Gondwana University, Gadchiroli
Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): EIGHTH SEMESTER

ME801: INDUSTRIAL MANAGEMENT (Theory)

CREDITS: 04

Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination Scheme
Duration of Paper: 03 Hours
University Assessment: 80 Marks
College Assessment: 20 Marks

UNIT – I
[ 9 Hrs. ]
Principles of Management:
Concepts of management, development of scientific management, Principles of Management.

UNIT – II
[ 9 Hrs. ]
Functions of Management:
Functions such as planning, organizing, leading, motivating, communicating, controlling, decision making,

UNIT – III
[ 9 Hrs. ]
Personnel Management:
Meaning, functions of personnel management, manpower planning, collective bargaining, wages & salary administration, labor welfare, training, trade unions, Introduction to Industrial Factories Act, Industrial Boils Act, Trade Union Act.

UNIT – IV
[ 9 Hrs. ]
Marketing Management:
Definition, Importance & scope, selling & modern concepts of marketing, market research, product launching, sales promotion, pricing, channels of distribution, advertising, market segmentation, marketing mix.

UNIT – V
[ 9 Hrs. ]
Financial Management:
Sources of finance, financing organizations, types of capital, elements of costs & allocation of indirect expenses, cost control, budgets & budgetary control, balance sheet, ratio analysis, profit & loss statement.
BOOKS RECOMMENDED:

1. Principles of Management - Koontz & O. Denial
3. Elementary Economic Theory – Dewett K.K., Varma J.D.
4. Financial Management - Kuchal
5. Principles of Marketing Management - Philip Kotler & William Stau
## UNIT - I  Vapour Compression Refrigeration Systems : [ 9 Hrs. ]


Multiple Compressor and Multi Evaporator Systems, Cascade Refrigeration Systems (Elementary)

## UNIT - II  Refrigerants and System Components : [ 9 Hrs. ]


## UNIT – III  Vapour Absorption, Air Cycle Refrigeration & Cryogenics : [ 9 Hrs. ]


## UNIT – IV  Psychrometry and Air conditioning Systems : [ 9 Hrs. ]

Airconditioning Principles and application
Psychrometric properties of moist Air, Psychometric Chart, Psychometric processes, Concept of ADP, Bypass Factor, Air Conditioning System, RSHF, GSHF, ESHF.

## UNIT – V  Heat Load Calculation & Air Distribution Principles : [ 9 Hrs. ]


Methods of Duct Design, Air Outlets Types & Selection, Air Conditioning Controls.
TEXT BOOKS:

2. Refrigeration & Air-conditioning - Dr. P. L. Ballany (Khanna Publication)
3. Refrigeration & Air-conditioning - C. P. Arora (TMH Publication)
4. Refrigeration & Air-conditioning - Manohar Prasad (New Age Int. Pub.)
5. Refrigeration & Air-conditioning - S.V. Domkundwar (Dhanpat Rai & Sons)
6. Refrigeration & Air-conditioning - Dr. R.C. Arora (PHI)

REFERENCE BOOKS:

3. Refrigeration & Air-conditioning - Jordon & Priester (PHT Publication)
4. Thermal Environmental Engineering - James Threlkeld
5. Modern Refrigeration Practice - Guy R. King.
7. ASHRAE hand books - McGrawHill Publication
   Design data book
   An Energy Approach
ME803: ELECTIVE – II

ME8031: AUTOMOBILE ENGINEERING (Theory)

CREDITS: 03

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UNIT – I

Chassis, articulated and rigid vehicles and vehicles layout. Engine Construction - Structural components and materials. Fuel supply system, cooling and lubrication systems, Filters, water pumps, radiators, Thermostats, antifreezing compounds, recent development in Automobiles.

UNIT – II

Clutch – Necessity, requirements of clutch systems, Types of clutches, centrifugal clutch, single & multi-plate clutch, fluid clutch. Gear Box - Necessity of transmission, principle, types of transmission, Sliding mesh, constant mesh, synchromesh, Transfer gear box, Gear selector mechanism, lubrication & control. Torque Converter, Automatic Transmission.

UNIT – III


UNIT – IV

Steering systems, principle of steering, center point steering, steering linkages, steering geometry and wheel alignment, power steering, special steering systems. Tyres, tyres specification, factors affecting tyres performance, special tyres, wheel balancing. Suspension systems - Function of spring and shock absorber, conventional and independent suspension system, Telescopic shock absorber, linked suspension systems.

UNIT – V


**BOOKS RECOMMENDED:**

1. Automobile Mechanics - Joseph Heitner  
5. Automotive Mechanics - Ganeshan
ME803: ELECTIVE – II

ME8032: MACHINE TOOL DESIGN (Theory)

CREDITS: 03

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UNIT I | [ 9 Hrs. ]

**DESIGN OF MACHINE TOOL DRIVES**

1) **Selection of Electric Motor**

2) **Stepped Regulation of Speed**, Laws of Stepped Regulation, Why Geometric Progression is used against Arithmetic, Harmonic & Logarithmic despite shortcomings, Relation between Range ratio, Geometric Progression Ratio and No. of Speed Steps

3) **Design of Stepped Drives**: Break up of Speed Steps, Structural Formulae, Structural Diagram, Selection of Best Structural Diagram, Ray Diagram, Speed Chart, General recommendations for Developing the Gearing Diagram, Determining the number of teeth of Gears

   a) **Speed Gear box**: Limiting Transmission Ratio of Speed Gear Box, Design Case Study of Speed Gear Box for Lathe, Classification of Speed Gear Boxes

   b) **Feed Gear box**: Limiting Transmission Ratio of Feed Gear Box, Design Case Study of Feed Gear Box (with Gear Cone & Sliding Key) for Drilling Machine, Classification of Feed Gear Boxes, Study of Application of Norton’s & Meander’s Mechanism for Thread Cutting

4) **Step less Drives**: Step less Regulation of Speed & Feed Rates through Hydraulic, Electric & Mechanical means, Positively Infinitely Variable Drive, Case Study of CNC Lathe with Electronic Controller for Speed & Feed Step less Regulation

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UNIT II | [ 9 Hrs. ]

**DESIGN OF MACHINE TOOL STRUCTURE**

UNIT III                                                                                                                [ 9 Hrs. ]

DESIGN OF GUIDEWAYS

Function & Types of Guideways, Types of Slideways & Antifriction Ways,
Functional features of Slideways, its Shapes & Materials, Methods of adjusting Clearance, Design Criteria (Wear Resistance & Stiffness) and Calculations for Slideways operating under semi liquid friction condition, ‘Stick Slip’ phenomena affects accuracy of setting & working motions.
Comparison of Design & stiffness of Hydrodynamic, Hydrostatic & Aerostatic Slideways,
Design of Antifriction Guideway, Concept of Combination Guideways

UNIT IV                                                                                                                 [ 9 Hrs. ]

DESIGN OF POWER SCREWS

Design of Sliding friction Power Screw for Wear Resistance, Strength, Stiffness, & Buckling Stability.
Design of Rolling friction Power Screw for Strength under static loading, Strength under cyclic loading, & Stiffness

UNIT V                                                                                                              [ 9 Hrs. ]

DESIGN OF SPINDLE AND SPINDLE SUPPORTS

Function & Requirements of Spindle Units, their Materials,
Effect of Machine Tool Compliance on Machining accuracy
Design of Spindle for Bending Stiffness : Deflection of Spindle Axis due to a)Bending, b) - due to Compliance of Spindle Supports, c) - due to Compliance of the Tapered Joint
Optimum Spacing between Spindle Supports
Permissible Deflection & Design for stiffness: Additional Check for Strength like Additional Supports, Location of Bearings and Drive elements, Balancing
Requirements of Spindle Supports
Features of Anti-friction Bearings,Load bearing abilities of Ball & Roller Bearings. Parameters which assess the viability of combination of roller & Ball & Roller Bearings in Spindle Units. Preloading of Anti Friction Bearing & its method
TEXT BOOKS:

REFERENCE BOOKS
ME803: ELECTIVE – II

ME8033: OIL HYDRAULICS AND PNEUMATICS (Theory)

CREDITS: 03

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Tutorial: 1 Hour/Week | University Assessment: 80 Marks
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UNIT I [ 9 Hrs. ]

FLUID POWER SYSTEMS AND FUNDAMENTALS:

UNIT II [ 9 Hrs. ]

HYDRAULIC SYSTEM & COMPONENTS:

UNIT III [ 9 Hrs. ]

DESIGN OF HYDRAULIC CIRCUITS:

UNIT IV [ 9 Hrs. ]

PNEUMATIC SYSTEMS AND COMPONENTS:
UNIT V  

DESIGN OF PNEUMATIC CIRCUITS:
Servo systems - Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics - Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

TEXT BOOKS:
1. Hydrantion and Pnumation by Dr. H.D.Ranchandra, Sudha Publication, Bangalore
4. Hydraulics & Pneumatics by Andrew Parr, Jaico Publishing House
5. Pneumatic Systems by S.R. Mujumdar, TMH

REFERENCE BOOKS:
ME803: ELECTIVE – II

ME8034: SYNTHESIS OF MECHANISMS (Theory)

CREDITS: 03

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UNIT – I

Introduction to kinematics, Types of Mechanism, Kinematics synthesis, Science of relative motion, Tasks of kinematics synthesis with practical applications, Degree of freedom, Class-I, Class-II chain, Harding’s notation, Grashof criterion, Grubler’s criterion.

Introduction to position generation problem, concept of pole, two & three position generation synthesis, pole triangle. Relationship between moving & fixed pivots. Four position generation, opposite pole quadrilateral, center point & circle point curve, Burmester’s point. Matrix method for position generation problem, rotation matrix, displacement matrix.

UNIT – II

Introduction to function generation problem, co-ordination of input-output link motion, relative pole technique, inversion technique, overlay technique, graphical synthesis of quick return mechanisms for optimum transmission angle. Types of errors, accuracy points, cheby sher’s spacing, frudenstein’s equation.

UNIT – III


UNIT – IV

Synthesis for infinitesimally separate position, concept of polode and centrod, Euler’s savvy equation, inflection circle, Bobbilier and Hartman’s construction.
Optimal synthesis of planer mechanisms, Powell’s search method, least square method, penalty function. Introduction to spatial mechanisms, D-H notations, introduction to kinematic analysis of robot arm.
BOOKS RECOMMENDED:

1. Synthesis of Mechanism - D. C. Tao
2. Synthesis of Mechanism - Hall
ME804: ELECTIVE – III

ME8041: UNCONVENTIONAL ENERGY SYSTEMS (Theory)

CREDITS: 03

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UNIT – I [ 9 Hrs. ]


Solar flat plate collectors. Types of collectors, liquid flat plate collectors, solar air heaters, selective surfaces, evacuated collectors, novel designs of collector.

UNIT – II [ 9 Hrs. ]

Concentrating collectors - Line focusing, point focusing & non focusing type, central receiver concept of power generations, compound parabolic collector, comparison of flat & concentrating collectors. Applications of solar energy to water heating, space heating, space cooling, drying, refrigeration, distillation, pumping, solar furnaces, solar cookers, solar thermal electric conversion, solar photo voltaic. Solar energy storage, sensible, latent & thermo chemical storage, solar pond.

UNIT – III [ 9 Hrs. ]


UNIT – IV [ 9 Hrs. ]

Wind & ocean Energy - Power in wind, forces on blades, wind energy, basic principle of wind energy, conversion site, selection consideration, wind data & energy Estimation, basic components of WECS. Classification of WEC systems, savonius and darrieus rotors, applications wind energy.

Ocean Energy Introduction :- Ocean thermal electric conversion, open & closed cycle of OTEC, hybrid cycle, energy from tides, basic principle of tidal power & components of tidal power plants, Single & double basin arrangement, estimation of tidal power and energy. Energy from ocean waves - energy availability, wave energy conversion devices.
UNIT – V

Geothermal & MHD power Generation :- Geothermal Energy :- Introduction, classification of geothermal systems, vapour dominated, liquid dominated system, total flow concept, petro thermal systems, magma resources, applications of geothermal operational & environmental problems. Magneto Hydro Dynamic Power Generation :- Introduction, principles of MHD power generation, MHD open & closed systems, power output from MHD generators, design problems of MHD generation, gas conductivity, seeding.

BOOKS RECOMMENDED:

2. Non Conventional Energy Sources - Rao & Parulekar
4. Solar Energy - S.P. Sukhatme
ME804: ELECTIVE – III

ME8042: STRESS ANALYSIS (Theory)

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UNIT – I [ 12 Hrs. ]

Two Dimensional Problems in Cartesian Coordinate system – Fundamentals of stress & strain, stress-strain relationship, Elastic constant, Plane stress, Plane strain, differential equation of equilibrium, Boundary conditions, Saint Venant’s principle, Compatibility equation, Airy’s stress function, Stress analysis of cantilever subjected to concentrated load, Stress Analysis of simply supported beam subjected to Uniformly Distributed Load.

UNIT – II [ 12 Hrs. ]

Two dimensional problems in polar coordinate systems – General equations of equilibrium in polar coordinate, compatibility equation, stress distribution about symmetric axis, stress analysis of cylinder subjected to internal & external pressure, Pure bending of curved beams, effect of hole on the stress distribution in plates, Stress analysis of rotating circular disk.

UNIT – III [ 12 Hrs. ]

Two Dimensional Photo elasticity – Introduction to basic optics related to photo elasticity, stress optic law, plane & circular polariscope arrangements, effect of stressed model in plane & circular polariscope, Isoclinic & Isochromatics, stress trajectories, calibration of photo elastic material (determination of fringe constant), various photo elastic materials & their properties. Casting of photo elastic models, Tardy’s compensation technique, Separation techniques like shear difference, oblique incidence & electrical analogy.

UNIT – IV [ 12 Hrs. ]

Introduction to 3D photo elasticity – Phenomenon of Stress freezing, Method of stress freezing, slicing techniques, determination of material fringe constant at critical temperature. Scaling Model – Prototype relations.

Introduction to Reflection polariscope, fringe sharpening & fringe multiplication.

Strain gage technique for stress & strain analysis – Introduction to electrical resistant strain gage, gage factor, bridge circuit, bridge balance, output voltage of Wheatstone bridge, temperature compensation, various bridge configurations.
Determination of principle strains & stresses using strain rosettes.

Introduction to Strain measurement on rotating components, Static & Dynamic Strain measurement, Introduction to semiconductor gages, high temperature strain gages & self – temperature compensated gages, Introduction to commercial strain indicators.

Brittle coating method for stress & strain analysis.

**BOOKS RECOMMENDED:**

1. Theory of Elasticity - S.P. Timoshenko
2. Experimental Stress Analysis - Dalley S.W., Riley W.F.
3. Experimental Stress Analysis - T.K.Ray
4. Experimental Stress Analysis - L.S. Srinath
ME8043: PROJECT EVALUATION AND MANAGEMENT (Theory)

CREDITS: 03

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UNIT – I                                     [ 9 Hrs. ]

Need analysis, market survey, characteristics of market, sample survey, demand forecasting, secondary data, accuracy, confidence level, uncertainty.

UNIT – II                                    [ 9 Hrs. ]

Technical feasibility: Process selection, Level of automation, Plant capacity, Acquiring technology, appropriate technology plant location, Equipment selection and procurement, Govt. policies.

UNIT – III                                   [ 9 Hrs. ]

Economic Feasibility: Cost of project, working capital analysis, fixed cost, means of finance, estimation of sales and production price analysis, Break even point, projected cash flow statements, projected balance sheet, profit and loss statement, projected cash flow, rate of return, discounted payback period, cost benefit analysis, return after taxes.

UNIT – IV                                    [ 9 Hrs. ]


UNIT – V                                     [ 9 Hrs. ]

Project Review: Initial review, performance analysis, ratio analysis, sickness, project revival, environmental and social aspects.

BOOKS RECOMMENDED:

2. Projects, P.K.Joy, Macmillon
UNIT – I

Types of interplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications. Introduction to control of hoisting equipments.

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains, selection of chains, hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems. Chain and rope sheaves and sprockets.

UNIT – II

Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

UNIT – III

Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagnetic, double shoe type, thruster operated, controller brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes general theory of band brakes, its types and construction.

UNIT – IV

Different drives of hoisting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels, slewing, jib and luffing gears. Operation of hoisting gear during transient motion, selecting the motor rating and determining braking torque for hoisting mechanisms, drive efficiency calculations,
selecting the motor rating and determining braking torque for traveling mechanisms, slewing mechanisms, jib and luffing mechanisms. (Elementary treatment is expected)

UNIT – V

Cranes with rotary pillar, cranes with a fixed post, jib cranes with trolley, cranes with luffing boom cantilever cranes, cage elevators safety devices of elevators belt and chain conveyors and their power calculations, vibrating and oscillating conveyors pneumatic and hydraulic conveyors, screw conveyors hoppers, gates and feeders. Introduction to AGVs as new material handling device, use of robot for material handling.

BOOKS RECOMMENDED:

3. Introduction to Material Handling – Siddharth Ray, New Age International
UNIT – I  
[ 9 Hrs. ]

Definition of CAD, CAD software modules (Operating system, Graphics, Applications, Programming, Communication). Rasterization principle, Rasterization of line, frame buffer, N-bit plane buffers, Simple color frame buffer.

Line generation using Bresenham’s & DDA algorithms for line, circle, ellipse.

Two dimensional geometric and co-ordinate transformations like scaling, translation, rotation, reflection, shear. Concepts of homogeneous representation and concatenated transformations. Inverse transformations. (Enumeration of entity on graph paper)

UNIT- II  
[ 9 Hrs. ]

Three dimensional geometric and co-ordinate transformation like scaling, translation, rotation & reflection. Reflection about on arbitrary line, Bezier Curve (for Control points).

Algorithms for windowing and clipping.

UNIT– III  
[ 9 Hrs. ]


UNIT-IV  
[ 9 Hrs. ]

Truss problems (Linear shape functions only), Shape functions for CST, Two dimensional problems using constant strain triangle.

UNIT-V  
[ 9 Hrs. ]

Objectives of optimum design, adequate and optimum design, Johnson’s Method of optimum design, primary design equation, subsidiary design equations and limit equations, optimum design with normal specifications of simple machine elements like: tension bar, transmission shaft, pressure vessel, helical spring etc. Introduction to redundant specifications with suitable examples.
BOOKS RECOMMENDED:

1. CAD / CAM , Theory & Practice - Ibrahim Zeid
2. Procedural Elements for Computer Graphics - D. Rogers
3. Introduction to Finite Elements in Engineering - Chandrupatla & A. D. Belegudu
4. Optimization for Engineering Design - Kalyanmoy Deb
**ME806: REFRIGERATION & AIR CONDITIONING (Laboratory)**

**CREDITS: 02**

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**LIST OF PRACTICALS:**

Minimum Eight experiments out of following should be performed.

1. To study / demonstration of tools and equipments used by a Refrigeration / A/C mechanic.
2. To study / demonstration of a Window Air-conditioner / Split A/C
3. To study the evacuation, dehydration and charging of a refrigeration system.
4. To study the Refrigeration and Air-conditioning controls.
5. To determine COP of a Vapour Compression Refrigeration System.
6. To determine EER of a Air-conditioning system and to determine capacity and bypass factor of the coil.
7. To study the COP of a Vapour Absorption Refrigerator.
8. To determine the cooling efficiency of a Desert Cooler
9. To determine the COP of a Thermoelectric Cooler / Vertex tube etc.

A Journal/Report on practicals conducted shall be submitted by each student. University Practical examination shall be on viva-voce of 10 marks and practical performance or objective test of 15 marks.
ME807: COMPUTER AIDED DESIGN (Laboratory)

CREDITS: 02
Teaching Scheme          Examination Scheme
Practical: 3 Hours/Week   University Assessment: 25 Marks
                                     College Assessment: 25 Marks

LIST OF PRACTICALS:
Minimum Eight out of following shall be performed

1. Development of application program for DDA.
2. Development of application program for Bresenham’s Line Generation Algorithm.
3. Development of application program for Bresenham’s Circle Generation Algorithm
4. Development of application program for Bresenham’s Ellips Generation Algorithm
5. Development of application program for Scaling, Translation and Rotation
6. Development of application program for standard reflection
7. Development of application program for clipping
8. Solution of 1D FE problems (Linear Bar) using commercial / freeware / self developed application programs.
9. Solution of 1D FE problems (Quadratic Bar) using commercial / freeware / self developed application programs
10. Solution of Truss problems using commercial / freeware / self developed application programs
11. Solution of 2D FE problems based on CST using commercial / freeware / self developed application programs

A Journal/Report on practicals conducted shall be submitted by each student. University Practical examination shall be on viva-voce of 10 marks and practical performance or objective test of 15 marks.
The project work may conform to anyone of the below stated types of broad based work.

1. Detailed design of some mechanical system. This may comprise of machines, Thermal / Hydraulic / Pneumatic system etc.
2. Detailed experimental / Practical verification of some mechanical engineering systems.
3. Detailed study of some industry/s manufacturing some product/s. This study may comprise of various aspects such as plant layout, mechanical handling systems, assembly shop, quality control system, maintenance system, various service systems, design, development and planning functions, techno-economic studies etc.

Group of students shall be considered for the project work and shall submit the report and give the presentation.