Mechanical Engineering **Semester III**

DME 301 STRENGTH OF MATERIALS

3L-1T-0P-3.5C **MM 100**

MODULE I:

Stress & strain: Tension, compression, shearing stress & strain; Poisson's ratio: Stress-strain relationship, Hooke's law,

Bending Moment and Shear Force: Concept of a beam, and supports (Hinged, Roller and Fixed). Types of Beams: Simply supported, cantilever, fixed, overhang and continuous beams. Types of loads (distributed and point). Concept of bending moment and shear force. Sign conventions. Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed and concentrated loads.

MODULE II:

Bending and Shear Stresses: Assumptions of theory of simple bending. Derivation of the equation– M/I=F/Y=E/R. Concept of centroid and second moment of area, Radius of Gyration, Theorems of parallel and perpendicular axes, Second Moment of Area for Sections, rectangle, triangle, circle, trapezium, angle, tee, I, Channel and compound sections. Moment of resistance, section modulus. Concept of Shear stress in beams, shear stress distribution in rectangular, T and I section.

MODULE III:

Combined Direct and Bending Stresses and Strain Energy: Concentric and eccentric loads, eccentricity, effect of eccentric load on section, middle third rule, stresses due to eccentric loads. Examples in the case of short columns, chimneys and dams.Meaning of strain energy and resilience.Derivation of formula for resilience of a uniform bar in tension and Theory of Failure.

MODULE IV:

Columns and Struts: Definition of a long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse load, End conditions of column. Application of Euler's and Rankine's formula (no derivation), simple numerical problems based on Euler's and Rankine's formulae.

MODULE V:

TORSION: Definition of torque and angle of twist. Derivation of the torsion equation.Polar moment of inertia.Strength of hollow and solid shaft, advantage of a hollow shaft over a solid shaft. Comparison of weights of solid and hollow shafts for the same strength, power transmitted. Calculation of shaft diameter for a given power.

Text/ Reference Books:

1. **Rajput RK**, *Strength of Materials*, Chand& Co. Ltd., Delhi.
2. **Kapoor J.K.**, *Strength of Materials*, Asian Publication, Muzaffarnagar.
3. **Punmia B.C.**, *Strength of Materials*, Laxmi Publication, Delhi.
4. **Ramamutham S.**, *Strength of Materials*, DhanpatRai and Sons, Delhi.

Mechanical Engineering **Semester III**

DME 310 ENGINEERING MATERIALS & MATERIAL SCIENCE

3L-0T-0P-3C **MM 100**

Module I: STRUCTURE OF METALS AND THEIR DEFORMATION: - Structure of metals and its relations to their physical, Mechanical and technological properties, Elementary idea of arrangement of atoms in metals, Molecular structures, Crystal structures and crystal imperfections, Deformation of metals, Effects of cold and hot working operations over them, Recovery, Recrystallization and grain growth.

Module II: FERROUS METALS: Classification of iron and steel, Sources of iron ores and places of availability,Outline of manufacturing of pigs iron, wrought iron, cast iron and steel (Flow diagrams only), Cast iron: types as per I.S. – White, malleable, grey mottled, modular and alloys, properties and common uses, Classification of steels according to the carbon content and according to use as per I.S., Mechanical properties of various steels and their uses.

Module III: NON- FERROUS MATERIALS: Important ores and their metals content, Outline of manufacturing methods, Trade names, Properties (Physical/Mechanical/Electrical)and use of the following metals: Aluminum, Zinc, Copper, Tin, Silver and Lead.

Important properties and use of the following alloys

Aluminum Alloys: Aluminum-Copper alloy, Al, Zn alloy, Aluminum-Silica Alloy-Al-Ni-Alloy, Duralumin-derived alloys.**Copper Alloys:** Brass, Bronze, Gun metal, Phosphor Bronze, Aluminum Bronze, Ni Bronze, Nickel Silver: Nickel-Copper Alloy (Monel metal), Inconel, Nickel, Silver**Bearing Metals**: Lead base alloys, Tin base alloys. (White metals or babbit metals) Copper base alloys.

MODULE IV: HEAT TREATMENT OF METAL:- Elementary concept, purpose, Iron-carbon equilibrium diagram T.T.T. or 'S' curve in steels and its significance, micro structure, micro structure of steels and martensitic transformation (elementary idea). Hardening, Tempering, Annealing, Normalizing and case hardening. Ageing, Various temperature ranges for different metals and alloy (From heat treatment hand book).

MODULE V: NON-METAL MATERIALS: Timber: Conversion of timber: Its meaning, Necessity, Seasoning of timber, Preservation of timber, Types of preservation, Methods of application, Defects in timber, Surface treatment soaking treatment, Hot and cold treatment, Common Indian timber specific uses, Properties identification,

TEXT/REFERENCE BOOKS:

1. HajraChoudhary S.K., Materials Science & Processes, Indian Book Distributing Company, Kolkata.
2. Bhatnagar S.K., Material & Materials Science, navbharatPrakashan, Meerut.
3. Gupta K.M., Book of Material Science.
4. Kashyap K.T., Material Science for Engineers, I.K. International Publishing House Pvt. Ltd., New Delhi.
5. Purohit R.K., materials Science & processes, Standard Publishers Distributors, Delhi.

Mechanical Engineering **Semester III**

DME303 THERMAL ENGINEERING

3L-1T-0P-3.5C **MM 100**

MODULE I

FUNDAMENTAL OF THERMODYNAMICS: Definitions, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, and thermodynamics definition of work. Zeroth law of thermodynamics. First law of thermodynamics for cyclic and non-cyclic processes.Idea of internal energy and enthalpy.

MODULE II

THERMODYNAMIC PROCESSES: Thermodynamic processes- constant volume, constant pressure, constant temperature (Isothermal) processes, adiabatic Process polytrophic process, their representation on P-V diagram and calculation of work done. Application of the first law of these process. Second law of thermodynamic Concept of perpetual motion machine of first order and that of second order Concept of heat engine, heat pump and refrigerator. Carnot cycle efficiency for heat engine and cop for refrigerator and heat pump

MODULE III

PROPERTIES OF STEAM: Idea of steam generation beginning from heating of water at 0°C to its complete formation into saturated steam. Pressure temperature curve for steam.Idea of dry saturated steam, wet steam and its dryness fraction, super-heated steam and its degree of super heat.Enthalpy, entropy, specific volume and saturation pressure and temperature of steam. Use of steam table and mollier chart.

MODULE IV

STEAM GENERATORS: Types of steam generators - Low pressure and High pressure boilers, Modern high pressure high discharge boiler – Stirling boiler, Lamont, Loefflor, Benson, Velox, ramsin and Schmidi-Hartmann boiler, Computer controlled accessories, Equivalent evaporation, Boiler performance efficiency.

MODULE V

STEAM TURBINE: Classification, details of turbine, working principle of impulse and reaction turbine, compounding methods of steam turbine, efficiency bleeding ,concept of steam nozzles, governing of turbine.

Text/ Reference Books:

1. Bhat Nagar S.k , thermal engineering, Nav Bharat Prakashan, Meerut
2. BallaneyP.l , Thermal , Khanna Publishers, Delhi
3. Rajput R.K., Thermal Engineering, Laxmi Publications, new delhi.

Mechanical Engineering **Semester III**

ENG 108 TECHNICAL COMMUNICATION

2L-0T-0P-2C **MM 100**

MODULE I

FUNCTIONAL GRAMMER-Active, passive, conditional sentences, Syntax, Concord, common errors .**PRACTICAL (oral) -** To make students practice the above mentioned grammatical Rules in the practical Classes

MODULE II

Communication: Meaning & importance of communication, Process of communication, Language as a tool of communication. **Practical (Oral)**: To make students speak on their understanding of communication in English.

MODULE III

Writing Skills: Reporting events, writing newspaper reports, Bio-data making, Writing of C.V & resumes, writing job application .**Practical (Oral) -**To make students practice writing on the above mentioned processes

MODULE IV

Listening skills: The listening process, hearing & listening, types of listening, barriers to listening. **Practical (Oral)-** To make students develop skills of listening & thus improve their speaking skills.

MODULE V

Project writing for sponsoring agencies .Research paper and data sheet preparation and communication for publication .Preparing analysis report

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Recommended Books:

1. Raman Meenakshi& Sharma sangeeta , technical communication, ONP,N.DELHI
2. Wren & Martin: high school English grammer.S.chand& co.

Note- This syllabus has been designed to improve the oral and written communications skills of students.

Mechanical Engineering **Semester III**

DME305 MECHANICAL ENGINEERING DRAWING

0L-0T-4P-2C **MM 100**

DETAILED CONTENTS

General concept of manufacturing drawing

Views and sections (full and half), dimensioning, Technique – Unidirectional and aligned practice conventions as per latest code of practice for general engineering drawing. General concept of IS working drawing symbols for Welding & reverting (ii) Screw & Screw threads (iii) Surface Finish Marks (iv) Limits, Fits and Tolerances

FAMILIARIZATION WITH AUTOCAD COMMANDS

a. What is CAD, Different type of CAD software available, Advantages of using CAD, AutoCAD graphical user interface?
b. Setting up drawing, environment: Setting Modules, Drawing Limits, Snap, Opening and saving a drawing, Setting drafting properties, Different co-ordinates system used.
c. Commands and their aliases, Different methods to start a command.
d. Selecting object, removing object from selection set editing with grips, editing properties.
e. Use of draw command- line, arc, circle, polygon, polyline, rectangle, ellipse, construction line or spline
f. Use of modify commands – erase, offset, move, copy, mirror, fillet, chamfer, array, scale, stretch, rotate, explode, lengthen
g. Creating 2D object using draw and modify commands, use of hatch commands
h. Controlling the drawing display, zoom, pan view ports, aerial view
i. Drawing with precision: adjustment snap and grid alignment
j. Use of tools menu bar for calculating distance, angle, area, ID points, Mass using inquiry, command, Quick select
k. Adding text to drawing, creating dimension
l. Use of UCS, alignment of UCS , move UCS, orthographic UCS
m. Creating 3D objects using region, boundary, 3D polyline
n. Extrude, revolve feature
o. Use of solid #d edit features, shell, imprint, separate, section, Boolean functions like Union, subtract and intersect, extrude faces, Move faces, delete face, offset faces, copy faces and colour faces commands
p. To show the section – use of slice, section commands
q. Rendering and imaging, produce hard copies

Sectioned View of

a. Foundation bolts
b. Pipe joints – Flanged, Socket, Hydraulic joint and union joint

Assembly Drawing of

a. Knuckle joint – part drawing , solid modeling , assembly and sectioning
b. Protective type flange coupling – part drawing, solid modeling, assembly and sectioning
c. Bench vice – part drawing, solid modeling, assemble and sectioning

Assemble drawing from detail and vice versa

a. Tail stock of lathe machine
b. Screw jack
c. Drilling jig

Spur gear profile drawing from given data free hand sketching of

a. Pipe fitting – such as elbow, reducers, T cross and Bibcock
b. IC Engine piston, simple bearing, cotter and knuckle joint, pulleys and flywheel – sectioned view
c. Cutting tools of lathe machine, shaper and common milling cutters
d. Gear puller and C clamp
e. Sketching of orthographic views from isometric views be practiced

Text Books:

1. Sharma SC, Machine Drawing, Standard Publishers Distributers
2. Jone K. C., MACHINE DRAWING, PHI Learning Pvt. Ltd.
3. Bhatt N. D., Machine Drawing, Charotar Publishing House Pvt. Ltd., AnandGujrat.

Mechanical Engineering **Semester III**

DME 306 MECHANICAL ENGINEERING WORKSHOP

0L-0T-4P-2C **MM 100**

1. To study lathe machine construction and various parts including attachments, lathe tool cutting speed, feed and depth of cut.
2. One turning job on lathe containing the operations like plain turning, step turning, Knurling, Chamfering.
3. To prepare a job on shaper machine calculate quick return ratio.
4. Two welding job having two different joints.
5. One simple job on TIG welding setup or visit to TIG welding setup and write report.
6. One simple job on MIG welding setup or visit to MIG welding setup and write report.
7. Drilling two holes of size 5 mm and 12 mm diameter on job used.
8. To prepare a T-Lap joint using carpentry shop.
9. Making of one simple wooden pattern.
10. Preparation of small cot conduit pipe frame by electric arc welding / gas welding.
11. To prepare a Job-Productionof a utility job involving all the operations and different types of elbow T-Union,Socket, stopstock, taps etc.
12. To prepare a Job- Drillingpractice on soft metals (Aluminium, Brass and lead)Care and maintenance of measuring tools like calipers, steel rule, try square, verniermicrometer,height gauge , combination set , reading gauge, Handling measuring instruments, checking of zeroerror, finding of least count.

Mechanical Engineering **Semester III**

DME 307 STRENGTH OF MATERIALS LAB

0L-0T-4P-2C **MM 100**

List of experiments:

1. To study the universal testing machine and perform thetensile test
2. Double shear test on Mild steel rods.
3. Double shear test on Aluminium strip.
4. Torsion test on mild steel rod.
5. To study the impact testing machine and perform the impact Test(Izod test)
6. To study the impact testing machine and perform theimpact Tests(Charpy test)
7. Hardness test on metals - Brinnell Hardness Number.
8. Hardness test on metals - Rockwell Hardness Number.
9. Hardness test on metals –Vickers Hardness Number.
10. Deflection test on beams.
11. Compression test on helical springs.
12. Tension test on helical springs.
13. To study the universal testing machine and perform the Bending test
14. To study the universal testing machine and perform the Compression test.
15. Fatigue testing.

Mechanical Engineering **Semester III**

DME 311 ENGINEERING MATERIALS & MATERIAL SCIENCE LAB

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0L-0T-2P-1C **MM 100**

1. Study of diamond polishing apparatus.
2. Study of metallurgical microscope.
3. To prepare specimen for:
   i) To prepare specimens for examination (for polishing and etching).
   ii) To examine the microstructure of the above specimens under metallurgical microscope.
4. Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.
   i) Cast iron
   ii) Low carbon steel
5. To perform heat treatment process on metals of known carbon percentage:
   a) Annealing
   b) Normalizing
   c) Quenching
6. Mini projects :
   a) Collect samples of heat insulating materials.
   b) Collect samples of various steels and cast iron.
   c) Collect samples of non-ferrous alloys.
   d) Collect samples of non-metallic engineering materials.

Mechanical Engineering **Semester III**

DME 309 THERMAL ENGINEERING LAB

0L-0T-4P-2C **MM 100**

All experiments are compulsory to perform

1. Determine the temperature by
   a. Thermo couple
   b. Pyrometer
2. Study of working of four stroke petrol engine and four stroke diesel engine.
3. Study of working of two stroke petrol and two stroke diesel engine.
4. Study of fuel supply and lubrication system in IC Engine.
5. Determination of B.H.P for diesel engine by dynamometer.
6. Determination of dryness faction of wet steam sample.
7. Study of working and constructional detail of boilers.
8. Study of mounting and accessories on a boiler.
9. To perform constant speed load test on a single cylinder diesel engine & to plot performance curves.
10. To prepare heat balance sheet for 4-stroke 4-cylinder diesel engine.
11. Mohr's test on a multi-cylinder petrol/diesel engine.
12. Study of battery ignition system of multi cylinder petrol engine.
13. Assembly and disassembly of four stroke petrol engine.
14. Study of steam turbines.
15. Study of valve time diagram of diesel engine.
16. Study of two stage air-compressor.

Mechanical Engineering **Semester III**

ENG 112 : ADVANCE SOFT SKILL

0L+0T+2P- 1C **MM100**

MODULE: 1- What is Personality? Personality Traits & Grooming

MODULE: 2 - Importance of Attire, Table Manners

MODULE: 3- General Etiquettes- (a) Talking to Elders/ Younger ones/ Peer/ Stranger

(b) Treating Gender Discrimination

MODULE: 4- Behaviourology- With Parents/ Relations/ Neighbors

MODULE: 5 - Use of Language - (a) Spoken- At phone/ General Conversation

(b) Written- E- mails/ other electronic media

Text/Reference Books:

1. Business communication Design, Angell, Pamela, Mcgraw-Hill, New York.
2. Grammar Finder, Eastwood, John, Oxford university press.
3. Effective technical communication, Mitra, K. Barun, Oxford university press.
4. Communicate to conquer: A handbook of group discussion and interviews, PHI learning, New Delhi.

Mechanical Engineering **Semester IV**

DME 401 PRODUCTION TECHNOLOGY-I

3L-0T-0P-3C **MM 100**

Module I

GENERAL FORMING PROCESS: Classification and elementary idea of metal forming process – Rolling, Extrusion, forging, drawing, pressing, punching, blanking

MODULE 2

WELDING: Definition, Weldability, Various welding process – Electric arc welding, Resistance welding, Metal Inert gas welding (MIG), Tungsten Inert gas welding (TIG), Atomic hydrogen arc welding, Laser Beam, Electron beam welding, Explosion welding, Ultrasonic welding

MODULE 3

WELDING OF SPECIAL MATERIAL: Welding of gray cast iron, Shielded metal arc gas welding procedure, Welding of aluminum- argon arc and gas welding procedure, Welding of copper, brass and bronze, Gas shielded metallic arc welding; welding of alloy steels, stainless steel by oxy acetylene process, MIG & TIG

MODULE 4

TESTING OF THE WELDS AND RELEVANT WELDING CODES – Destructive methods, Non-destructive methods-Methods of visual, X –ray, Gamma Ray, Magnetic Particles, Flaw detection, fluorescent, Dye penetrate and Ultrasonic Testing

MODULE 5

COST ESTIMATION OF WELDING: Material cost, Fabrication cost, Preparation cost, Welding cost and finishing cost, Overhead cost, Cumulative effect of poor practices on cost, Calculation of cost of welding gas consumption and welding electrodes.

TEXT/REFERENCE BOOKS:

1. Sharma and Bhatnagar, Manufacturing process II, Nab Bharat Prakahan, Meerut
2. M.M.Rao, Manufacturing Technology, Language Book Society
3. Sinha and Goel, Foundry Technology, Standard Publisher, Delhi
4. Hitomi, Manufacturing System Engineering, Standard Publisher, Delhi
5. A.H.Rizvi, Manufacturing Technology, Kataria Sons

Mechanical Engineering **Semester IV**

DME 402 INDUSTRIAL ENGINEERING

3L-1T-0P-3.5C **MM 100**

Module-I: PRODUCTION AND PRODUCTIVITY: Production, Production functions, Productivity, Factors affecting productivity, Measurement of productivity, Causes of decrease in productivity, Difference between product and productivity.

PLANT LOCATION AND LAYOUT: Plant location, Factors affecting plant locations, Concept of plant layout, Types of layout and their characteristics, Factors affecting plant layout, Work station design, Factors considered while designing a work station .**MATERIAL HANDLING:** Introduction, Need and objective of material handling, Factors considered while selecting a material handling device, Safety concept of material handling equipment's.

Module II: WORK STUDY: Definition and scope of work study, Area of application of work study in industry, Role of work study in improving productivity, Work measurement objectives, Need and method of Work Measurement .**METHOD STUDY:** Objectives, Needs and methods of method study, Information Collection, Recording techniques, Process Symbols, Charts and diagrams, Critical examination, Development, Installation and maintenance of improved methods.

Module III: TIME STUDY: Time study, various allowances, Calculation of time, Work sampling, standard data and its use, Application of engineered time standards and work sampling, Ergonomics- concept and advantages.

JOB EVALUATION AND INCENTIVES: Introduction, Objectives, Need of job evaluation, Job definition, Data source, Job evaluation methods such as ranking method, Grade description method, Point system and factory comparison method, Hybrid system.

Module IV: PRODUCTION PLANNING AND CONTROL: Introduction, Objective and components (Functions) of P.P.C., Advantage of production planning and production control, Stages of P.P.C., Process planning, Routing, Scheduling, Dispatching and follow up, Routing purpose, Route sheets, Machine loading chart, Gantt chart, Drawing of simple networks and critical time calculation, Production control in job order.

Module V: ESTIMATION AND COSTING: Introduction, Purpose/functions of estimating, Costing concept, Ladder and elements of cost, Difference between estimation and costing, Overheads and their types, Estimation of material cost, Estimation of cost for machining processes, Numerical problems.

TEXT/REFERENCE BOOKS:

1. Industrial Engineering, O.P.Khanna ,DhanpatRai and Sons , New Delhi.
2. Industrial Engineering, S.C. Sharma ,Khanna Publisher.
3. Industrial Engineering and Management, T.R. Banga.
4. Elements of Work Study, Suresh Dalela.
5. Production management, Jain and Agrawal.

Mechanical Engineering **Semester IV**

DCS 402 COMPUTER PROGRAMMING USING C

2L+1T+0P+2.5C **MM: 100**

Module I:

Elements of C: character set, key words, Data types, Constants and Variables, Operators: unary, binary, ternary, Operator precedence, flowcharts. Control statement- if statement, if-else statement, conditional operator, switch control statement, for loop, while loop, do-while loop, the break and continue keyword.

Module II:

Array Introduction: Basic concepts, Memory representation, one dimensional array, Two dimensional array, Three dimensional array.

Module III:

Functions- Basic Concepts, Declaration and prototypes, Calling, Arguments, and Scope rules, recursion, Storage classes types, Library of functions: math, string, system.

Module IV:

Pointers- Basic concepts, operators, Pointer expression: assignment, arithmetic, comparison, Dynamic memory allocation, Pointer v/s Arrays, Array of pointers, Pointer v/s Functions.

Module V:

Structure- Basic concepts, Declaration and memory map, Elements of structures, Structure v/s array, Structure v/s function, Union, Enumerated data types: typedef, enum, Self –referential structures, Low level Bitwise Operators.

Text/Reference Books:

1.Let us C, Yashwant Kanetkar, BPB

2.Programming with C, Schaum's Series, TMH

3.C Programming, E.Balaguru Swami, MH

Mechanical Engineering **Semester IV**

DME 404 THEORY OF MACHINES

3L-1T-0P-3.5C **MM 100**

Module I

MECHANISM AND MACHINES: Definition, Types of constrained motion, Link, Kinematic pair, type of joints, Degree of freedom, Classification of kinematic pairs, Linkage, mechanisms and structures, The four bar chain, Mechanical advantage, Transmission angle, Slider crank chain, double slider crank chain, Space mechanisms.

KINEMATIC ANALYSIS: Inversion of mechanisms: four bar chain, Slider crank and double slider crank, Velocity analysis of four bar chain, Instantaneous centre method and Kennedy theorem.

Module II

CAMS AND CAM FOLLOWER MECHANISMS: Cams, Purpose of using cams, Types of cams and cam follower mechanisms, Nomenclature, Motion of the follower, Displacement, velocity and acceleration diagrams for follower in: Uniform velocity, Simple harmonic motion, Uniform acceleration and retardation.

Module III

GEARS AND GEAR DRIVES: Introduction to power transmission, Classification of gears and advantage over other modes of power transmission like Belt, chain etc. Law of gearing, Forms of teeth, Involute and cycloidal teeth, Effect of altering centre difference between gears, Length of path of contact, length of arc of contact (No derivation), Interference and undercutting.

GEAR TRAINS: Simple, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic gear trains, Sun and planet gear trains

Module IV

BRAKES AND DYNAMOMETERS: Introduction, Materials for brake lining, types of brakes, Single block or shoe brake, Simple band brake, Differential band brake, Band and block brakes, Internal expanding brake, Dynamometer, Types of dynamometers, Classification of absorption dynamometer, Rope brake dynamometer, Prony brake dynamometer.

Module V

CLUTCHES: Introduction, types of clutches, Materials for clutch, Friction clutches, Single plate clutch, multi-plate clutch, Cone clutch, Analysis of single plate clutch on basis of : uniform pressure theory, uniform wear theory, Dog clutch, Magnetic clutches.

TEXT/REFERENCE BOOKS:

1. Khurmi R.S., theory of machines, Eurasia Publishing Company
2. Sadhu Singh, Theory of Machines, Pearson Education India
3.Ballaney P.L., Theory of Machines and Mechanisms, Khanna Publishers
4. Rattan, S.S., Theory of Machines, Tata McGraw-Hill Education.

Mechanical Engineering **Semester IV**

DME 405 HEAT TRANSFER

3L-1T-0P-3.5C **MM 100**

Module I:

INTRODUCTION TO HEAT TRANSFER PROCESSES: Conduction and radiation, Fourier's law of heat conduction ,thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity, Newton's law of cooling, general parameters influence the value of heat transfer coefficient.

CONDUCTION: General 3-Dimensoinal conduction equation in Cartesian, cylindrical and spherical coordinates different kinds of boundary conditions, nature of differential equations, and one dimensional heat conduction with and without heat generation, critical thickness of insulation.

Module II:

HEAT TRANSFER FROM FINNED SURFACES: fin efficiency and effectiveness, two dimensional steady state heatconduction using analytical and numerical methods (FORMULA ONLY), periodic heat conduction.

CONVECTION: Review of Navier–Stokes and energy equation, hydrodynamic and thermal boundary layers,laminar boundary layer equations, forced convection appropriate non dimensional members, effect of prandtl number,.

Module III:

NATURAL CONVECTION: Dimensional analysis, grashoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations.

HEATTRANSFER WITH CHANGE OF PHASE: Nature of vaporization phenomena, different regimes of boiling heat transfer, correlations for saturated liquid vaporization, condensation on flat plates, correlation of experimental results, drop wise condensation.

Module IV:

HEAT EXCHANGER: Different types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger, effectiveness of heat exchanger, N.T.U. method(FORMULA ONLY), fouling factor, constructional and manufacturing aspects of Heat Exchangers.

Module V:

THERMAL RADIATION: Plank distribution law, Kirchhoff's law, radiation properties, diffuse radiations, Lambert's law, radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies, shapefactor, electrical analogy,

Text/Reference Books:

1. Heat Transfer, Holman J.P., Tata McGraw-Hill, New Delhi**.**
2. Heat and Mass Transfer, Cengel, Tata McGraw-Hill, New Delhi.
3. Heat and Mass Transfer, Kumar D.S., Kataria and Sons.
4. Heat Transfer, Sharma and Lal, Vardhan Publisher Jaipur.
5. Heat and Mass Transfer, Nag P.K., Tata McGraw-Hill, New Delhi

Mechanical Engineering **Semester IV**

DME 406 PRODUCTION TECHNOLOGY LAB - I

0L-0T-4P-2C **MM 100**

ADVANCE WELDING SHOP:

Steady of various gas welding and welding equipments: Welding transformer, Generator/rectifier, Gas cylinder etc; various electrodes and filler metals and fluxes. Practice of welding and cutting of different metals by making suitable jobs by different method

(1) Arc Welding practice of mild steel and Spot welding on Aluminum jobs.
(2) TIG welding practice of non-ferrous metals, like Copper, Brass and Aluminum.
(3) Practice of gas cutting manually.
(4) Practice of gas cutting by cutting machine.
(5) Practice of arc cutting.
(6) Study of welding defects.
(7) Inspection and test of welded joints by destructive method.
(8) Practice of spot welding.
(9) Practice of welding pipe joints, pipes and pressure vessel.
(10) Prepare a V – Butt Joint using Arc Welding Process.
(11) Prepare a Lap Joint using Arc Welding Process.
(12) To prepare a lap Joint on the given work pieces using spot welding equipment.
(13) To Design and Manufacture a Wooden Pattern for any given Casting.

Mechanical Engineering **Semester IV**

DME 407 HEAT TRANSFER LAB

0L-0T-4P-2C **MM 100**

Experiments to be Performed

1. To Determine Thermal Conductivity of Insulating Powders.
2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal Conductivity of Liquid.
4. To determine the transfer Rate and Temperature Distribution for a Pin Fin.
5. To Measure the Emissivity of the Test plate Surface.
6. To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8. Determination of Heat Transfer Coefficient in Drop Wise and Film Wise condensation.
9. To Determine Critical Heat Flux in Saturated Pool Boiling.
10. To Study Performance of Simple Heat Pipes.
11. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12. To Find the Heat transfer Coefficient in Forced Convection in a tube.
13. To determine the total thermal conductivity and thermal resistance of the given Compound resistance in series.
14. To find out the thermal conductivity of given slab material.
15. To determine the individual thermal conductivity of different lagging in a lagged pipe.

Mechanical Engineering **Semester IV**

DME 408 THEORY OF MACHINE LAB

0L-0T-4P-2C **MM 100**

1. Study of 4- bar chain mechanism for simple kinematic analysis (calculation of velocity and acceleration of each link).
2. Study of slider crank mechanism and find its mechanical advantage for given link lengths.
3. Study of motion of follower for Simple harmonic motion and uniform acceleration and declaration.
4. Verification of effect of variation of center distance for involute gears on velocity ratio.
5. Study of planetary gear and calculation of speed ratio for it.
6. Study of rope breaks dynamometer.
7. Study of single plate and multi-plate cutch.
8. Study of various types of brakes.
9. Governor Apparatus.
10. Motorised Gyroscope Apparatus.
11. Journal Bearing Apparatus.
12. Static & Dynamic Balancing Apparatus.

Mechanical Engineering **Semester IV**

DCS 406 COMPUTER PROGRAMMING USING C LAB

0L-0T-4P-2C **MM 100**

Objective: To understand the basic concepts of C Programming. It includes all necessary concepts of C programming language like arithmetic operations, looping, conditional statements and other aspects related to Basic programming.

1. WAP in C to calculate factorial of a number by using function.
2. WAP in C to swap two numbers by using function.
3. WAP in C to read and display array elements.
4. WAP in C to read an array and display the sum of its elements.
5. WAP in C to add two 3x3 matrixes.
6. WAP in C to multiply 3x3 matrixes.
7. WAP in C to calculate the length of a given string.
8. WAP in C to read information about 10 books and display them.
9. WAP in C to read a file and display its contents.

Mechanical Engineering **Semester IV**

MGT 110: GENERAL APTITUDE

0L-0T-2P+1.0C **MM 100**

MODULE I

LEVEL 1:- Number System:-Number Series, HCF and LCM of Numbers, Fractions and Decimals, Square Root and Cube Roots, Indices and Surds, Simplification and Approximation,

MODULE II

LEVEL-2 Problems on Ages and Numbers Percentage, Profit, Loss and Discount, Average, Ratio and Proportion, Time, Work and Wages, Pipes and Cisterns, Simple Interest, Compound Interest,

MODULE III

LEVEL-3 Growth and Depreciation, Time and Distance, Trains, Boats and Streams, Races, Clocks, Calendar

MODULE IV

LEVEL-4: Area of Plane Figures, Volume and Surface Area of Solid Figures Elementary Algebra, Linear Equations, Quadratic Equations and In-equation, Progression,

MODULE V

LEVEL-5: Permutation and Combination, Probability, Geometry, Trigonometry, Data Interpretation, Data Sufficiency

Text/Reference Books:

1. R. S. Agarwal- Aptitude Mathematics
2. Mathuria- Quicker Mathematics

Mechanical Engineering **Semester V**

DME 501 POWER PLANT ENGINEERING

3L-0T-0P-3.0C **MM 100**

Module I

LAYOUT OF POWER PLANTS: Schematics of various power plant systems – steam, hydel, Gas turbine, Combined Cycle, Fuel cell, Cogeneration, Solar, Wind mill, Comparisons, Selection.

Module II

STEAM & NUCLEAR PLANTS : Steam generators including FBC, cycle analyses, subsystems of thermal analyses power plants, coal gasification technologies, Types of Nuclear Reactor plants – Indian Scenario, Environmental aspects of thermal and nuclear plants, Development trends.

Module III

HYDEL & OTHER POWER PLANTS : Essential elements of hydel power plants, selection of turbines, microhydel plant developments, pumped storage plants, Wind mill developments, specialitiesof fuel cell power plants – PAFC, MCFC, SOFC and PEM systems, Hybrid power plants, advanced piston engine and gas turbine power plants, geothermal power plants.

Module IV

INSTRUMENTATION & CONTROLS : Modern Control system of power plants, instrumentation for vital parameters like temperature, pressure, flow of steam, gas, water, flue gas etc.,flue/exhaust gas analyses, automatic controls.

Module V

ECONOMICS, RENOVATION & MODERNIZATION OF POWER PLANTS : Load duration curves, costing of electrical energy, tariff types, load sharing economics, Renovation and modernization of aged power plants, Development pathways for power plants ,national and global scenario.

Text/Reference Books:

1. Power Plant Engineering, P.K. Nag, Tata McGraw – Hill Publishing Company Ltd., Third Edition, 2007.
2. Standard Handbook of Powerplant Engineering, Thomas C. Elliott, Kao Chen and Robert
3. Swanekamp, McGraw – Hill, 1998, Second Edition.
4. Power Plant Engineering, Frederick T. Morse, Affiliated East-West-Press Private Ltd., New Delhi 1953.

Mechanical Engineering **Semester V**

DME 502 REFRIGERATION & AIR-CONDITIONING

3L-1T-0P-3.5C **MM 100**

Module I

INTRODUCTION: Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration Heat pump, reversed Carnot cycle.

VAPOUR COMPRESSION REFRIGERATION SYSTEM: Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram, Effect of operating conditions, liquid vapour heat exchangers, Actual refrigeration cycle.

MULTIPLE EVAPORATOR & COMPRESSOR SYSTEM: Application, air compressor system, Individual compressor, compound compression, cascade system, application, air compressor systems, individual compressor, compound compression, cascade system.

Module II

GAS CYCLE REFRIGERATION: Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative heat exchanger, Air cycle for air craft, Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.

Module III

VAPOUR ABSORPTION SYSTEM: Simple Vapor absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System.

REFRIGERANTS: Classification, Nomenclature, selection of refrigerants, global warming potential of CFC Refrigerants, Refrigeration Equipments - Compressor, condenser, evaporator, expansion devices – types and working.

Module IV

PSYCHOMETRIC: Psychrometric properties, psychometric relations, pyschrometric charts, psychrometric processes, cooling coils, By-pass factor and air washers.

HUMAN COMFORT: Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.

Module V

COOLING LOAD CALCULATIONS: Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, air conditioning system.

Text/Reference Books:

1. Refrigeration and Air Conditioning, Stoecker W.F**.,** McGraw Hill Publication.
2. Modern Refrigeration and Air Conditioning, Andrew D. Althouse, GoodHeart-Willcox Co.
3. Refrigeration and Air Conditioning, Arora C.P., Tata McGraw Hill New Delhi.
4. Refrigeration and Air Conditioning, Jorden and Priester, Prentice Hall of India.
5. Refrigeration and Air Conditioning, Ballaney R.C., Khanna Publication.
6. Refrigeration and Air Conditioning, Jain V.K., Tata McGraw Hill New Delhi.

Mechanical Engineering **Semester V**

DME 514 HYDRAULICS

3L-0T-0P-3.0C **MM 100**

MODULE I

Properties of Fluids: Real fluid, ideal fluid, Fluid Mechanics, Hydraulics, Hydrostatics, Hydro-Kinematics, Mass density, specific weight, specific gravity, cohesion, adhesion, viscosity, surface-tension, capillarity, vapour pressure and compressibility.

MODULE II:

Measurement of Pressure: Pressure, intensity of pressure, pressure head, Pascal's law and its applications, Atmospheric pressure, gauge pressure, vacuum pressure, absolute pressure, Measurement of pressure by manometer and pressure gauges, Use of simple manometer, differential manometer and mechanical gauges.

Hydrostatic Pressure: Total pressure, resultant pressure, and center of pressure, Total pressure and centre of pressure on vertical and inclined plane surface, rectangular, triangular and circular.

MODULE III:

Fundamentals of fluid flow: Types of flow, steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Discharge and continuity equations (flow equation), types of Hydraulic Energy .Potential energy, Kinetic energy, Pressure Energy, Bernoulli's Theorem statement and description, without proof of theorems).Venturimeter (Horizontal and Inclined).

MODULE IV

Orifice: Definition of Orifice and types of orifice, hydraulic coefficients, large vertical orifice. Free, drowned and partially drowned orifice. Time of emptying a rectangular/circular tank with flat bottom. **Flow through Pipes:** Definition, Laminar Turbulent flow explained through Reynolds's experiment. Reynolds's number, critical velocity and velocity distribution. Head loss in pipelines due to friction. Sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (no derivation of formula).Hydraulic Gradient line and Total Energy line.

MODULE V

HYDRAULIC MACHINES: Reciprocating pumps, Centrifugal pumps, Impulse turbines, Reaction turbines, Sketching and description of of principle of working of the above mentioned machines.

Text/ Reference Books:

1. *Fluid Mechanics and Hydraulic Machines*, Laxmi Publication (P) Ltd., New Delhi.
2. V**ijay Gupta and Gupta S.K.**, *Fluid Mechanics*, New Age International Publishers, New Delhi.
3. **Kapoor J.K.**, *Hydraulics*, Bharat BhartiPrakashan, Meerut.
4. **Likhi S.K.**, *Hydraulics Laboratory Maunal*, New Age International Publishers, New Delhi.
5. **Garde R.J.**, *Fluid Mechanics*, New Age International Publishers, New Delhi.
6. **JagdishLal**, *Hydraulics and Hydraulic Machines*, Metropolitan Book Depot, Delhi.
7. **Modi P.N.**, *Fluid Mechanics*, New Age International Publishers, New Delhi.

Mechanical Engineering **Semester V**

DME 504 PRODUCTION TECHNOLOGY-II

3L-1T-0P-3.5C **MM 100**

Module I

PRODUCTION MACHINE TOOLS: Machine tools used for quantity production, Semi-automatic, automatic lathe, Auto lathes- single spindle automatics, Sliding head type, Multi-spindle automatic, Ultra high speed machining.

Mechanical copying systems.Hydraulic servo copying systems for lathe, Electric copying systems, special purpose machines- brake drum turning lathe.

Module II

UNCONVENTIONAL MACHINING PROCESSES- Mechanical Process- Abrasive jet machining, fundamental principles, basic mechanisms of material removal, Application & process. Ultrasonic machining: principle, application and uses.

Elector chemical machining: Fundamental, Principles, Basic mechanism of metal removal, Laser beam machining: Fundamental, Principles, Basic mechanism of metal removal, Plasma arc machining: Fundamental, Principles, Basic mechanism of metal removal.

Module III

PRODUCTION OF PLASTICS- Polymers, Thermo plastics, Molding of thermo plastic. Extrusion process, Sheet forming process, Machining of thermo plastics, Thermo setting plastics, Molding of thermosetting plastics, Machining of thermosetting plastics, Other processing methods for plastics, Plastic components design, Mould design.

Module IV

CUTTING TOOLS FOR MACHINING: Elementary theory of metal cutting, Single point tools-basic angles, Chip formation, Basic mechanism of chip formation, Effect of manipulating factors such as velocity, Size of cut ,Effect of tool geometry, Specific power consumption, Tool wear and tool life, Tailor's tool life equation, Properties of tool materials.

Module V

PRESS TOOLS: Elements of press tools, Factors affecting press tool design, Shearing, Bending and drawing operation, Combination, Progressive and compound die, Rubber die formation.

MODERN CONCEPT OF QUALITY CONTROL- Do it right at first time, Just in time (JIT) and zero defect production.

TEXT/REFERENCE BOOKS:

1. ChoudharyHajraS.K ,Elements of workshop technology vol-1 Media promoters and publishers pvt. Ltd.
2. Pandey&Singh ,production engineering & science ,standard publishers distributors ,Delhi.

Mechanical Engineering **Semester V**

DME 505 AUTOMOBILE ENGINEERING

3L-1T-0P-3.5C **MM 100**

Module I

Frame and Body: Layout of chassis, types of chassis frames and bodies, their constructional features and materials.

Transmission System: Requirements. Clutches, Torque converters, Over Drive and free wheel, Universal joint, Differential Gear Mechanism of Rear Axle.Automatic transmission, Steering and Front Axle, Castor Angle, wheel camber & Toe-in, Toe-out etc., Steering geometry.Ackerman mechanism, Understeer and Oversteer.

Module II

Power Unit and Gear Box: Principles of Design of main components. Valve mechanism, Power and Torque characteristics, Rolling, air and gradient resistance, Tractive effort, Gear Box. Gear ratio determination, Design of Gear box,

Module III

Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio, Mechanical brakes, Hydraulic brakes, Vacuum and air brakes. Thermal aspects,

Electrical System: Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

Module IV

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector &Fuel Pump, Carburetor etc. MPFI.

Module V

Automobile Air Conditioning: Requirements, Cooling & heating systems.

Cooling & Lubrication System: Different type of cooling system and lubrication system.

Maintenance system: Preventive maintenance, break down maintenance and over hauling.

TEXT/REFERENCE BOOKS:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

Mechanical Engineering **Semester V**

DME 506 METEOROLOGY AND MEASURING INSTRUMENTS

3L-0T-0P-3C **MM 100**

Module I:

INTRODUCTION: Meaning and scope of metrology in field of engineering, standards and types of measurements (Line, Wave length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances. Interchangeability, precision and accuracy, Source of error.

Module II:

PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS

Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw and screw nut method, compound gearing and helical spring methods, Principles of Optical Instruments: Reflection, Refraction, Interference, Polarization, Optical Prisms, Principle of Electrical measuring instruments.

Module III:

COMPARATORS: General principles of constructions, use of comparators, difference between comparators, limit gauges and measuring instruments, Classification of comparators, construction and working of dial indicator, read type mechanical comparator electromechanical, electronics, pneumatic comparators, gauges, tool maker microscope.

Module IV:

SURFACE FINISH: Geometrical characteristics of surface roughness-Waviness. Lay, flows, Effect of surface quality on its functional properties. Factor affecting the surface finish. Drafting symbols for surface roughness. Evaluation of surface finish.RMS and CLA values. Methods of measuring surface roughness .Qualitative and Quantative methods.

Module V:

VARIOUS TYPES OF INSTRUMENTS USED FOR- Physical measurements such as length, depth, height. Thickness, Gaps, Curvature, Angle, Taper, Area ,Surface finish, thread and gear measurement, Liquid level & Viscosity, Temperature measurement-Various types of thermometers, thermocouples **MECHANICAL QUANTITIES**: Displacement, velocity, acceleration, speed, torque, pressure & vacuum, Idea of atmospheric pressure, Gauge pressure and Vacuum-use of instruments such as manometers & pressure gauge using elastic elements.

TEXT/REFERENCE BOOKS:

1. Bhatnagar S., Metrology & measuring instrument, Nav Bharat Prakshan, Meerut.
2. Vikram Sharma, Measurement Metrology & Control, S. K. Katria& Sons, New Delhi.
3. Rajput R.K., Mechanical Measurement and Instrument, S .K. Katria& Sons, New Delhi.

Mechanical Engineering **Semester V**

DME 507 REFRIGERATION& AIR-CONDITIONING LAB

0L-0T-4P-2C **MM 100**

LIST OF EXPERIMENTS:

1. To study the analysis of simple vapor compression cycle and explain the types of vapor compression cycle with T-H and P-H diagram.
2. To study refrigeration cycle, determine the co efficient of performance of cycle and determine of tonnage capacity of refrigeration unit.
3. To determine the COP and tonnage capacity of Air conditioning system.
4. To study about the Mechanical heat pump.
5. To study the cut section model of reciprocating rotary and centrifugal compressor.
6. To study works principle of steam jet refrigeration system.
7. To study different psychometric process and chart.
8. To study various controls used in Refrigeration and Air conditioning system.
9. To impart knowledge of on the erection and maintenance of different A/C systems.

Mechanical Engineering **Semester V**

DME 508 PRODUCTION TECHNOLOGY LAB.-II

0L-0T-4P-2C **MM 100**

1. MAKING UTILITY JOBS ON LATHE INVOLVING

a) Step turning, parallel turning, taper turning and knurling.
b) Drilling, boring, counter-boring and internal taper turning undercutting.
c) Chamfering and facing.
d) Square thread-cutting.
e) Internal thread-cutting.
f) Eccentric turning.
g) Study and operate turret lathe.
h) Study and operate capstan lathe.

2. MAKING UTILITY JOBS ON

a) Shaper.
b) Drilling machine
    (i) Identification of drill bits.
    (ii) Making holes of different diameters.
c) Tool and cutter-grinder.
    (i) To grind lathe tools (all angles).
    (ii) To grind shaper/planer tools.
    (iii) To grind a drill-bit.

3. GROUP WORK ON MILLING MACHINE INVOLVING DOWN AND CLIMB MILLING

a) Study of a milling machine.
b) To perform spur gear cutting.
c) To perform groove cutting (dove-tail, square, T-slot and radial).

4. FITTING SHOP

a) Making male and female fitting jobs.
b) To make different types of keys.
c) To make different types of notches.

5. SHEET METAL OPERATIONS

a) Shearing
b) Piercing
c) Blanking
d) Notching

Mechanical Engineering **Semester V**

DME 509 AUTOMOBILE ENGINEERING LAB.

0L-0T-4P-2C **MM 100**

1. Valve refacing and valve seat grinding and checking for leakage of valves
2. Trouble shooting in cooling system of an automotive vehicle
3. Trouble shooting in the ignition system, setting of contact breaker points and spark plug gap
4. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
5. Trouble shooting in braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system and its testing.
6. Fault diagnosis in transmission system including clutches, gear box assembly and differential.
7. Replacing of ring and studying the method of replacing piston after repair.

Mechanical Engineering **Semester V**

DME 510 METEOROLOGY AND MEASURING INSTRUMENTS LAB.

0L-0T-4P-2C **MM 100**

1. Measurement of angle with the help of Sine bar/ Venire bevel protector.
2. Study and sketch of various types of optical projectors.
3. Use of comparators for measurement.
4. To measure the diameter of hole with the help of precision balls.
5. Measurement of taper by standard balls and rollers.
6. To measure the pitch, angle and form of thread of a screw.
7. Measurement of gear elements by using gear tooth vernier.
8. Use of linear measuring instruments such as vernier caliper and micrometer.
9. Use of height gauge and vernier caliper.
10. Calibration of vernier calipers/micrometers with slip gauge.
11. Calibration of height gauge/ depth gauge with slip gauge.
12. Measurement of Thread parameter by using tool makers microscope.
13. Use of slip gauge in measurement of centre distance between two points.
14. Checking of accuracy of a plug guage with micrometer.
15. Measurement of surface roughness of a surface.
16. Use of filler, wire, radius and fillet gauges for checking of standards parameters.

Mechanical Engineering **Semester V**

DME 511 INDUSTRIAL TRAINING & SEMINAR

0L-0T-4P-2C **MM 100**

Students will attend industrial training of four weeks in any industry or reputed organization after IV semester examination in summer vacation. The evaluation of this training shall be included in the V semester evaluation.

The students will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training.

Students will also be required to prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was taken in the industry/ organization. The covering format shall be signed by the concerned office in charge of the training. The officer-in-charge of the trainee would also give his rating of the student in the standard university format in a sealed to the principal of the college.

The students at the end of the V semester will present his report about the training before a committee constituted by the principal of the college which would be comprised of at least three members comprising of the department coordinator, class coordinator and a nominee of the principal. The students guide would e a special invitee to the presentation. The seminar session shall be an open house. The internal marks would be the average of the marks given is an open house session. The internal marks would be the average of the marks given be each member of the committee separately in a sealed envelope to the principal.

The marks by the external examiner would be based on the report submitted by the students which shall be evaluated by the external examiner and cross examination done of the student concerned.

Not more than three students would form group for such industrial training/project submission.

Mechanical Engineering **Semester V**

DME 515 HYDRAULICS LAB

0L-0T-4P-2C **MM 100**

1. To verify the Bernoulli's theorem.
2. To find out the Venturimeter coefficient.
3. To determine coefficient of velocity (C_v), Coefficient of Discharge (Cd), Coefficient of Contraction (Cc) and verify the relation between them.
4. To perform the Reynolds's experiment.
5. To study the force exerted by a liquid jet impact on a Plane/Inclined/Curved surfaces.
6. To study the losses of head due to various fittings in pipelines.
7. To determine the loss of head in the fittings at the various water flow rates.
8. To determine the loss co-efficient for the pipe fittings
9. Metacentric Height Apparatus.
10. The aim of this experiment is to Calibrate the given obstruction flow meter, Like Orifice-meter and to find its coefficient of discharge for different rates of flow and Obtain an appreciation of how it meters work and of the theory behind the apparatus.
11. To determine Darcy's coefficient of friction for flow through pipes.
12. To verify head loss due to:
    (i) Sudden enlargement
    (ii) Sudden contraction.
13. Pelton wheel turbine test rig.
14. Kaplan turbine test rig.
15. Francis test rig.
16. Centrifugal Pump Test Rig.
17. Reciprocating Pump Test Rig.

Mechanical Engineering **Semester V**

DME 513 Skill Development Course: AutoCAD

0L-0T-2P- 1.0C **MM 100**

1) Introduction of Engineering Drawings, Views & AutoCAD, History, GUI, Units, Limits, Line, Circle, Erase, Trim, Extend. File Management- New, Open, Save, Close, Exit, Arc, Ellipse, Rectangle, Polygon, Move, Copy, Mirror, Offset.
2) CO-Ordinate System- Absolute, Relative- Rectangular, Polar, Zoom, Pan, Regenerate, Array- Rectangular, Polar, Path, Array Edit.
3) Ray Line, Construction Line, Multiline, Polyline, Spline. Rotate, Scale, Stretch, Lengthen, Isometric View, Hatch, Gradient, Hatch edit, Boundary, Region, Wipeout, Revision Cloud.
4) Fillet, chamfer, Break, Join, Explode, Object Properties- color, Line type, scale, line weight
5) Block- Make, Save, Insert Block Editor, Table, Text, Helix, Donut, Match Properties,
6) Dimensions- Linear, Angular, aligned, radius, diameter, jogged, tolerance, center mark, inspection, Oblique, align text, Dimension Style- Modify, Override, Update,
7) tools- Workspace, tool Palettes, Dynamic Block, Clear Screen, Command Line, Quick Select, External Reference, Xbind, Xopen, PDF Underlay, Raster Image, Hyperlink, OLE Object., Mini Project 4, Field, Update Filed
8) Edit- Copy, Copy with base point, copy link, paste, paste as block, paste Special, Paste to Original Co-ordinate, Import, Export, Etansmit, Dwg Convert,
9) Page Setup, Plot, Publish, View- Zoom, Pan, Orbit, View Port, , Mini Project 4,
10) Introduction of 3D, 3D Views, Visual Style. √ Modeling- Box, Polysolid, Cylinder, Cone, Sphere, Pyramid, Wedge, Tours
11) Extrude, Revolve, Sweep, Loft, Union, Subtract, Intersect, Presspull,
12) 3D Operations'- move, rotate, align, mirror, array, Slice, Extract Edges, Extract Isolines,
13) Solid Editing-Face, Edge, Body, Material Browser, Render,

Mechanical Engineering **Semester VI**

DME 601 UNCONVENTIONAL MACHINING PROCESSES

3L-0T-0P-3C **MM 100**

Module-I INTRODUCTION
Unconventional machining Process – Need – classification – Brief overview .

Module-II MECHANICAL ENERGY BASED PROCESSES
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications.

Module-III ELECTRICAL ENERGY BASED PROCESSES
Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

Module-IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES
Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications.Principles of ECM- equipment-Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH - Applications.

Module-V THERMAL ENERGY BASED PROCESSES
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

Books/Reference:

1. Pandey& Singh, Production Engineering & Science, Standards Publishers Distributors, Delhi
2. ChoudharyHazra S.K., Elements of workshop Technology Vol-1, Media Promoters & Publishers Pvt. Ltd.

Mechanical Engineering **Semester VI**

DME 602 AUTOMATION IN PRODUCTION

3L-1T-0P-3.5C **MM 100**

Module I

AUTOMATION – Definition, Scope, its types and their merits, reason for automation .Its appreciation and criticism. Introductory idea and meaning of the terms CNC, DNC, adaptive control and FMS, Introduction to robotics.

Module II

PRODUCTION ECONOMICS: Methods evaluating investment alternatives, constraints in manufacturing, Break even analysis, Module cost of production, Cost of production, Cost of manufacturing lead time and work in process.

Module III

HIGH VOLUME PRODUCTION– Types of production, Types of layout, Economic justification of transfer machines, Detroit type automation, concepts of different flow lines for automatic loading and transferring, buffer storage and automatic inspection.

Module IV

AUTOMATED ASSEMBLY SYSTEMS: Design for automated assembly, types of automated assembly systems, parts feeding devices, feed tracks, role of industrial robot in automatic assembly, part placing mechanism

Module V

NUMERICAL CONTROL PRODUCTION SYSTEM- Numerical machine tool, Binary system, Co-ordinate system and machine motions, Types of N.C systems, Machine tool applications, Economics of NCS

TEXT/REFERENCE BOOKS:

1. Visal s, Computer Aided Manufacturing, S.K kataria& Sons
2. SrinivasaPrakashRegalla, Computer aided analysis & design, International publishing house Pvt Ltd.

Mechanical Engineering **Semester VI**

DME 603 DESIGN OF MACHINE ELEMENTS

3L-1T-0P-3.5C **MM 100**

Module I

INTRODUCTION TO DESIGN: Definition, Classification, General consideration in machine design, General procedure in Machine design, Design analysis, Design synthesis

MATERIAL AND MANUFACTURING CONSIDERATION IN DESIGN: Selection of materials for engineering purpose, Mechanical properties of metals, IS coding of materials, Material selection from properties and economic aspects, Standardization, Interchangeability, Limit, Fit, Tolerances and Surface roughness, Design for assembly

Module II

THEORY OF FAILURES: Design of elements based upon: Maximum principle stress theory, Maximum shear stress theory and Maximum distortion energy theory.

Module III

DESIGN FOR STRENGTH: Different modes of failure, Factor of safety, Allowable stresses, Strength and stiffness considerations, Stress concentration: causes and mitigation, Fatigue failures. Design of members subjected to direct stresses, Knuckle joint and Cotter joint.

Module IV

RIVETED AND WELDED JOINTS: Introduction, Methods of riveting, Materials of rivets, Types of rivets based on heads, Types of riveted joints, Lap joints, Butt joints, Important terms used in riveted joints, Caulking and Fullering, Unwin formula for rivet design, Strength of riveted joints, Efficiency of riveted joints.

Advantage of welded joints over riveted joints, Common types of welded joints, Basic weld symbols, Lap joints, Butt joints, Strength of transverse fillet joint, Strength of parallel fillet joints,

Module V

DESIGN OF MEMBERS IN TORSION:

SHAFTS: Introduction, Maximum permissible working stress for transmission shaft, Design of shaft, Shaft subjected to torsion only, Design on basis of rigidity criteria

KEYS: Types of keys, Sunk keys, Saddle keys, Tangent keys, Round keys, Forces acting on keys, Strength of keys and design.

TEXT/REFERENCE BOOKS:

1. Jadon, V.K., Machine Design Databook, I.K. International Publishing House Pvt.Ltd., New Delhi

2. Sharma P.C., Machine Design, S.K.Kataria& Sons, New Delhi.

3. Bhandari V.B., design of Machine Elements, Mc-Graw Hill Publications.

4.Kashyap K.T., Material Science for Engineers, I.K. International Publishing House Pvt. Ltd., New Delhi.

5.Purohit R.K., materials Science & processes, Standard Publishers Distributors, Delhi.

Mechanical Engineering **Semester VI**

DME 604 INTERNAL COMBUSTION ENGINES

3L-0T-0P-3C **MM 100**

Module I:

INTRODUCTION: I.C.Engines and their classification, Piston – Cylinder Arrangement and Related Terms, parts and their functions, Cycle of operation of four strokes and two stroke Engines, Applications, Analysis of Air Standard Otto, Diesel and Dual Cycles, Air Standard Efficiency and Mean Effective Pressure, Deviation of Actual Engine Cycle from Ideal Cycle, Valve Timing Diagrams for I.C.Engines. **TWO STROKE ENGINES**: Principle of working, Scavenging and Scavenging Methods, Port Timing Diagram, Merits and Demerits, Applications, Comparison with Four Stroke Engines.

Module II: CARBURATION: Purpose, Main Requirements and Principle of a Carburetor, Constructional and Operational Details of a Single jet Carburetor, Solex Carburetor, Carter Carburetor, SU type Carburetor Compensating Devices .**FUEL IGNITION SYSTEMS**: Salient Features and Comparative Merits/Demerits of Battery Ignition system and Magneto Ignition System, Timings and Spark Advance, Firing Order. Introduction to Basic Electronic Petrol Injection System, and Multipoint Fuel Injection System **FUEL INJECTION IN C.I. ENGINES**: Requirements of Diesel Fuel Injection System, Air Injection and Airless Injection systems, constructional and Operational Details of Fuel Pump and Fuel Atomizer.

Module III: COMBUSTION PROCESS: Stages of combustion in S.I.Engines, Flame Ignition and Propagation, Effect of Engine Variables on Flame Speed, Pre-Ignition and Detonation, Engine Variables Affecting Detonation, Theories of Detonation, Highest Useful Compression Ratio. Combustion in CI Engines, Effect of Operating Variables on Delay Period and Diesel Knock, Comparison between Knocking in SI and CI Engines. **FUELS**: Conventional Petroleum, structure, Refusing Fuels for SI & CI engines, Octane rating of gasoline fuels and Cetane rating of diesel fuels Knock rating, Additives. Alternative Fuels: Alcohol, LPG, Hydrogen, CNG, Biogas, Relative Merits and Demerits of these Fuels.

Module IV: LUBRICATION SYSTEMS: Function of a Lubricating System, Splash and Pressure Lubrication System, Wet and Dry Sump Lubrications, Lubrication of different Engine Parts, S.A.E. Rating of Lubricants .**ENGINE COOLING**: Need for Cooling, Classification of Cooling Systems – Thermo System, Radiator and Air-Cooling Systems. **SUPERCHARGING**: Thermodynamic cycle & performance of super charged SI& CI engines Methods of super charging, Limitation.

Module V: ENGINE TESTING & PERFORMANCE: Purpose of Testing, Performance Parameters: Brake Power, Indicated Power, Mechanical Efficiency, Fuel and Air Consumption. Thermal Efficiency and Specific Fuel consumption. Heat balance Calculations and Performance Maps. Supercharging: Objective, Effects and its limits in SI and CI Engines, Numerical Problems.**DUAL& MULTI FUEL ENGINES**: Principle, fuels, Combustion, performance Advantages, Modification in fuel system. Working principles of Rotary, Stratified charge, free piston, Variable compression ratio engines.

Text/Reference Books:

1 I. C. Engines ShyamK.Agarwal New Age International
2 I. C. Engines 3 rd ,4th Edition V.Ganeshan TMH
3 I. C. Engines Fundamentals John B.Heywood TMH
4 I. C. Engine Mathur& Sharma DhanpatRai Publication
5 I.C.EngineR.K.RajputLaxmi Publication
6 I.C.Engine, R.Yadav

Mechanical Engineering **Semester VI**

DME 605 DESIGN OF MACHINE ELEMENTS SESSIONAL

0L-0T-2P-1C **MM 100**

Problems on:-

1. Selecting fit and assigning tolerances
2. Design & drawing of Cotter joint.
3. Design & drawing of Knuckle joint
4. Design of machine components subjected to combined steady and variable loads
5. Design for bending: Beams, Levers etc.
6. Design of Keyed joints.
7. Design for rigidity (Transverse / Torsional)
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of helical spring
10. Design of screw fastening
11. Curved Beams U-clamp.
12. Belt, Rope and Chain drive system.

Mechanical Engineering **Semester VI**

DME 606 AUTOMATION IN PRODUCTION LAB.

0L-0T-4P-2C **MM 100**

Following Experiments to be performed using CNC Lathe /CNC Milling:-

1.Study of CNC Lathe including G Codes and M Codes.

2. Study of CNC Milling Machine.

3. Programming and plain turning on CNC Lathe.

4. Programming and Step turning on CNC Lathe.

5. Programming and Taper turning on CNC Lathe.

6. Programming and circular interpolation clock wise on CNC Lathe.

7. Programming and threading _18 mm on CNC Lathe.

8. Programming and drilling 8 mm x 20 mm depth on CNC Lathe.

9. Programming and grooving operation on CNC Lathe.

10. Programming and Drilling on CNC Milling.

Mechanical Engineering **Semester VI**

DME 607 PROJECT WORK

0L-0T-10P-5C **MM 100**

PROJECT PROBLEMS (EXAMPLES):- For problems on design and drawing of simple machine/machine part and preparing project report for loan to establish small scale industry to fabricate the item designed, A few examples of such items are given below: Bench vice, Small centrifugal pump, Screw jack, Hand shearing machine, Hand blower, Main switch outer casing (cast iron), Stepped motor pulley, Biogas plant, Smoke lesschulha, Hand operated grinder/ Juicer, Agricultural Implements, Material Handling equipment for small scale industry, Solar cooker or any other simple items of general utility or industrial use.

Mechanical Engineering **Semester VII**

DME 608 BASIC INDUSTRIAL ROBOTICS

0L-0T-2P-1.0C **MM 100**

Module-I
Robot Definition: Definition of robots, Evolution of robots, Laws of robots, International Robotic Standards, Why Robots? Types of robots, Selection of robots.

Module-II
Robot Classifications: degrees of freedom; degrees of movements, robot configuration; accuracy and repeatability, specification of a robot ,actuators and sensors, drives andtransmission systems used in robotics. Applications of robots.

Module-III
Coordinate Transformation: Direct kinematic problem in robotics, geometry based direct kinematic analysis coordinate & vector transformation using matrices, the
orientation matrix & translator vector, homogeneous transformation matrices, three dimensional homogeneous transformations.

Module-IV
Trajectory interpolation: Introduction, the necessity of interpolators, the generation of motion commands, the trajectory planning, basic structure of interpolators.

Module-V
Autonomous mobile robots: Introduction, locomotion - key issues for locomotion, legged mobile robots, leg configurations & stability , examples of legged robot locomotion ,
wheeled mobile robots, wheeled locomotion-the design space, wheeled locomotion: case studies.

Text Books/ Reference Books:

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications - M.P.Groover, M.Weiss, R.N.Nagel, N.G.Odrey.
4. Robotics Control Sensing, Vision and Intelligence - K.S.Fu, R.C.Gonzalex, C.S.G.Lee- McGrew hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall