanical and production engineering such as Data acquisition systems, process control etc.

Reference:

1. R.S. Gaonkar, “Microprocessor Architecture, Programming and Applications” Wiley Estern Ltd., 1995.
2. A.P. Malvino and D.P. Leach, “Digital Principles and Applications”, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 1991.
3. C.M. Gilmore, “Microprocessors Principles and Applications”, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 1997.
4. T. Hanley, “Microprocessors and Microcomputer Technology”, BPB Publications, New Delhi, 1994.
5. V.K. Bansal, “Design of Microprocessors Based Systems”, New Age International (P) Ltd., New Delhi, 1992.

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B.E- IV

Mechanical

Semester -VII

MED 711 M (Elective I) Mechanical Vibrations

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Review of Fundamental: Undamped & damped free vibration of single degree of freedom systems. Equations of motions, energy method, free vibration with viscous damping.
2. Forced vibration of single degree of freedom system: Forced vibration with constant harmonic excitation, steadily state vibrations, forced vibration with reciprocating & rotary unbalance, vibration isolation & transmissibility frequency response curves.
3. Two degrees of freedom system: Normal modes & natural frequencies, Torsional system. Generalized co-ordinates and co-ordinates couplings, vibration absorbers, lagrange's equation.
4. Multi degree of freedom system: Equations of motion in terms of influence coefficients flexibility coefficients, Maxwell's reciprocal theorem, mass & stiffness matrix, matrix methods, torsional vibrations of multi rotor systems. Stodola method, holzer's method, forced vibration of multi rotor system, dynamics of rotor.
5. Vibration of continuous systems: Longitudinal vibration of bar, torsional vibration of shaft.
6. Industrial applications: Vibration isolation, shock isolation, practical aspects of vibration isolation. Uses of vibration in cleaning, conveying, machining, conditioning machining, conditioning monitoring. Vibration measuring instruments etc.

Reference:

1. G.K. Grover, Mechanical Vibrations, Nem chand & Bros, Roorkee-1996.
2. S. Graham Kelley, Fundamental of Mechanical Vibrations, McGraw Hill international, 1993.
3. W.I. Thomson, theory of vibration with application prentice hall, 1975.
4. R.A. Anderson, fundamentals of vibration, Amerind Pub Co., 1972.
5. S.S. Rao, Mechanical Vibrations, Addision – Wesely Pub Co., 1995.
6. G.W. Van santen, introduction to a study of mechanical vibration, cleaver-hume press ltd., 1961.

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B.E- IV

Mechanical

Semester -VII

MED 713 M (Elective) Analysis and Synthesis of Mechanics

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Introduction to mechanics: Geometry of motion, plane and space mechanisms, terminology, definitions and assumptions. Relative motion, degree of freedom, kinematics inversions, mechanical advantage.
2. Kinematic analysis of plane mechanics: Position and displacement analysis-position of a point, graphical and complex-algebra method for displacement. Rotational and translational displacement. Velocity analysis-relative motion, linear and angular velocity, relative, velocity, instant centers, Aronhold kennedy theorem of three centers, angular velocity ratio Freudenstein's theorem. Velocity analysis by analytical method, graphical method. Acceleration analysis-linear and angular acceleration, acceleration difference, relative acceleration and coriolis acceleration. Acceleration analysis by analytical graphical methods. Computer-aided kinematic analysis.
3. Curvature theory. Fixed and moving centroids, velocity and acceleration, inflection circle. Euler savary equation. Boiler's theorem, cubic of stationary curvature.
4. Kinematic synthesius of plane mechanism: Type, number and dimensional synthesis, function generation and path generation chebychev spacing three, four, five point synthesis. Burmeseter point theory, synthesis by analytical and graphical methods. Computer aided kinematic synthesis.

Reference:

1. J.E. Shigley and J.J. Vicker, theory of machines and mechanics: International student edition McGraw Hill.
2. G.N. Sandor and A.G. Erdman Mechanism Design – Analysis and synthesis Vol. I & II. Prentice Hall of India Pvt. Ltd. (Eastern Economic Edition).
3. A.Ghosh and A.K. Mallik, theory of mechanisms and machines (East West Press Pvt. Ltd.)
4. A.S. Hall, Kinematic and Linkage Design (Prentice Hall of India Pvt. Ltd.)
5. R.S. Hartenberg and J. Dovanit, Kinematic synthesis of Linkages (McGraw Hill Book Co.).
6. J. Duffy analysis of mechanisms and robot manipulators. (Edward Arnold Publishers Ltd.), 1980.

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B.E- IV

Mechanical

Semester -VII

MED 713 M (Elective) Mechanical Design Analysis

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Introduction: Review of Force, Moment and stress, force-moment equivalents, static equilibrium-general three dimensional cases. Dynamic force equilibrium stress strain relation, principle stresses, theories of failure.
2. Elements of theory of elasticity: stress tensor, plane stress problems, and equilibrium and compatibility equations in Cartesian co-ordinates. Airy's stress function.
3. Stress analysis of rotating discs and flat plates special cases of circulars and rectangular plates.
4. Fatigue failure: Soderberg and goudman's equations, designing for finite life, cumulative fatigue damage.
5. Elementary analysis of creep and thermal stresses.
6. Experimental techniques: Strain gauges, Rosettes.

References:

1. Arthun H. Burr, "Mechanical Analysis and Design, Preantice-Hall of India"
2. Kenneth S. Edwards, Jr and Robert B. McKee, "Fundamentals of Mechanical Component Design" Mc Graw Hill (1991)
3. R.C. Patel, et. al "Advanced Strength of Materials", C. Jamanadas & Co. (1987).
4. Joseph E. Shigley, "Mechanical Engg. Design", Mc Graw Hill (1989)
5. Vera B. Anand, "Computer graphics and geometric modeling for Engineers", John Wiley & Sons Inc. (1993).

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B.E- IV

Mechanical

Semester -VII

MED 714 M (Elective I) Advance Refrigeration & Air Conditioning

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Compound Vapor Compression Refrigeration System: Two stage compression with water intercooler, liquid sub cooler and flash chamber. Three stage compression with multiple expansion valves and flash intercoolers. Recent developments in refrigerants. Methods of defrosting, expansion devices.
2. Analytical Of Vapor Absorption Systems: Temperature concentration and enthalpy concentration diagrams. Enthalpy balance for various components of aqua ammonia systems.
3. Steam Jet Refrigeration Systems: Introduction analysis of steam jet refrigeration system, performance of the system.
4. Non Conventional Refrigeration Systems: Thermo electric refrigeration system, vortex tube, pulse tube refrigeration, adiabatic demagnetization.
5. Comfort Air-conditioning: Requirements of comfort air conditioning, thermodynamics of human body, comfort charts, effective temperature, ventilation standards.
   Design of air conditioning systems: Review of cooling load calculations by pass factor, effective sensible heat factor, design consideration for cooling coils, de-humifiers and air washers, central air conditioning and unitary air conditioning systems, factory air conditioning.
6. Duct Design: Fluid flow and pressure losses duct design, duct arrangement system, noise and noise control.

Reference:

1. Thrakeld J.L.: Thermal environmental engineering, prentice hall, 1982.
2. Khurmi R.S. and Gupta J.K.: A text book of air conditioning and refrigeration, Eurasia publishing house (P) Ltd., New Delhi, 1994.
3. Arora S.C. and Domkundwar S., A. course in refrigeration and air conditioning, Dhanpat rai and sons, Delhi, 1997.

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B.E- IV

Mechanical

Semester -VII

MED 715 M (Elective I) Safety Engineering

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Safety and Safety Psychology: Concept-Needed-Altitude-Conflict-Morule-Different etc.
2. Statistics Of Safety: Nature-source-need of static in safety-accident cost-management policy-Direct (Indirect loss/cost-cost to society tubler)
3. Appraisal Analysis Inspection Investigation Control: Technique-investigation approach-check list-house keeping.
4. Light Color Ventilation And Temperature: Purpose-principles-types-regulaion-control-of heat.
5. Safety in Engineering Ind. Other Industries: Need-type of ind.-statutory provision-health hazurel-control on site-of site energy-etc.
6. Safety in Mat. Handling And At Work Station: Lifting equipments-lifts-hoist-safety as peet-design consideration statutory need-testing-insp-responsibilities etc.
7. Noise Vibration Pollution: Concept-need-effect-on work force-statutory recommendation, remedy, compilation-control.
8. Safety Laws: Factory act 1948-ILO corenkan-social security legislation-boiler act-environment rules-public liabilities, insurance-child act etc.

Reference:

1. B.K. U Mistry, “A course in industrial safety”.

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B.E- IV

Mechanical

Semester -VII

MED 716 M (Elective) Automobile Engineering

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Power Plant: Constructional features of different types of engines used in automobiles.
2. Vehicle Performance: Resistance to motion of vehicle, air, rolling and gradient resistance. Power requirement for acceleration and grad ability, selection of suitable rear axle and gear ratios, carburetion.
3. Drive Mechanisms: Torque, thrust, propeller shaft, joints (universal). Differential axles, materials, bearing loads, rear wheel drive, front wheel drive, all wheel drive.
4. Suspension: Types, springs, materials, shackles and mounting, independent suspension system, torsion bar, shock absorber – types, construction and working, vibration and riding comforts.
5. Brakes: Types, stopping time and distances, braking efficiency, weight transfer during braking, shoe and disc brakes, Brakes power ratio, hydraulic and power brakes. Layout and details of components.
6. Front Axle and Steering Systems: Axle parts and material, Load and Stress, steering heads, axle bearing wheel alignment, steering geometry layout of system. Steering system for independent suspension and front wheel drive, wheel wobble etc.
7. Clutch: Types and necessity, description and working, torque damper, pedal pressure, centrifugal automatic, vaccum hydraulic operated clutch, Fluid transmission-advantages and disadvantages.
8. Gear Box: Necessity, Sliding mesh, constant mesh, synchromesh, epicycle, Overdrives. Electric transmission-advantages and disadvantages.
9. Electrical Equipment: Circuits, wiring system, ignition coil, magneto and electronics, charging system, battery and auxiliary circuits.

Reference:

1. G.B.S. Narang: Automobile Engineering 1979, khanna publishers, Delhi.
2. R.P. Sharma: A course in Automobile Engineering, 1977 Dhanpat Rai & Sons, Delhi
3. Automobile Engineers Reference Book Editor E. Molloy, London, George Newves Limited.

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B.E- IV

Mechanical

Semester -VII

MED 717 M (Elective I) Analysis of Solar Thermal Systems

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Thermal of flat plate collectors: Radiation transmission through covers, absorption, transmittance absorption product, basic energy equation of collector, temperature distribution, collector efficiency factors, collector heat removal factor, collector overall efficiency, collector performance.
2. Theory of Solar Air Heater, Basic Energy equation, collector efficiency factors, collector heat removal factors, air heater efficiency, performance of air heaters.
3. Analysis of cabinet drier & cooker: Basic energy balance, performance analysis of cooker, cooking period, various types of driers & cookers.
4. Theory of concentrating collectors: Concentration principles, thermodynamic limit of concentration, theory of cylindrical parabolic collectors, collector heat removal factor, and collector heat removal factors, collector efficiency, collector performance, introduction to CPC.

Reference:

1. Sukhtme S.P., “Solar Energy Principles of Thermal Collection and Storage”, 2nd Edi. Tata McGraw Hill, New Delhi, 1996.
2. Daffie, J.A. and Beckman, W.A. “Solar Engineering of Thermal Processes”, 2nd Edi. John Wiley & Sons, N.Y., 1991.
3. Tiwari G.N., suneja sangeeta. “Solar Thermal Engineering Systems”, Narosa Publishing House, New Delhi, 1997.
4. Saigh A.A.M. “Solar Energy Engineering” Academic press, N.Y. 1977.
5. Kreith F. and Kreider J.F. “Handbook of Solar Energy” McGraw Hill, N.Y., 1980.
6. Channiwala S.A. “Soalr Energy Data Book”.
7. A. Mani “Solar Radiation Data for India”.

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B.E- IV

Mechanical

Semester -VII

MED 718 M (Elective I) Corrosion Engineering

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Concept of electrometallurgy, electrochemistry electrode kinetics, polarization, exchange current density, mixed electrodes, mixed potential theory passivity, behavior of active, passive metals.
2. Principles of corrosion and oxidation, principles of corrosion in aqueous solutions. Electrochemical aspects. Metallurgical & other aspects.
3. Eight forms of corrosions, galvanic, crevice, pitting, intergranular, selective leaching, erosion corrosion, stress corrosion & hydrogen damage.
4. High temperature corrosion, corrosion environments corrosion of cast-irons, high alloy steels, nickel alloys, thermodynamics of gas metal systems.
5. Effects of mechanical factors on corrosion, stress corrosion cracking of stainless steels, high tensile stresses, alluminium & magnesium alloys corrosion fatigue, fretting corrosion & cavitation damage.
6. Corrosion control: Design & corrosion, catholic protection, pretreatment and design of metal finishing methods of applying coatings. Some specific case studies related to engineering industries.

Reference:

1. A.S. Khanna, S.N. Malhotra, K.V.S. Santaram, M.K. Totalani, Metallic Corrosion Principles & Control, Wiley Estern Ltd., 1994.
2. Mrs. G. Fontana, corrosion Engineering, McGraw Hill Edition, 1987.
3. L.L. Sheir, Corrosion of Metals and Alloys, George Newnes Ltd., London, W.C.Z., 1965.

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B.E- IV

Mechanical

Semester -VII

MED 719 M (Elective I) Production Management

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Production & Operations management: history, introduction, production system, functions of production planning & control, production & process planning.
2. Rotating sequencing-line balancing, loading, scheduling-short term scheduling Johnson method, dispatching, expending.
3. Material requirement planning (MRP)-MRP processing logic, MRP system components, lot sizing.
4. Capacity requirement planning (CRP) Capacity management capacity time horizons, CRP processing logic, CRP system components.
5. Replacement models-group replacement-selection of equipment.
6. Japanese management Techniques- total quality emphasis, KANBAN, repetitive manufacturing: push v/s pull systems, flexible manufacturing.
7. Just-In-Time manufacturing (JIT) JITB production system, elements of JIT.
8. Total quality management (TQM)-principle, TQM system, techniques of TQM. ISO 9000-elements, applications & benefits, zero defect. Implementation, registration & certification of ISO 9000.
9. Plant layout & plant location-location factors & models types of layouts, plants layout tools & techniques, evaluation of layout.
10. Material handling-principles of material handling, factors in material handling problems, cost aspects, introduction to material handling equipments.

Reference:

1. E.E. Adam & R.J. Elbert “Production & Operation Management” Prentice Hall of India Pvt. Ltd. New Delhi, 1993.
2. J.B.Dilworth, “Operation Management”, McGraw-Hill Inc. Co., 1992.
3. J.G. Monks, operations Management, McGraw-Hill Book Co., 1987.
4. Dr. K.C. Jain & Dr. L.N. Agarwal, “Production Management”, Khanna Publishers, Delhi, 1995.
5. M.G. Korgaonker, Just in time Manufacturing, “McMillan India Ltd. Mumbai, 1992”.
6. J.M. Apple, “Plant layout & Material Handling”, John Wiley & sons, 1997.

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B.E- IV

Mechanical

Semester -VIII

MED 801 M Instrumentation and Control

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Basic concept of control system, classification, transfer function, block diagram and signal flow graph.
2. Control system components, derivative, proportional and integral controllers and their combinations, Relative merits and drawbacks, hydraulic and pneumatic control systems, industrial applications of graph.
3. Response characteristic of control systems lap lace transformation, stability criteria, root locus and route stability criterion.
4. Method of least square Generalized performance characteristics of instruments first and second order instruments, response of a general form of instrument to step and linear input.
5. Data acquisition and processing, general data acquisition system, signal conditioning, data transmission- A-D and D-A converters, data storage and display devices.
6. Transducers, primary and secondary transducers, active and passive transducers-photo emissive cells-hall effect transducers.

Reference:

1. Peter dransfield, engineering systems and automatic control, printive hall of India pvt. Ltd., New Delhi.
2. J.P. Holman and W.J. Gajda, experimental methods for engineers, McGraw-Hill international book company, New Delhi 1989.
3. E.O. Doebalin, Measurement system-application and design, McGraw-Hill Book Company, New York, 1975.
4. Beckwith, T.G. and W.L. Buck, Mechanical Measurements, 2nd edition, Addison wesely publishing company, Inc., Reading, mass, 1969.
5. I.J. Nagrath and M. Gopal, Control systems engineering, Wiley Eastern ltd., New Delhi.

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B.E- IV

Mechanical

Semester -VIII

MED 802 M Elements of gas turbines

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

A.

1. Introduction: perfect gas, sonic velocity, mach number, regimes of flow, static and stagnation properties.
2. Isentropic flow: Governing equations, area-velocity relations, critical conditions, nozzles and diffusers, use of gas tables.
3. Fanno flow: Governing equations, fanno lines and its characteristics, chocking.
4. Rayleigh flow: Governing equations, Raleigh line and its characteristics, flow with maximum heat transfer.
5. Normal shocks: Governing equations, shock strength, Rankin hugonoit relation, pradtl-mayer equation, performance of a convergent –divergent nozzle.

B.

1. Gas turbine cycles: brayton cycle, methods of improving performance, open and closed cycles, co-generation.
2. Centrifugal composer: Governing equation, components and their function, types of impellers, slip factor, pre-whirl, non-dimensional parameters, performance, surging and stalling.
3. Axial flow compressor: basic operation, velocity triangles, factors affecting pressure rise chocking, degree of relation, calculation of blade parameters, polytrophic efficiency, losses, performance, surging and stalling.
4. Combustion chambers: Types, design requirements, arrangements of combustion chambers, losses, combustion efficiency, stability limits.
5. Application of gas turbine plants.

Reference:

1. Yahaya, S.M. Gas Dynamics, Tata Mc-Graw Hill, 1982.
2. Cohen, H., Roger GFC, Sravanamutto, H.I.H., Gas turbine theory, Longman, U.K., 1987.
3. Khajuria P.R., Dubey, S.P., Gas turbines and propubive systems, dhanpat rai & sons, Delhi, 1997.
4. Saad, M.A., compremible fluid flow, prentice hall, 1986.

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B.E- IV

Mechanical

Semester -VIII

MED 803 M Production Technologies II

	Lectures	Tutorial	Practical
Teaching Hours	3	0	2
Examination scheme Marks	100	00	Continuous Evaluation 20 Examination 30

Introduction to metrology, measurement of length and angle, gear and thread measurement, surface roughness measurement, optical instruments, limit-fit-tolerance and limit gauges.

Introduction to plastic deformation and yield criteria, mechanics of forming processes, cold and hot forming processes, analysis of forming, rolling, drawing, extrusion etc

Introduction to FMS, structure, objectives, elements type, section of configuration, design problems of FMS

Introduction to ‘artificial, intelligence, expert system development, concept, frame work, steps for development of expert system, expert system approach to FMS.

Design and selection of single and multipoint tools. Design of blanking and piercing dies.

- Laboratory experiments will be based on above syllabus.

Reference:

1. R.K.Jain, “Engineering Metrology”, khanna publishers, 1997.
2. Dr. R. Narayanswami, “Metal forming Technology”, Ahuja Book publishers, 1997.
3. A Gosh, A.K. Malice, “Manufacturing Science”, East-West press, 1988.
4. Dr. Surendrakumar, A.K. Jain, “CAD-CAM”, Dhanpat rai & sons, 1933.
5. “Fundamentals of Tool Design”, ASTME, prentice hall of India, 1983.

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B.E- IV

Mechanical

Semester -VIII

MED 804 M Industrial Management Techniques

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Linear programming, formulation, graphical method, simplex method, difficulties in simplex method, duality.
2. Assignment & transportation models.
3. Sequencing problems, flow shop & job shop problems, methods of solution.
4. Project management with CPM, PERT.
5. Theory of games, two persons zero sum games, dominance rule, application of LP to game problems.
6. Statistical quality control, control charts for variables, proportional defectives. Control & specification limits, percentage defectives, relative precision index (RPI).
7. Acceptance sampling, operating characteristics curves, single, double, multiple and sequential sampling plans, AOQ, AOQL.
8. Patents and copyrights: patents laws GATT, TRIPS, IPR etc. in Global Perspective. Patents invention, modification, product and process patents copyright.

References:

1. S.D. Sharma, “operations research”, kedarnath ramnath & co., 1996.
2. N.D. Vohva, “Quantitative Techniques in Management”, Tata McGraw Hill. 1990.
3. N.R. Dave & A.K. Manglani, “operations research”, acharya publications, 1992.
4. R.C. Gupta, “Statistical Quality control”, khanna publishers, 1994.
5. Navayanen, “Patents”.
6. Dr. N.S. Gopalkrishnan, “Intellectual; properly”.

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B.E- IV

Mechanical

Semester -VIII

MED 805 M Seminar

	Lectures	Tutorial	Practical
Teaching Hours	00	0	2
Examination scheme Marks	00	00	Continuous Evaluation 20 Examination 30

This shall consist of a seminar report prepared by a student based on studies conducted on a technical topic by referring to literature and presentation of the same before the examiners and students as decided by the head of the department.

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Mechanical

Semester -VIII

MED 805 M Project

	Lectures	Tutorial	Practical	
Teaching Hours	0	0	8	
Examination scheme Marks	00	00	Continuous Evaluation Examination	80 120

This shall consist of work carried out by a student during the period of final & pre final semesters with the main purpose of developing the ability of applying the knowledge gained in the undergraduate studies to some practical problem. The work may consist of one or many of the activities such as design analysis, fabrication, experimentation, product design and development, design and development of laboratory equipments/test rigs, developing computer programmes/software, industry based project etc.

Each student should submit a detailed project report at the ends of the final semester along with a certificate from Head of department for examination.

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B.E- IV

Mechanical

Semester -VIII

MED 820 M (Elective II) Maintenance Engineering

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction to maintenance concepts, maintenance systems, maintenance management.
2. Introduction to condition monitoring.
3. Quantative techniques in maintenance resources.
4. Computers in maintenance, replacement strategies, pert, cpm, quening etc. Applicable to maintenance.
5. Maintenance documentation.
6. Heat treatment, Fits, tolerance and surface finish necessary for maintenance.
7. Maintenance of transmission system bearing ,housing, lead screw, guide ways, machine spindle, hucks, Hydraulic system, Presses cranes, hammers etc.
8. Restoration and manufacture of parts by welding, metallization, plating, etc. Manufacturing and Machine norms.

REFERENCES:

1. L.C.C. Morrow (Editor) Maintenance Engineering Handbook, McGraw Hill.
2. Anthony A Kelly, Maintenance, planning and control, Prentice Hall.
3. N.D.Vohra Quantative Techniques in management, Tata-McGraw Hill,1992.
4. H.P.Garg, Industrial maintenance, S.Chand and company Ltd. 1990

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B.E- IV

Mechanical

Semester -VIII

MED 821 M (Elective II) Design of Machine Tools

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. General principles of machine tool design, Tool force for Various machining Processes.
2. Kinematics of machine tool-selection of speeds & Feeds, Design of gear box, steples drives.
3. Design of machine tool structures-principle, Materials, static &dynamic Stiffness, & shapes of machine tool structures, Design of beds, columns, housings, tables, etc.
4. Design of guide ways & power screws-Design of slide ways.
5. Design of spindles-Materials of spindles – Machine tool compliance, -Antifriction bearings sliding bearings.
6. Dynamic of Machine tools Dynamic of characteristics of elements and systems- Dynamic of characterization of cutting processes –stability analysis, -forced vibrations of Machine tools.
7. Control systems in Machine tools –hydraulic & Pneumatics. Controls of Machine tools systems

REFERENCES:

1. N.K.Mehta, “Machine Tool Design” Tata-McGraw Hill, 1984.
2. S.K.Basu, D.K.Pal, “Design Machine Tools” Oxford & IBH Publishing co.1983.
3. Acherkan N. Machine Tool Design Vol. I-IV, Mir publishers, Moscow ,1968.
4. Koenigsberger, K. “Design Principles of metal cutting Machine tools”, pergaman press, 1964
5. G.C.Sen, A. Bhattacharya, “Principles of Machine Tools” New central book Agency, 1971.
6. Tobias ,S.A , “Machine Tool vibration”, Blackie Oxford,London.

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B.E- IV

Mechanical

Semester -VIII

MED 822 M (Elective II) Design of heat exchanger

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Heat exchanger types, constructional details of different heat exchangers, selection of heat exchangers.
2. Design of double-pipe exchangers: Tube-side heat transfer and pressure loss calculations, annular heat transfer and pressure loss calculations.
3. Shell and tube heat exchangers: Approximate sizing of shell & tube heat exchangers, shell-side and tube side calculations. Design procedure for plain and finned tubes.
4. Design of compact heat exchangers and regenerators. Types of regenerator matrix. Design of coils.
5. Design of radiation furnaces, well stirred model and longitudinal model.
6. Fouling mechanisms, growth and its effect. Methods for minimizing fouling.
7. Flow induced vibrations.

Reference:

1. Kern D.O., Process Heat Transfer, Tata McGraw Hill. 1997.
2. E.A. Saunders, Heat Exchangers, Longmen Scientific & Technical Pub., 1998.
3. Heat Exchangers Design Handbook, Vol. 1 to 5, VDI, 1983.

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B.E- IV

Mechanical

Semester -VIII

MED 823 M (Elective II) Design of alternative energy systems

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Design of wind machines, basic theory, design concept, design of Dutch type wind machine, designing three bladed propeller type wind machine, site selection.
2. Design of solar cooling system: absorption principles, aqua-ammonia, Li-Br-H2O system, determination of collection area for a given cooling application.
3. Design of biomass energy systems, alcohol fermentation, anaerobic digestion, design of biogas plant based on total cost minimization, factors influencing biogas plant performance.
4. Gasifier-engine based gen-sets. Decentralized electricity generation, biomass gaifier, its principle chemical reactions, design concepts of biomass gasifier, performance.
5. Solar photo-voltaic system, theory of solar cells, design concepts of PV system, concept of PV-diesel hybrid system.
6. Thermion generators & fuel cells: The electricity generation potential, principles and design of thermion generators & fuel cells.

Reference:

1. Peter Auer “Advance in Energy Technologies vol. 1 & 2” academic press, 1977.
2. Twidell J.W., Weir A.D., renewable energy resources, ELBS pub., 1986.
3. ASHRAE “Handbook of Fundamentals”, 1986
4. Chawla, O.P. “Advance in Biogas Technology, Indian Council of Agriculture Research, New Delhi, 1986.
5. Mani. A. and Mooley D.A., “Wind Energy Data for India”.
6. Sukhatme S.P., “solar energy principles of thermal a collection and storage”, 2nd Edi, Tata Mc-Graw hill, New Delhi, 1996.
7. Duffie, J.A. and Beckman, W.A. “Solar engineering of thermal processes” 2nd Edi, John Wiley & sons, N.Y., 1991.
8. Tiwari G.N., Juneja Saneeta. “Solar Thermal Engineering Systems”, Narosa publishing house, New Delhi, 1997.
9. Sayigh A.A.M. “Solar Energy Engineering” Academic press, N.Y., 1997.
10. Kreith F. and Kreider J.F. “Handbook Of Solar Energy” Mc Graw Hill, N.Y. 1980
11. Channiwala S.A. “Solar Energy Data Book”.
12. A. Mani and Mooley D.A. “Solar Radiation Data For India”.

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B.E- IV

Mechanical

Semester -VIII

MED 824 M (Elective II) Design of mechanical handling equipments

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Introduction: material handling equipments, classification and their selection. Concept of material handling system design.
2. Lifting Equipments: classification and selection & design of steel wire ropes, chains, hooks, sheaves, drums and grab buckets. Classification of cranes, construction working of different types of conveyors, feeders and elevators.
3. conveying equipments: classification construction and working of different types of conveyors, feeders and elevators.
4. design of belt conveyors, screw conveyors and vibratory conveyors.

Reference:

1. J.M. Apple, “Plant Layout and Material Handling”, john Wiley & sons, 1997.
2. N. Rudenko, “material handling equipments”, MIR publishers.
3. M.P. Alexandrov, “material handling equipments”, MIR publishers.
4. Spivakovskii, “conveyors and related equipments”. MIR publishers.

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B.E- IV

Mechanical

Semester -VIII

MED 825 M (Elective II) Cryogenics

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Historical Background & application
2. Gas Liquifaction systems, Ideal Liquifaction systems, Linde, Claude, Heylanjt, and Kapitza and their thermodynamics analysis.
3. Gas separation and Purification systems, Ideal separation of Gases, Principle of Gas separation, Air separation systems.
4. Cryogenic refrigeration systems, Ideal cryogenic refrigeration systems, joule-thomsan, Linde hampsion refrigeration cycles, closed cycle cryo refrigerators.
5. Storage and handling of cryogens.
6. Cryogenic Insulation and their types.
7. Measurement of strain, pressure, flow, Temperature and liquid level in cryogenic range production and measurement of vaccum.
8. Heat exchangers, compressors, Expanders for cryogenic systems.
9. Laboratory Demonstration

REFERENCES:

1. Hastlden C, “Cryogenic Fundamentals’’ Academic press, 1970.
2. Barron R. “Cryogenic systems’’ plenum press, 1960.
3. Walker, “Cryocoolers Vol I &II’’ plenum press, 1980.
4. Mikulin Y, “Theory and design of Cryogenic systems’’, MIR Publication, 1985.

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B.E- IV

Mechanical

Semester -VIII

MED 826 M (Elective II) Robotics

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction to Robotics, Robot types of configuration and Anatomy, Drives systems, Trajectory planning & Motion ,Basic of Robot arm kinematics and dynamics.
2. End effectors –types , constructional details and working.
3. Sensors Robot Programming Language.
4. Robot Intelligence and task planning.
5. Application , Introduction to Robot Vision systems.

REFERENCES:

1. K.S.Fu, R.C. Gonzalez, C.S.G. Lee Robotics , McGraw-Hill International edition ,1987.
2. Groover, Weiss, Nagal and odery Industrial Robotics, McGraw-Hill International edition, 1988.

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B.E- IV

Mechanical

Semester -VIII

MED 827 M (Elective II) Design of Management of Small Enterprises

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction: Objective of Entrepreneurship –scope, risks and rewards, -characteristics of an Entrepreneur.
2. Economic and Industrial Requirements : current economic and industrial environment – Linkage among small, medium and large industrial sectors, Entrepreneurial Ventures and economic growth –business opportunity identification –ancillaries, subcontracting, demand based resources based and service based, industrial –Import substitution.
3. Setting Up An Industry: Forms of business organization –formation of a company procedures and formalities for setting up of new industry –sources of information incentives, subsidies and concessions industrial development agencies and their functions – state level and national level Institutions for small industry promotion.
4. Marketing: Component of marketing –market survey and analysis- Marketing arrangement strategies and assistance to small industry promotion.
5. Product Development: Creative thinking and organizing for product lunovation –functional Design and cost optimization factors affecting product design –stage of product design,- process analysis –selection of plant and Machinery –Reliability &Quality control patents.
6. Project Planning : Techno-economic feasibility studies and economic analysis payback periods average of return net present value –internal rate return and cost benefit analysis – break even analysis –assessment of fixed capital and working capital requirements financial viability –sources of finance –Financial Ratio analysis.
7. Project Finance: Detailed assessment of fixed capital and working capital factors affecting working capital-operating cycle –methods of calculating working capital –sources of finance for working capital.
8. Project Report : Preparation of detailed project report –project implementation programme evaluation and Review technique –Critical path Method.

REFERENCES:

1. Vasant Desai, “Dynamics of entrepreneurial development and management’’ Himalaya Publishing House Mumbai, 1996
2. Prasanna Chandra “Projects” ,Tata McGraw –Hill Publishing company Limited , New Delhi- 1995.
3. Vasant Desai Volume –II, “Entrepreneurship Development” Himalaya Publishing House Mumbai, 1991
4. James L. Riggs, “Production systems”, John willey & Sons ,New-York,1987.
5. Benjamin W. Niebel, “Product design and process engineering” McGraw –Hill Kogakusha Ltd. Tokyo.
6. Desai, A.N. “Environment and Entrepreneur”, Ashish Publishing House, New-Delhi, 1989.
7. J.M.Pandey “Financial Management” Vikash publishing House Pvt .Ltd. New-Delhi, 1997.

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B.E- IV

Mechanical

Semester -VIII

MED 828 M (Elective II) Design of pressure vessels - piping

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

Factors influencing the design of vessels-classification of pressure vessels, material selection, loads & types of failures

Stresses in pressure vessels stresses in circular ring, cylinder & sphere, membrane stresses in vessels under internal pressure, thick cylinders, multilayered cylinders, stress consideration in the selection of flat plat & conical closures, elliptical, semispherical, hemispherical heads, autoretage of thick cylinders, thermal stresses & their significance, fatigue of pressure vessels.

Design of pressure vessels as per ASME & is codes, externally pressurized vessels, tall vertical vessels, support for vertical & horizontal vessels, nozzles & flanges. Discontinuity stresses in pressure vessels.

Basic concepts, flow through pipes, fanno & Reynolds flow, pressure drop in isothermal & non-isothermal flows.

Head losses, loss due to contraction & expansion, loss due to fittings, equip mental length, distribution & mixing losses.

Reference:

1. M.V. Joshi & V.V. Mahmani, Process Equipment Design, Macmillan, India, Ltd., 1996.
2. J.F. Hanvey, pressure vessels design, von nostrand co. Inc.
3. ASME code section 8^{th} div. 1, div. 2.
4. K.P. Singh & A.L. Solen, Mechanical Design of Heat Exchangers, Arcrunus pub. Inc. N.J. 08003, USA, 1984.
5. Demis R. Moss, Pressure vessel design manual, gulf publishing co., Houston, 1987.
6. IS 2825.
7. Hand Book of piping Design.
8. ASHRAE fundamentals 1985

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B.E- IV

Mechanical

Semester -VIII

MED 829 M (Elective II) Total quality management

	Lectures	Tutorial	Practical
Teaching Hours	3	1	0
Examination scheme Marks	100	25	Continuous Evaluation 00 Examination 00

1. Quality concepts & functions-various definitions such as quality function, quality measurement, quality costs. Quality in production, design marketing etc. Quality audit, SQC, quality assurance, total quality control.
2. TQM-Introduction, history, principles, quality policy, quality system, quality management, TQM system & models. Essentials of TQM.
3. Organizing for TQM-organizing for quality implementation, TQM organization structure, employee involvement, quality circles.
4. Costs of quality-benefits of costs of quality control, measurement of quality costs, use of quality cost information.
5. Tools and techniques for TQM-Taguchi and PQKa-Yoke technique, Kaizen, PDCA cycle, flow diagram, 5s campaign, 7QC cause & effect diagram, FMEA & FTA etc.
6. ISO 9000 quality management system-ISO 9000 elements, application and benefits. Zero defect implementation registration & certification for ISO 9000.
7. Just-In-Time & TQM-JIT production, system, KANBAN, JIT techniques such as waste deduction, total production maintenance (TPM), push versuns pull systems.
8. Case studies on TQM.

Reference:

1. N. Logo thesis, “Managing for total quality”-prentice hall of India pvt. Ltd. – 1997.
2. Joel E. Ross, “Total Quality Management”-variety book international, New Delhi-1995.
3. K.C. Jain & A.K. Chitale-Quality Assurance & TQM-Khanna publishers, New Delhi-1998.
4. S.M. SundavaRaju- “Total Quality Management”- Tata Mc Graw Hill Publishing Co.P. Ltd., New Delhi-1995.
5. A.N. Singh-“prevention, implementation & registration of ISO 9000 Quality System”-Dolphin Books, New Delhi-1993.

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B.E- IV

Mechanical

Semester -VIII

MED 830 M Fluid Power Engineering

	Lecture	**Tutorial**	**Practical**
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction: Fluid power types, Systems, and their applications Desirable properties of hydraulic & Pneumatics .Selection of fluid, components of FPS.
2. Hydraulic Symbols: Circuit elements, fluid pumps and motors, Hydraulic valves, Types of controls, Reservoirs for fluids, miscellaneous units, composite symbols.
3. Fluid power Pumps: Classification, reciprocating, rotory, centrifugal, working principle, performance characteristics curves, selection .Design Considerations.
4. Fluid Reservoirs: Types function, setting Tank etc.
5. Pressure Accumulators: Types, selection & Design considerations.
6. Filters and strainers: Filter types circuits rating pressure drops in filters operation and maintenance.
7. Fluid Temperature control : Types of heat exchangers used for oil cooling .Design consideration for fluid temperature.
8. Control Valves : Pressure control valves, flow-control valves Directional Control valves.
9. Fluid Seals: Types, Materials for seals, seal lubrication.
10 Electrical Devices for hydraulic circuits: Solenoids, Torque motors, Safety consideration.
11. Fluid power Actuators: Linear actuators, gear motors, vane motors, piston motors, Hydraulic motor Performance.
12. Industrial hydraulic and pneumatic circuits.

REFERENCES:

1. Andrew Parr: Hydraulic and pneumatic, Jaico publishing House, 1994.
2. Peter Rohner: Industrial hydraulic Control Prentice Hall, 1987.
3. Pipepenger J.J.: Industrial hydraulics, Mc-Graw Hill Co. 1979.
4. Turn bull, B.L ; Fluid Power Engineering,Butterworth,1976.