

**SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)**

SEMESTER: SEVEN

7ME01 MACHINE DESIGN AND DRAWING – II

- Unit I :**
- a) Design of Shaft: Material, Design on the basis of strength considering shaft subjected to
 - Twisting moment only
 - Bending moment only
 - Combine twisting and bending moment
 - Design on the basis of rigidity.
 - b) **Design of Key** ó types, strength of key
 - c) **Design of Coupling** ó types, requirements of good couplings, design of sleeve coupling, clamp or compression coupling, rigid flange coupling, flexible flange coupling.
 - d) **Design of fly-wheel :** Puction, coefficients of fluctuation of speed and energy, energy stored in fly wheel, construction, stresses in fly wheel arms and rim, Design of fly wheel based on T-M diagram, fly wheel for Otto cycle engines and punching machines. (12 Hrs)
- Unit II:**
- a) **Antifriction Bearings :** Types of bearing, construction, designations, standard load ratings by AFBMA for static and dynamic loads, life of bearings, selection of bearings, lubrication, mounting and enclosure,
 - b) **Journal bearings :** lubrication of bearings, stable lubrication, Thick film lubrication, pressure distribution , minimum film thickness, relations of variables-viscosity, coefficient of friction, speed, pressure, length and diameter, bearing modules, viscosity-Temperature chart, sommerfeld number, selection of lubricant, design procedure and numericals.
 - c) **Design of belts :-**
Flat belts ó types, material and construction of belt, type of drives, slip, creep, Design of belt.
V-Belts- Construction and types, design of V Belts.
 - d) **Wire Rope-** Selection, Construction, classification, designations, stresses in wire rope, selection of wire rope for given loads.

Unit III :- Design of Gear Classification, law of gearing, forms and system of teeth, interference. beam strength of teeth, dynamic tooth load, wear tooth lead, tooth failure.

- a) Spur gear - Design of gear
- b) Helical gear ó Classification face width, formative teeth number, strength of gear Design of gear
- c) Bevel gear ó Classification, pitch angles, strength of gear, Design of gear
- d) Worm gear ó Types, efficiency of gear, Design of gear.

Unit IV: a) Design of I.C. Engine parts : Design of Cylinder, Piston, Piston rings, Piston pin, connecting rod and crank .

- b) Design and drawing of Governor (Parts and Assembly) Types of Governors, Design procedure and problems, Hartnell Governor (including design of Spring, spindle, lever and bails).

BOOKS RECOMMENDED:

TEXT BOOKS-

- 1) Machine Design fundamentals- Mechanical designer workbook, J.E. Shigley, published by McGraw Hill .
- 2) Machine Design, R.S.Khurmi and Gupta J.K. published by Eurasia Publishers- New Delhi.
- 3) Machine Drawing, N.D.Bhat, Charotar Publication

REFERENCE BOOKS:

- 1) Machine Design, Maleev and Hartman, published by C.B.S. Publication New Delhi.
- 2) Machine Component Design, William Orhwein, published by Jaico Publishing House- N.Delhi
- 3) Machine Elements in Mechanical M.F. Spotts
- 4) Machine Design, Black P.H. Published by McGraw Hill,
- 5) CAD CAM Concepts & applications, Chenna Kesava, PHI Publications
- 6) Design Data Book by- P.S.G. Koimbatore
- 7) Design Data Book by Mahadevan
(Use of any data book from the above will be permitted during the examination).

7ME02 ENERGY CONVERSION – II

SECTION – A

UNIT I: Reciprocating, Air Compressions :- Industrial uses of compressed air , Methods of compression and efficiencies of compression, Methods of reducing losses during compression

single and multistaging of compressions, clearance volume and its effect on work done and volumetric efficiency, condition for minimum work in two stage compression, intercooling and its effects, Overall, isothermal and adiabatic efficiencies, IHP, BHP, requirements and after cooler. (7 Hours)

UNIT II: Rotary Compressors :- Comparison between reciprocating and rotary compressors, difference between fans, blowers and compressors, general equations for rotary machines, Vane, Roots blower, construction, working and velocity diagrams of centrifugal and axial flow compressors, performance characteristics of blowers and compressors. (8 Hours)

UNIT III: Definitions, classifications of refrigeration systems : Air refrigeration, Bell-column cycle, reversed Carnot cycle, reversed Brayton cycle, vapour compression refrigeration, vapour absorption refrigeration based on solar and waste gear recovery. Analysis of simple saturated vapour compression cycle, representation on T-s, Ph diagrams, Problem on simple saturation cycle, Need for CFC free refrigerants.
Air conditioning :- Definitions, classification and applications. Psychrometric properties, psychrometric charts. (8 Hours)

SECTION – B

UNIT IV: Classification of gas turbines, construction and working Gas turbine ideal and actual cycles constant volume, constant pressure, (Open and Closed) cycle analysis, Inter cooling, Regeneration and reheating application, optimum and maximum pressure ratios, work ratios, Performance characteristics. Fields of application of gas turbine power plant, Introduction to Jet Propulsion, Ram jet, turbo jet. (No numerical treatment for Jet Propulsion). (8 Hours)

UNIT V: NUCLEAR POWER:- Fusion, fission, Chain reaction, conversion and breeding in nuclear fission, components of water, gas cooled, liquidized metal cooled thermal reactors.

UNIT VI: Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, basic requirements, Advantages, Disadvantages and applications. (7 Hours)

RECOMMENDED BOOKS:-

TEXT BOOKS:

1. Steam and gas turbines R, Yadav; Central Publication Allahabad.
2. Thermal Engineering, Domkundwar, Kothandarwar, Dhanpat Rai & Co.
3. Power Plant Engineering; R.K.Rajput; Laxmi publication

4. Solar Energy by S.P.Sukhatme; Tata McGraw-Hill in New Delhi

REFERENCE BOOKS:

1. Thermal engineering by Mahesh M.Rathore; Tata McGraw-Hill in New Delhi
2. Gas Turbines Theory- By Cohen and C.F.Rogers, P.H.I.H. Saravanamuttoo Heritage Publishers,
3. Gas Turbines and Rotary compressors, Khajuria and Dubey, Dhanpat Rai & Co.
4. Thermal Engineering : R.K.Rajput, Laxmi Publication.
5. Renewable Energy; Godfrey Boyle, Oxford University Press.

7ME03 INDUSTRIAL MANAGEMENT & COSTING

UNIT I: Concept, Principles and Techniques of Management; Evolution of management thoughts, functions of management, organization structure & relationship.

UNIT II: Marketing and Management : Marketing strategy market research, buying, motives, types of market, new product development, Product life cycle, Sales Organization, advertising, methods of selling, consumer behaviour.

- UNIT III:**
- a) Functions of personnel management, Human resource planning, Recruitment, training and development, workers participation in management, joint consultation, collective bargaining.
 - b) Materials management, classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material identification, store function.

SECTION - B

UNIT IV : Objectives, functions, principle factors of estimating and estimating procedure, Estimation of weights & materials, Estimation of machining time, estimation of fabrication cost, forging cost, foundry cost.

UNIT V: a) Introduction to costing and costing Techniques: Definitions, objectives, elements of costs, components of cost, job costing, simple process costing, normal and subnormal losses in process, waste, scrap. (8 Hours)

- UNIT VI:**
- a) Financing of business :- Basis of business finance, need of finance, Kinds of capital, sources of fixed & working capital.
 - b) Financial statements :- Profit and loss statement, balance sheet

- c) Depreciation Analysis :- Causes and significance, methods of calculation of depreciation. (7 Hrs)

TEXT BOOKS:

1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Management Accounting; Paresh Shah; Oxford University Press
3. Estimating and costing; TTTI Madras.

REFERENCE BOOKS:

1. Essentials of Management; Koontz, Harold; Mcgraw-Hill Education(India)
2. Cost Accounting; Jawahar Lal; Tata Mcgraw Hill Publishing
3. Cost Accounting by Bhar.

**7ME04 AUTOMATION ENGINEERING
SECTION - A**

UNIT I: Automation & Types, Automation for mass manufacturing and assembly, Automation of continuous processing systems, Detroit type automation, Automated flow lines. Methods of work part transport, transfer mechanisms, control function. General terminology and analysis of automated flow line, partial automation, assembly, systems and Line balancing.

UNIT II: NC/CNC :- Basic concept, N.C. controls- point to point, straight-cut and continuous path control, machine control units, closed system, NC machine components, tooling, CNC & DNCs, Manual part programming formats, programming languages, -APT, ADAPT, EXAPT etc. NC/CNC Programming- Various Programming codes, Manual part programming for drilling, Milling and turning operations, Examples of APT, Sensors and adaptive control in machining, Applications and economics of CNC. (12 Hrs.)

UNIT III: ROBOTICS :- Introduction to cybernetics, Evolution of industrial robots, Robots anatomy, Arm geometry, drive system and end efforts, sensors, Evolution of geometrical configurations for robots Programming techniques of Robots. Application of Robots in manufacturing, casting, welding, painting, m/c loading, handling, heat treatment, assembly, inspection, etc. Technical Specifications of a Robot, Robot economics. (9 Hrs)

SECTION - B

UNIT IV : GROUP TECHNOLOGY AND PROCESS PLANNING : Introduction-Part families, part classification and coding systems, Group technology machine cells, advantage of group technology

The planning function, retrieval type process planning system, Generative process planning systems Benefits of CAPP, Expert systems and expert system approach to CAPP. (09 Hrs)

UNIT V: FMS : Introduction, schematic of FMS, FMS cells, Components of FMS, Relation of Group Technology, with FMS, Planning, Simulation and analysis of FMS, Applications of FMS. Material handling : Automated storage and Retrieval system (ASRS), Automated Guided Vehicle (AGV) etc. (08 Hrs)

UNIT VI: Computer Integrated Manufacturing; Introduction, Sequence of functions in CIM, elements of CIM system, CIM Wheel, structure of CIM database system. Guidelines for CIM development, benefits of CIM shop floor control and process monitoring. Automated inspection and testing : Introduction to automated inspection, Advantages over traditional method. On-line & off-line inspection, CMM construction, types & working. (09 Hrs)

TEXT BOOKS:

1. Production system, Automation and CIM, Mikhal Groover, Pearson Publications.
2. CNC Machines; M. Adithan & B.S. Pabla; New Age International.

REFERENCE BOOKS:

1. Robotics; Yarem Koren, Mcgraw Hill.
2. Computer aided Manufacturing; P.N. Rao, N.K. Tiwari and T.K. Kundra; Tata Mcgraw Hill.
3. Machine Tool Design; N.K. Mehta, Tata Mcgraw Hill.
4. Computer Control of Manufacturing; Yarem Koren, Tata Mcgraw Hill.
5. CAD/CAM/CIM ; Radhakrishnan & Subramaniam; New age International.

PROFESSIONAL ELECTIVE – I

7ME05 (1) NON-CONVENTIONAL ENERGY SYSTEMS

SECTION – A

Unit I :- Introduction :- Renewable & Non-renewable resources. Solar Radiation- Solar Constant basic earth-sun angles spectrum distribution of extra terrestrial radiations and its variation, Solar time, Direction of beam radiation, computation of radiation inclined surfaces, solar charts, measurements of diffuse & global & direct radiations, duration of sunshine hours, computation of radiation data, Alteration of solar radiation by the atmosphere.

Unit II: Radiation transmission through covers :- Reflection and absorption of radiation, optical properties of cover systems in transmittance effects of surface layers on transmittance,

transmittance absorptance product. Solar Energy collections;- Heat transfer for solar energy utilization, flat plate collections such as liquid & air collector, collector overall heat transfer coefficient, temperature distribution between the tubes & the collector efficiency factor useful heat gain, heat removal and flow factor, Testing of collectors & effects of various parameters on the performance. Introduction to various systems of concentrating collectors

Unit III: Solar energy Utilisation :- Application of solar energy in heating, cooling, pumping, power production, distillation, drying, solar cookers, solar pond, solar furnaces, Solar Energy Storage:- Methods of storage such as sensible, latent heat & thermochemical storage, selection of method of storage, properties of storage materials and different arrangements of storages. (No alphabetical treatment)

SECTION - B

Unit IV: Energy from Ocean : Tidal Power :- Types of tidal plants such as single and two basin plants, power developed and operation of tidal power plant. Ocean thermal energy conversion system. Ocean temp. profile, OTE Power plant development, controlled flash evaporation, indirect vapour cycle, Salinity differences conversion of salinity gradient resources, osmotic pump, dytanic battery, etc.

Wind power :- Wind speed data, power in the wind, wind power development, types of wind mills, application for pumping and power generation. (8 Hours)

Unit V: Biomass Energy Resources; Mechanism of green plant photosynthesis, efficiency of conversion, solar energy plantation, Biogas- Types of Biogas plants, factors affecting production rates, Pyrolysis, Gasification Types & Classification of vegetable oils as a liquid fuel and their properties, esterification process, formation of Biodiesel, Biodiesel & its properties, suitable species for Biodiesel formation and its cultivation, byproduct formation during esterification, Biodiesel economics. (8 Hours)

Unit VI: Direct Energy Conversion :- Photo voltage cells: Principle, concept of energy conversion, conversion efficiency, power output and performance, storage, Fuel Cells : Principles types of fuel cells, conversion efficiency, Geothermal energy resources, power generation methods like vapour dominated, water dominated, flash steam, binary fluid and total flow concept of power generation. (7 Hours)

TEXT BOOKS :-

1. Solar Energy, S.P.Sukhatme, TMH
2. Non-Conventional Energy Sources, G.D.Rai, Khanna Publications

REFERENCE BOOKS :-

1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons
2. Renewable Energy Conversion, Transmission and Storage, Bent Siresen; Elsevier Publication
3. Renewable Energy; Godfrey Boyle, Oxford University Press, Mumbai.

7ME05

PROFESSIONAL ELECTIVE – I (2) TOOL ENGINEERING

SECTION – A

Unit I: Theory of metal cutting : Chip formation, shear angle, shear strain-velocity relations, undeformed chip thickness, Force relations, Merchant circle, energy consideration in metal cutting, Tool wear tool life, tool life criterion, machinability, tool materials, properties & types, Newly invented tool material and their types, cutting fluids. (08 Hours)

Unit II: Single point cutting tools-classification and nomenclature, various systems of nomenclature, single point cutting tool design, recommended speed, feed and tool angles determination, clamping arrangements and form tools. Twist drills & Reamers ó Geometry types, cutting forces, Numerical on Power & torque. (09 Hours)

Unit III: i) Broaches ó Geometric elements of broach teeth, classification of broaches, design of broaches, cutting forces.
ii) Milling cutters- Geometry elements of broach teeth, classification of broaches, design of broaches, cutting forces.
iii) Thread cutting tools:- Geometry of taps and dies.
iv) Gear cutting tools :- Geometry of gear shaper cutter, gear hobs. (09 Hours)

SECTION - B

Unit IV: Jigs & Fixtures : Design economics, principles of locations, types of locations, prevention of jamming, problems of chip & dust in location, use of dowel, Reducant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting, types of drill bushes, types of drill jigs & their designs, Turning, Milling, Grinding, Broaching and Assembly fixtures, Indexing devices in jigs & fixtures. (10 Hours)

Unit V: Press tools, Classification of presses, Theory of sheet metal cutting, clearance, cutting force calculations, Methods of reducing cutting forces, centre of pressure & its significance, classification of press working operations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing & bending forces, planning for cupping operation, stock layout. (09 Hours)

Unit VI: Design of press working tools, Types of die construction, function & nomenclature of die components Cutting Dies- Blanking & Punching, Forming Dies-Forming, Drawing and Bending etc. Design of Compound, Combination and progressive dies. Miscellaneous dies- Horn die, cam-action die, rubber & bulding die, sub-press die. (9 Hours)

TEXT BOOKS :

1. Fundamentals of Tool Design, -A.Kumar (Dhanpatrai & Sons)
2. A text book of Production Engineering -P.C.sharma (S.Chand Publication)

REFERENCE BOOKS :

1. Tool Design - Cyril Donaldson (Tata Mcgram Hill)
2. Jigs & Fixtures - P.H.Joshi (Tata Mcgram Hill)
3. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
4. Tool Design - ASTME (ASTME)
5. Fundamentals of Metal Cutting & M/c Tools - Juneja (Age Internatioal).

PROFESSINAL ELECTIVE -I

7ME05 (3)ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

SECTION – A

Unit-I: **Introduction to Artificial Intelligence (AI)** – Overview of AI, definition and importance of knowledge based systems, representation of knowledge, knowledge organization, knowledge manipulation, acquisition of knowledge. (6 Hours)

Unit II: Introduction to Expert Systems - Features of expert systems, knowledge engineering, basis expert system terminology, human experts and artificial experts, algorithmic and heuristic methods, difference between conventional programmes and expert systems, Architecture of expert systems. (8)

Unit III : Knowledge Representation ó Rule based methods, rule execution, forward chaining and backward chaning, knowledge representation using semantic nets, structure of semantic nets, Frame-based methods . (8 Hours)

SECTION – B

Unit IV : Expert system Tools – Types of tools for expert system building, system building aids, support facilities, debugging aids, I/O facilities, explanation facilities, knowledge base editors, stages in the development of expert system tools, procedure oriented methods, object-oriented methods, logic-based methods, access-oriented methods. (7)

Unit V : Building an expert system ó Development phased in expert system building, development constraints, reliability, maintainibility, examples of expert systems, difficulties in development of expert systems (7)

Unit VI: Fuzzy Engineering- Fuzzy logic, fuzzy expert systems, fuzzy sets, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, defuzzification, development of rules matrix, applications of fuzzy expert systems for design of industrial controllers,

RECOMMENDED BOOKS :

TEXT BOOKS :

1. A guide to Expert Systems by Donald a. Waterman, Pearson
2. INtroduction to Artificial intelligence & Expert Systems by Dan W.Peterson, PHI
3. Fuzzy Logic by John Yen, Reza Langari, Pearson

REFERENCE BOOKS :

- 1) Expert Systems ó Theory & Practice, By Ermine, Jean Louis, PHI
- 2) Expert systems in Engineering , By D.T.Pham. JFS Pub.
- 3) Expert system application by Sumit Vadera, Sigma press
- 4) Artificial Intelligence by Winston P.H., Pearson

7ME05

PROFESSIONAL ELECTIVE –I

(4) MECHATRONCS

SECTION - A

Unit I : Introduction to Mechatronics – Definition, Block diagram & Example, Basics of Sensors, Position & Speed Sensors, Proximity Sensors & Switches, LVDT, Digital optical encoder, Temperature Sensors Actuators-Functions, Electromagnetic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydraulic and pneumatic actuators, (6 Hrs.)

Unit II: Data Acquisition: Analog signal processing using operational amplifier- Introduction, types of amplifiers, sample and hold circuits, introduction to data acquisition, sampling theorem, Quantizing theory, Analog to digital conversion, Analog to digital convertor, Digital to analog conversion, Multiplexer. (6)

Unit III: Mechatronic Systems – control architecture Introduction, Control architecture, Analog circuits, digital circuits, Design of logic networks, sequential logic, flip-flops, application of flip-flops, micro-controllers, Programmable logic controller. (6 Hrs)

SECTION - B

Unit IV: Control Valves – Study of different control components and pneumatic & Hydraulic system- Construction, working and function of Directional control valve, Flow control valves, Pressure relief valve, pressure reducing valve, sequence valve with symbols.

Unit V : Pneumatic System – Design and analysis of pneumatic circuits, Synchronizing, Power chucking operations, controlling the rate of speed of piston, circuit to move with piece around a corner, circuit to move a work piece at a constant speed . (6 Hrs)

Unit VI : Hydraulic System – Design and analysis of Hydraulic systems- Sequencing, pneumohydraulic, regeneration circuit, circuit to control tool movement on lathes, grinders, etc.

TEXT BOOKS:

1. Introduction to Mechatronics and Measurement systems- 2/e by Aciatore and M.B.Histant, Tata Mcgraw Hill edition.
2. Pneumatics and Hydraulics by H.L.Stewart.

REFERENCE BOOKS:

- 1) Introduction to Mechatronics by Appus Kuttan K.K.- Oxford Univesity Press.
- 2) Mechatronics ó A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
- 3) Automation, Production systms and CIM by M.PGroover- Pearson Publication.

7ME06 PROJECT & SEMINAR

7ME07 MACHINE DESIGN AND DRAWING- II –LAB.

List of Exercises for Term Work :

- 1) Sheet 1 : Design of shaft
- 2) Sheet 2 : Design of coupling or any one type of gears.
- 3) Sheet 3 : Design of I.C. Engine Part (any one based on syllabus)
- 4) Sheet 4 : Preparation of detail drawing of simple machine assembly (Pedestal bearing, Plumer block, simple eccentric, stuffing box, Cross head, Tail stock, Tool post, C-clamp, Screw jack, Boiler safety valve ó Any1 of these)
- 5) Sheet 5 : Preparation of assembly drawing of simple machine assembly (Any 1 machine from Practical 4)

Note :- Any one from the above list should be done using Computer Programming/software.

7MEO8 ENERGY CONVERSION II –LAB.

List of Experiments :

Any six of the following :-

1. Trial on reciprocating compressor.
2. Trial on centrifugal blower.
3. Studies of domestic refrigerator.
4. COP calculation of vapour compression system.
5. Study of room air conditioner.
6. Study of gas turbine with the help of models.
7. Study of Pyrheliometer and measurement of direct radiation.
8. Study of testing of a flat plate controller
9. Study of Solar still and trial on it.
10. Study of a photovoltaic system.

Practical Examination shall consist of viva voce based on above term work.

7MEO9 AUTOMATION ENGINEERING – LAB.

PRACTICALS :-

At least six practicals will be based on the following topics.

1. Preparation of Manual part program for Point-to-Point control. Ex; Drilling Operation.
2. Preparation of Manual part program for two-axis CNC turning operation.
3. Study of working & Programming of XY plotter.
4. Programming Examples on APT.
5. Study of performance of Robots.
6. Simulation of CNC Machining.
7. Case study of CAPP.
8. Case study on GT.
9. Performance on NC and CNC m/c.
10. Study of computer aided quantity control (CAQC).

PRACTICAL EXAMINATION :-

Practical Examination shall consist of viva voce based on above term work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I (1)NON-CONVENTIONAL ENERGY SYSTEMS –LAB.

List of practicals :

Any six practicals will be based on the following topics :-

1. Study of Pyrheliometer and measurement of direct radiation.
2. Study of pyranometer and measurement of global and diffuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.

5. Study of various concentrating collectors..
6. Study of a solar absorption of refrigerating system.
7. Study of a solar dryer.
8. Study of wind mill and trial on it.
9. Study of a bio-gas plant.
10. Study of sterling cycle engine and a trial on it.
11. Study of a Solar Still and trial on it.
12. Study of a gasifier and trial on it.
13. Study of a Photovoltaic system & trial on it.

Practical Examination :

Practical Examination shall consist of viva voce based on the term ówork and syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I
TOOL ENGINEERING – LAB.**

TERM WORK : ANY EIGHT OF THE FOLLOWING .

1. Design & drawing of single point cutting tool.
2. Design & drawing of form tools.
3. Design & drawing of drill.
4. Design & drawing of broach.
5. Design & drawing of milling cutter.
6. Study of geometry of reamer.
7. Study of gear cutting tools.
8. Measurement of forces in Orthogonal cutting by Dynamometer.
9. Study of Geometry of taps and dies.
10. Design & Drawing of press tools.
11. Design & drawing of jigs.
12. Design & drawing of fixtures.

Practical Examination :

Practical Examination shall consist of viva voce based on the term ówork and syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I
(1) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS - LAB**

Practical : The students are expected to perform five practicals based on the above syllabus.

**7ME10 PROFESSIONAL ELECTIVE – I
(2) MECHATRONICS – LAB.**

PRACTICALS : At least six practicals will be based on the above syllabus.

Practical Examination :

Practical Examination shall consist of viva voce based on the term ówork and syllabus.

SEMESTER: EIGHTH

**8ME01 PROFESSIONAL ELECTIVE – II
(1) AUTOMOBILE ENGINEERING**

SECTION – A

Unit I :- Classification of automobiles, chassis types, Power Unit- Functions and locations power for propulsion, engine mounting, engine parts- types, construction and functions, Multiple cylinder engines, General considerations of engine balancing, firing order.. (7 Hrs)

Unit II : Fuel feed systems - fuel feed systems for petrol engines. Fuel pumps, fuel filters, Air filters, Basic principles of MPFI and CRDI. Multipoint fuel injection Systems (MPFI) Common Rail Diesel Injection Systems (CRDI) Controlling system : purpose, types of cooling systems, liquid cooling system-water jacket ports, water pump and radiators, by pass retractor system, temperature indicator, antifreeze, mixtures, troubles and remedies of cooling system.

Unit III: The electrical system, Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive, over running clutch, solenoid switch and shift, Ignition system;- Battery coil ignition system, Ignition timing and its effect on engine performance, Ignition advance mechanisms, Electronic Ignition system.

SECTION – B

Unit IV : Transmission system : Layout, types of clutches, single plate friction clutch and multiple clutch, clutch adjustments, clutch troubles and remedies, Gear Boxes :- Sliding mesh, constant mesh and synchromesh gear box, function of over drive, trouble shooting and remedies, torque convertor, automatic transmission, Propeller shaft, hotchkiss drive, torque tube drive, differential. (8 Hrs)

Unit V: Braking system:- Mechanical, hydraulic brakes, power brakes, and vacuum brakes Fault finding and maintenance of brakes, Steering system :- Function, types of linkages. steering gears, steering gear ratio, wheel balancing, wheel alignment castor, king pin inclination, toe-in & toe-out & their effect, introduction to power steering.

Unit VI : Suspensions:- Rigid axle and independent suspension system, shock absorbers. Auto lubrication :- Types of lubrication, their tests and ratings, multi-viscosity oils, chassis lubrication, Engine lubrication :- types of lubricating system, full premier system, dry sump system, oil pump, oil filters system- by pass system, full

flow system, oil breather, crankcase ventimeter, Engine lubrication troubles and remedies.

TEXT BOOKS :

1. Automobile Engineering- Vol.I & II, Kirpal Singh, Standard Publishers Distributors
2. Automobile Engineering ó R.K.Rajput; Laxmi publications, New Delhi.

REFERENCE BOOKS :

1. Automotive Mechanics; Crouse & Anglin, TMH.
2. Automotive Mechanics ; J Heitner; East West Press
3. Automotive Mechanics ; S.Srinivisan; TMH.

8ME01 PROFESSIONAL ELECTIVE –II (2) PRODUCTION PLANNING AND CONTROL

SECTION –A

Unit I :- INTRODUCTION

Objectives and Advantages of PPC, Production procedure, functions of PPC, production consumptions cycle, centralised & decentralised PPC, Pre-requisite of PPC.

Unit II :- PRODUCTION FORECASTING :-

Introduction, definition and importance of forecasts, Qualitative model: Delphi techniques, Quantitative models :- Simple moving average, weighted moving average, simple experimental smoothing.

Forecasting error and selection of forecasting model. Types of forecaste: Constant,linear cycle forecaster,Verification and conrolling, The moving range chart, Average MR, out of control conditions.

UNIT III: PRODUCTION PLANNING :- The production order, Procedure for formulating Production order, masier Program, Basic problems in production planning, Quantities in batch production, criteria for batch, size determination, minimum cost batch size, production range, Maximum profit Batch size, Maximum return, Rate of return, Economic Batch size.

SECTION – B

Unit IV : MACHINE OUTPUT :

Machine output, multi machine supervision by one operator, Machine interforcence, Ashcroft lalbles, average number of consecutive servicing task, the Ashcraft Number.

Unit V: ANALYTICAL STRUCTURE OF INVENTORY :- Definition of inventory, Types of inventory and the classification, structure of inventory problems and its analysis, the relevent cost, objectives of carrying inventories, selective inventory analysis. Static Model :- General characteristic, incremental analysis, opportunity cost, cost of risk, decision criteria under uncertainty.

Unit VI: A) DYNAMIC MODEL :- CERTAINTY CASE ;- General characteristic, optimum lot size model win constant demand, quantity discounts.

Risk Case :- General characteritics, P-system and Q-system.

B) Material Requirment planning (MRP) :- Introduction to MRP, Manufacturing Resource Planning (MRP-IT), just in time (JIT), comparasion of MRP, MRP-II, Enterprenureship Resource Planning (ERP) (8 Hrs.)

TEXT BOOKS :

1. Elements of Production Planning and Control by Simuel Eilon ó Universal Publishing Corporation ltd.Mumbai
2. Production Control ó John E.Biegal- Prentice Hall of India.
3. Inventory control, Theory & Practice- Start & Miller

REFERENCE BOOKS :

1. Production Planning and control and Management:- K.C.Jain & L.N.Agrawal.
2. Production & Operation Mgmt.:- E.E.Adam, Jr.R.J.Ether, Prentics Hall of India.
3. Industrial Engineering and Production Management- M.Mahajan-Dhanpat Rai.

8ME01 PROFESSIONAL ELECTIVE –II (3) MANAGEMENT INFORMATION SYSTEM

SECTION -A

Unit I : Basis of MIS :

What is a system, what is information and data, necessity of prompt, accurate & relevent information for effective decision making, decision tables, Types of information, organisational structure and types of information within them, Fact gathering techniques. (8 Hrs.)

Unit II : System of Anaylsis & Design :

Phases of system development procedure, project request form system proposal, cost/benefit analysis functional specifications, detailed system descriptio, system acceptance criteria, audit and control requirments, structured system development, data flow diagram, context analysis diagram, exploding a process,

structured analysis, structured design, structure charts, coding schemes, input form design, system protection . (8 Hrs.)

Unit III : A) Development of MIS

Long Range plans of MIS, Class of Information, information requirement, implementation of MIS, Management of Quality in the MIS, Organisation for the development of MIS, Factors of success & failure of MIS.

B) Choice of Information Technology :

Nature of IT decision, Strategic decision, Configuration decision, Evaluation, IT implementation plan. (8 Hrs.)

SECTION – B

Unit IV : Introduction of MIS :

Priliminaries of Information System Technology Data base Management System : Concepets, Models, design, Performance monitoring & Turning, Security in the database environment MIS & RDBMS. DBMS Software ORACLE (8 Hrs)

Unit V : a) Decision Support Systems (DSS) :

Concept & Philosophy AI, Knowledge based expert system, MIS & Role of DSS.

b) Enterprise Management System (EMS) :

Introduction to ERP, basic feature, benefits, selection and implementation EMS & MIS.

c) Business preoces Re-inenginerig (BPR) ; Introduction, Business process, Processl Models of Organisation and value stream model of organization, MIS& BPR. (8 Hrs)

Unit VI ; Application of MIS

A) Application in Manufacturing Sector:- Personal Management, Materials Management, Marketing Management.

B) Application in Service Sector like Hospitals, Airlines, Hotels, Banks, Insurance. (8 Hrs)

TEXT BOOKS :

- 1) Management Information System - W.S.Jawadekar (TMH, 2010)
- 2) Information Systems for operation & Mgmt.-Voichdan, Homer.
- 3) Management Information Systems - Ross.

8ME01

PROFESSIONAL ELECTIVE – II

(4) ADVANCED MANUFACTURING SYSTEMS

SECTION – A

Unit I: Total Quality Management(TQM) : Understanding quality, commitment & ledership Customer satisfaction involment

Performance measures- Case Study IMplementation of TQm Case Study (10)

Unit II : Total Productive Maintanance (TPM) Introduction outline of TPM Concepts of öKobetsu-Kaizenö, öJishu-Hozenö Planned Maintenance Systems Operation & Maintenance skill upgrade training initial control, öHIInshitu-Hozenö concept. (10)

Unit III : Business Process Re-Engineering (BPR) : Introduction, Reengg.Rethinking The new world of work who will Re-Engineer? Succeeding at Re-Engg.-case study. (10)

SECTION – B

Unit IV : Value Engineering (VE) Introduction Value Orientation The various phases of VE like orientation phase INformation phase, function phase etc.How to manage the VE progrmme case study (10)

Unit V : Concurrent Engineering (CE) Introduction to CE & need of CE CE tools ADvances in design & manufacturing Engineering Design for manufacture, design for assembly Rapid phototyping Concurent approaches in design, manufacturing and aspects of engg.

Unit VI : Just in Time (JIT) Introduction to JIT What is Toyota Production Systems Design, Development & Management of JIT Manufacturing systems, Implementation of JIT.

BOOKS RECOMMENDED:

TEXT BOOKS :

- 1) Besterfield D.H. etal öTotal Quality Management,ö PHI New Jersey , 1995.
- 2) Johan S.Okland,öTQMö: Text with Cases, Butterworth einemamn, Oxford, 1995.
- 3) öTPM edited notesö by Japan Institute of Plant Management.
- 4) Michel Hammer & Jones Champy, öRe-Engineering the Corporation, Nicholas Brealey, London, 1994.
- 5) G.Joganathan, öGetting MOre at Less Cost : The Value Engineering Wayö, Tata Mcgraw Hill, 1992.

REFERENCE BOOKS:

- 1) Andrew Kausik, :Concurrent Engineering : Automation, Tools & Techniquesö, John Willey & Sons.
- 2) Chanan S. Syan & Unny Menon, öConcurrent Engineering: Concept, Implementation & Practice, Champman & Hall.
- 3) M.G.Korgaonkar, öJust in Time Manufacturingö, Macmillan India Ltd. New Delhi, 1992.

PROFESSIONAL ELECTIVE – III
(1) REFRIGERATION & AIR CONDITIONING

SECTION – A

- Unit I:** Introduction to automotive air conditioning- Vapour compression system:- Analysis of simple vapour compression system. Use of pressure enthalpy. Temperature entropy charts. Effect of operating conditions such as evaporation and condensation pressure, superheating and sub cooling Actual vapour compression system, Refrigerants :- classification: primary & secondary refrigerants, desirable properties of refrigerants; merits & demerits of commonly used refrigerants such as Ammonia R-12, R-22 and their selections and eco friendly refrigeration 134 a, HFC.
- Unit II:** Multi stage pressure systems;- multistage compression: choice of intermediate pressure, complete multi-stage compressions. Multi evaporator systems; single compression individual expansion valve, single compression multi expansion valve, individual compressor multi expansion valves, cascade systems, its applications to cryogenics Air liquefaction processes- Linde-Hampson (No numerical treatment to air liquefaction system)
(10 Hours)
- Unit III :** Refrigeration systems components & controls:- brief study of refrigerants compressor, condensers, evaporators, expansion valves, drier, fillers, selection criteria for the components of vapours compression systems Flow controls, temperature controls, pressure controls and safety devices. Defrosting systems, testing & charging of refrigeration systems, leak detection. (No analytical treatment is expected)
(8 Hours)

SECTION – B

- Unit IV :** Psychrometric properties of moist air psychrometric chart, concept of thermodynamic wet bulb temperature, representations of Psychrometric process on Psychrometric charts, mixing of air, evaporating cooling, air washers. Human comfort:- metabolism of human body, factors influencing comfort, concept of effective temperature, optimum effective temperature & comfort charts.
(7 Hours)
- Unit V :** Classification of air conditioning systems & applications. Unitary system package, window type & split type air conditioning. Central system:-System components, types:- direct expansion system, all water system & all air system. Water, summers & year

round air conditioning. Transmission & distribution. Types of supply air ducts, consideration for selection & location of outlet, distribution parameters of outlet, location of return air opening & introduction to duct design.
(No numerical treatment is expected) (9 Hours)

- Unit VI:** Load calculation & applied Psychrometry-basic consideration at heat gains/losses sensible & latent , heat due to occupancy lighting, appliances, products, process, air conditioning systems, safety factor cooling load estimates, heating load estimates. Sensible heat factor by pass factor, apparatus dew point, effective sensible heat factor (8 Hours)

BOOKS RECOMMENDED :

TEXT BOOKS :

1. Refrigeration & air conditioning; C.P.Arora; Tata Mcgraw Hill Publication.
2. Refrigeration & air conditioning; Arora, Domkundwar; Dhanpat Rai Publication.

REFERENCE BOOKS:

1. Principles of Refrigeration; J.Dossat; Pearson Education, Asia publication
2. Refrigeration & air conditioning- P.L.Balaney
3. Refrigeration & air conditioning- Manohar Prasad.

PROFESSIONAL ELECTIVE – III
(2) MACHINE TOOL DESIGN

SECTION – A

- Unit I :** General requirement of machine tool design kinematics of m/c tool :- Various driving systems used in machine tools, basic design consideration in the design of variable speed range in the machine tools, layout of speed in geometric, logarithmic & earthmatic progression saw diagrams, range ratio, graphical representation of speed on structural and ray diagrams, design of speed & feed boxes and their classification. (8 Hours)
- Unit II :** a) Mechanical, electrical, Hydraulic stepless regulation of speeds.\
b) Machine tool structure (bed, column, cross-rail) functions & their requirements design criteria for machine tool structure design procedure factors effecting stiffness for machine tool structure & their profile. (8 Hours)
- Unit III :** Static & dynamic rigidity, methods of increasing rigidity of structure, machine tool classic system, procedure for assessing dynamic stability, dynamic characteristics, single degree &

multidegree of freedom systems, Experimental determination of dynamic characteristics of m/c tool, dynamic characteristics of cutting process, stability analysis, single degree, multidegree (8 Hrs)

SECTION – B

Unit IV: Vibrations of machine tools :- Effects vibration on m/c tool on cutting conditions, workpiece, Sources of vibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization.

Shock absorber, isolated tool holder, chatter in milling lathe, grinding, reduction of chatter in design & production stages. (8 Hrs)

Unit V : a) Machine tool guideways & slideways :- Functions, shapes of guideway, materials, methods of adjusting clearance in guideways, design of slideways for wear resistance, determination of maximum and average pressure, on slide way, Hydraulic guideway, antifriction guideway, protecting devices for slideway. (8 Hrs)

Unit VI: machine tool spindle and bearings :- Functions, requirement, types and materials of spindle, machine tool compliance, design of spindle, antifriction bearing, performance indices, Hydrostatic journal bearing, hydrodynamic bearing. (8 Hrs)

BOOKS RECOMMENDED:

TEXT BOOKS:

1. Principles of Machine Tools ó Base & Pal
2. M/c Tool Design ó N.K.Mishra.

REFERENCE BOOKS:

1. Machine Tool Design Vol. I,II,III,IV, N. Acherkar (Mir Pub.)
2. Principles of Machine Tools ó Sen & Bhattacharya
3. Design Principles of Metal ó Kondsberger Cutting Machine Tools
4. Machine Tool Design Vol. I to VI ó CMIT, Bangalore.

8ME02

PROFESSIONAL ELECTIVE-III (3) FINITE ELEMENT METHOD

SECTION - A

Unit I: Introduction : Application, Advantages, Steps of FEM, Stress and Equilibrium, Boundary conditions, Strain Displacement Relations, Stress-strain Relations, Von mises stress, Temperature effect, Potential Energy & Equilibrium, Galerkin's Method, stiffness (Displacement) Method. (7 Hrs)

Unit II: Matrix Algebra & Gaussian Elimination : Matrix Multiplication, Transposition, Diagonal Matrix, Symmetric Matrix, Upper Triangular Matrix, Determinant of Matrix, Matrix Inversion Eigen values & Eigenvectors, Gaussian elimination. (7 Hrs)

Unit III: ID Problems : Finite Element modeling, coordinate Shape function, The potential Energy approach, The Galerkin's Approach, assemblies of the global stiffness matrix and load vectors, Properties of stiffness Matrix, Treatment of boundary conditions, quadratic Shape Functions, Temperature Effects. (7 Hrs)

SECTION – B

Unit IV : 2D Problems for CST : Constant strain triangle, isoperimetric Representation , potential Energy approach, element stiffness, Galerkin's approach, temperature effects, problem modeling and boundary conditions. (7 Hrs)

Unit V: Development of equations: Truss equations, derivation of the stiffness, matrix for a bar element in local coordinate, global stiffness matrix, beam equation. Beam stiffness, example assemblage of beam stiffness matrix, plain stress & plain strain, derivation of the CST stiffness matrix and equations Treatment of body and surface forces. (7 Hrs)

Unit VI: Heat Transfer : Derivation of the basic differential equations, Heat transfer with conduction, radiation, ID Formulation using variational method.

Fluid Flow : Derivation of the basic differential equations, Id Finite Element formulation, Computer Implementation (preprocessing, post processing, input data file, mesh generation)

BOOKS RECOMMENDED:

TEXT BOOKS:

1. Introduction to Finite Element Engineering ó T.R.Chandrupatla, Belegunda; PHI
2. A First course in Finite Element Method- Darya Logon, Thompson Learning (TL Publisher)

REFERENCE BOOKS:

1. The Finite Element Method in Engineering- S.S.Rao, Elsevier Pub., 4th Edition.
2. Fundamentals of Finite Element Method analysis ó D.V.Huttan, Tata Mcgraw Hill

3. Concept & Applications of Finite Element Analysis ó Robert D.Cook
4. Finite & Boundary Element Method in Engineering ó O.P.Gupta
5. An Introduction to Finite Element Method- J.N.Reddy, Tata Mcgraw Hill, 2nd Edition, 2005.

8ME02 PROFESSIONAL ELECTIVE - III

(4) ROBOTICS

SECTION – A

- Unit I: Fundamentals of Robotics-** Introduction, Automation & Robotics-robot applications robotic systems, robot anatomy and robot configurations, Joint types used in robots, robot wrists, joint notation schemes, work value for various robot anatomies, robot Specifications. (8 Hrs.)
- Unit II: Robots end-effectors-**classification of end-effectors, mechanical grippers, hooking or Lifting grippers, grippers for molten metals, plastics, vacuum cups,magnetic grippers Electrostatic grippers, multiple grippers, internal & external grippers, drive systems for grippers, active & passive grippers. (7 Hrs.)
- Unit III: Robot drives & control-**pneumatic power drives, hydraulic systems, electric drives, robot controllers-servo and non servo systems, motion control of robots, point to point and continuous path control, teaching of robots, robot programming methods. (7 Hrs.)

SECTION – B

- Unit IV : Robot Sensors :** Scheme of robotic sensors, contact type sensors, force, torque, touch, position, velocity sensors, non-contact type sensors, electro-optical imaging sensors, proximity sensors, range imaging sensors, robot environment and robot input/output interfaces, machine intelligence, safety measures in robots. (7 Hrs.)
- Unit V : Robot Kinematics-** Forward & reverse kinematics, forward and reverse transformation of two DOF & three DOF 2-D manipulator, homogeneous transformations.
- Unit VI : Quantitative Techniques for economic performance of robots-** Robot investment coats, robot operating expenses. methods of economic evaluation, method of pay-back period, return on investment method, discounted cash flow method. (7 Hrs.)

RECOMMENDED BOOKS:

TEXT BOOKS:

- 1) Robotics Technology & Flexible Automation by S.RDeb, Tata Mcgraw Hill.

- 2) Industrial Robotics by M.P.Groover, McGraw Hill.

REFERENCE BOOKS:

1. Robotics for Engineering, Korean Yoram, McGraw Hill.
2. Robots & Manufacturing automation by Asfahal, C.Ray, John Wiley.
3. Robotic Engineering by Richard D.Klafter, PHI.

8ME03

I. C. ENGINES

SECTION – A

- UNIT I: Introduction to IC Engines and cycle analysis:** Basic of I.C. Engines , Details of two stroke and four stroke engines, Air standard cycles, Fuel air cycle and actual cycle. Variation in specific heat, Dissociation and their effect on engine performance. Review of other losses in IC engines. (7 Hrs)
- UNIT II: Fuels and alternative fuels :** Conventional fuels for IC engines, requirement, properties, fuel additive, limitations of fossil fuels. Review of various alternative/non-conventional fuels . Studies of fuel injection systems : Fuel pump and their working, different types of fuel feed systems, studies of injectors nozzles, Bosch type fuel pump. (8 Hrs)
- UNIT III: Combustion SI Engine:-** Stages of combustion, factors influencing various stages, Normal and abnormal combustion, Detonation, Factors responsible for detonation. Effect of detonation. Octane rating of fuel, Requirement of combustion chambers for SI engines, important types, relative advantages and disadvantages and application. (8 Hrs.)

SECTION - B

- UNIT IV: Combustion in CI. Engines:-** Stages of combustion in CI Engines, Delay period, factor affecting delay period, diesel knock, cetane rating, Requirements of combustion chamber for CI Engines. Methods of generating turbulence in combustion chamber. Types of combustion chambers for CI Engines. (8 Hours)
- UNIT V: Performance testing of IC Engines:** Evaluation of various performance parameters of IC Engines including heat balance, sheet and excess air calculation. Methods of determination of friction power. Supercharging : Basic principles, objectives, arrangements for super charging, advantages and limitations of super charging (8 Hours)
- UNIT VI: Emission from IC Engines :** review, their effect on human health, cause of formation and approaches to control this pollutants. Study of BIS, EURO emission norms, IC Engines: Recent trends: Microprocessor based engines, management multi-point fuel

injection engines, common rail direct injections engines, variable valve timing engines. (8 Hours)

TEXT BOOKS:

1. Internal combustion Engines - M.L.Mathur & Sharma Dhanpatrai & Sons.
2. Internal combustion Engines ó V.Ganeshan, Tata Mcgraw Hills.

REFERENCE BOOKS:

1. Internal combustion Engines Fundaments- John B. Heywood, Mcgraw Hills
2. Internal combustion Engines & Air Pollution- Obert E.F.Intext Educational.

8ME04 OPERATION RESEARCH TECHNIQUES

SECTION –A

UNIT I: Operations Research : Introduction, characteristics, Phases, Limitations, Models and classification of O.R.Models.

Linear Programming : Formulation, Standard Form, Graphical and simplex methods, Primal-Dual relationship. (8 Hrs)

UNIT II: Transportation Models : Introduction, LP Formulation of transportation problems, Methods for finding initial solution, MODI method.

Assignment Models : Introduction, Mathematical statement and solution methods of assignm. Problems, variations of assignment Problems. (6 Hrs)

UNIT III: Network Models : Network construction, PERT analysis, CPM analysis, cost analysis & Crashing the network, Updating resources smoothing and leveling. (6 Hrs)

SECTION-B

UNIT IV: Waiting line models : Introduction, characteristics, classification, analysis of M/M/1 and M/M/s models.

Sequencing : processing of n jobs through two machines, n jobs through m machines, two jobs through m machines. (7 Hrs)

UNIT V: Replacement models : introduction, value of money, individual and group replacement policies.

Simulation : introduction, Monte Carlo simulation, advantages and limitations, applications of simulation to queuing models, inventory models, maintenance models , etc. (7 Hrs)

UNIT VI: Dynamic programming: introduction, characteristics, applications of dynamic programming to capital budgeting, production

scheduling, travelling sales men, cargo loading problems, etc. (6 Hrs)

RECOMMENDED BOOKS:

TEXT BOOKS:

1. Operations Research and Theory applications- II ed.J.K.Sharma; Macmilan Business Books
2. Operations Research; Prem kumar Gupta, D.S.Hira; S.Chand & Co. Ltd.

REFERENCE BOOKS:

1. Inroduction to Research Operation, 7th Edition; Hiller/Lieberman; Tata Macgraw Hills.
2. Operations Research : An Introduction, 7th Edition, H.A.Taha; PHI.
3. Operations Research: Principles and practices; 2nd Edition, Ravindran, Philips, Solberg, John Willey & Sons.
4. Operations Research: Kapoor .

8 ME05 PROJECT & SEMINAR

8ME06 PROFESSIONAL ELECTIVE-III

(1) REFRIGERATION & AIR CONDITIONING -LAB.

List of Practicals :-

Any six of the following should be conducted and a report there of should be submitted

1. Trial on Vapour compression system.
2. Trial on Air-conditioning system.
3. Study of Electrolux system.
4. Study of Water cooler.
5. Study of window Air conditioner.
6. Study of household refrigerator.
7. Study of desert cooler.
8. Study of cold storage plant.
9. Testing and changing of refrigeration system.
10. Study of defrosting system.
11. Study/trial of ice plant.
12. Study of various refrigeration and air-conditioning controls.

Practical Examination:

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE-III

(2) MACHINE TOOL DESIGN -LAB.

PRACTICALS :-

- (1) Design of speed box.
- (2) Design of feed box.
- (3) Design of combination guide way.

- (4) Design of combination guide way.
- (5) Acceptance lists
- (6) Pneumatic trainer
- (7) Hydraulic Trainer.
- (8) Design of Laths bed

Note :- At least 6 practicals from above list should be done.

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

**8ME06 PROFESSIONAL ELECTIVE-III
(3) FINITE ELEMENT METHOD-LAB.**

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

**8ME06 PROFESSIONAL ELECTIVE-III
(4) ROBOTICS – LAB.**

PRACTICAL : The students are expected to perform 5 practicals based on the above syllabus

8ME07 I. C. ENGINES- LAB.

List of Experiments :

Any six of the following practical should be performed and

1. Performance test on a single cylinder diesel engine.
2. Performance test on a single cylinder petrol engine.
3. Evaluation of the heat balance for single cylinder diesel engine.
4. Performance test on a multi-cylinder petrol engine.
5. Mors test on multi-cylinder petrol engine.
6. Trial on petrol/ diesel engine to plot p-0 and p-V diagram.
7. Measurement of exhaust gas emission from S.I engine
8. Measurement of smoke density of CI engine exhaust.
9. Study of Bosch type single plunger fuel pump.
10. Study of various types of fuel injectors and nosels.

It shall consist of viva-voce based on term work and syllabus.

8ME08 OPERATION RESEARCH TECHNIQUES - LAB.

List of Practicals:-

At least 6 practical from above list should be done.

1. Formulation of LPP from real life situation.
2. Solution of LPP by using MS Excel.
3. Case study of transportation problems.
4. Case study of assignment problems
5. Case study on project network.
6. Case study on sequencing problems
7. Constructing and solving the simulation model from real life situations
8. Study of Replacement model through different problems.
9. Case study on dynamic programming problems.

External Practical Examination ó Viva voce on the term work and syllabus.

**SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRONICS & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)**

SEMESTER : SEVENTH

7 EP01/7EL01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:

Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:

State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ó Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ó SISO Systems.

Unit III : State Space Techniques II:

Concept - controllability and observability; SISO/MIMO Linear systems -Gilbert's method and Kalman's test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:

Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ó open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Jury's Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :

Non-linear system behavior ó types and characteristics; Describing functions - typical non-linearity and their