VISION & MISSION OF THE DEPARTMENT :

Vision - To be a globally renowned center for quality education and innovative research in Mechanical Engineering

Mission -

- To prepare effective and responsible graduate engineers for global requirements.
- To continuously strive to improve pedagogical methods employed in delivering the academic programs.
- To respond dynamically to the changing requirements of the industry.
- To conduct basic and applied research to contribute to intellectual human capital.
- To inculcate the spirit of entrepreneurship and social responsibility.

B.Tech Mechanical Engineering

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

PEO 1. To prepare technocrats by imparting basic and contemporary Science and Engineering skills to identify and solve the problems in the academia, industry and practical research domains.

PEO 2. To develop an ability to understand and analyze the problem requirements and design novel engineering solutions.

PEO 3. To provide exposure on emerging technologies and work with interdisciplinary projects.

PEO 4. To inculcate the spirit of sustainable learning and continued leadership for better decision making.

PEO 5. To imbibe the spirit of professionalism, ethics, public policies that allow them to become responsible professional Engineers.

PROGRAM OUTCOMES (POs) :

PO-1: Able to apply mathematics, science, computing and engineering knowledge to Mechanical Engineering problems.

PO-2: Able to design, set-up, and conduct engineering experiments and analyze the results.

PO-3: Graduates will acquire strong fundamental concepts in design, synthesis and optimization of various fields of Mechanical Engineering.

PO-4: Ability to carry-out projects and research in interdisciplinary areas like Mechatronics, Bio-Fuels

PO-5: Acquire excellent programming, analytical, logical and problem solving skills.

PO-6: Graduates will possess managerial and leadership skills with best professional ethical practices and social concern through organizing National Conferences, Seminars and Workshops by various professional bodies. Also graduates will understand the proper use of technical papers, copyrights and patents, recent advances in engineering field, and shall acknowledge whenever referred.

PO-7: An ability to communicate effectively through communicative English and Language lab.

PO-8: Able to understand the impact of mechanical engineering solutions in a global, economic, environmental and societal context by participating at national level competitions like technical paper presentation, quiz programs, essay writing competitions, cultural activities, Industrial tours, NSS and NCC, Alumni Association.

PO-9: By arranging guest lecturers by the experts from industry through Industry Institution Interaction programs under TEQIP –II and Mechanical Engineering Association (MEA).

PO-10: Graduates will be aware of emerging technologies and current professional issues. Also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.

PO-11: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

PO-12: Project management and finance: coordination, participation, mobilizing the finances from various sources/sponsorship.

CET 61 ENGINEERING MECHANICS

Lectures/Week : 4 periods | Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives

1. To understand the eternal forces on rigid bodies both on the 2D/3D.
2. To learn internal stress system due to action of eternal forces.
3. To study CG and M.I

Course Content:

Unit – I

STATICS: basic concepts – system of force, concurrent and non – concurrent coplanar and non – coplanar forces – Resultant – Moment of force and its application – couples and resultant of force systems – equilibrium of systems of forces – Free body diagrams, Equation of equilibrium of coplanar systems and spatial systems

Unit – II

CENTRE OF GRAVITY AND MOMENT OF INERTIA : Theory of pappus – centroids of composite figures – Areas of gravity of bodies – Moment of inertia – parallel and perpendicular axis theorems – Moment of inertia of composite of areas (rolled and built up sections) – Radius of gyration of areas.

Unit – III

SIMPLE STRESS AND STRAINS: Elasticity and Plasticity – Types of stresses and strains – Hooke`s law – stress and strain diagram for mild steel – working stress – Factor of safety.

Unit – IV

Lateral strain – Poisson`s ratio volumetric strain – Elastic module and relationship between elastic constants – Bars of varying section – composite bars – temperature stresses.

Unit – V

STRAIN ENERGY : Gradual, sudden and impact loading – Endurance limit principles of virtual work and its applications.

Course outcome:

1. Able to apply mathematics, science, computing and engineering knowledge to Engineering Mechanics problems.
2. An ability to carry out projects and research in interdisciplinary areas.
3. To a quire the basic knowledge of the analysis of general structures when external loads are applied.
4. Ability to analyze different forces and their results of the forces acting on it.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

Text books:

1. Ghose DN: Applied Mechanics and Strength of Materials, Third Edition, CBS Publishers & Distributors, 1985.
2. Timoshenko and Young: Engineering Mechanics, Fourth Edition, NewYork, N.Y.McGraw-Hill, 1956
3. Junarkar SB: Mechanics of structures Vol – I, Sixth Edition, Charotar, 1974
4. Junarkar SB: Elements of Applied Mechanics, Fourth Edition, Charotar Book Stall, 1965

EET43 ELECTRICAL ENGINEERING

Lectures/Week : 4periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To provide students basic knowledge of kirchoff's laws and fundamentals of AC.
2. To make the students to learn about the construction, types of dc machines and apllicatons.
3. To teach the operation of dc machine as motor and hoe to assess the performance of dc machines.
4. To provide students basic knowledge of transformers and assess the performance of transformers.
5. To provide students good knowledge on 1-phase and 3-phase induction motors.

Course Contents:

UNIT-I

BASIC ELECTRICAL CIRCUITS: parameters-Resistance, inductance and capacitance, kirchoff's law- alternating currents-definitions of peak value, rms value, average value and form factor ,single phase circuits –behavior of resistance, inductance and capacitors to sinusoidal excitation voltage ,series, parallel and series parallel circuits. three phase circuits-line &phase relations of star and delta circuits. power and power factor.

UNIT-II

DC Generators: Constructional details-principle of operation-types of excitation, generated emf, characteristics of various types of generators and applications.

UNIT-III

DC Motors: Torque developed in a motor, characteristics of different types of motor and applications, motor starters and losses and efficiency calculations.

UNIT-IV

Single Phase Transformers: Constructional details, Principle of transformer, emf equation, ideal transformer, leakage flux, and phasor diagram of transformer, equivalent circuit, determination of parameters of equivalent circuit, losses and efficiency

UNIT-V

Induction motors: three phase induction motor-principle of operation, types, slip torque characteristics, principle of operation of single phase induction motors-types of starting and applications

Course Outcomes:

1. Students are expected to learn about basics electrical parameters used practical electrical system.
2. Students are expected to learn about Kirchhoff's laws and fundamentals of AC.
3. Students are expected to have good knowledge in construction and operation of dc generator, construction and principle of transformer.
4. Students are expected to learn about different types starters, speed control methods for dc motors.
5. The students are expected to know the expressions related to losses and efficiency

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

Text Books:

1. Theraja B.L :Electrical technology vol I &vol II,S.Chand &company limited,2008.
2. Mehta V.K : Principles of Electrical Engineering & Electronics,firth Edition, S.chand & company limited,2005.

MET 02 BASIC THERMODYNAMICS

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Basic Concepts Scope of Thermodynamics – Macroscopic and Microscopic properties Thermodynamic system – Control Volume – Thermodynamic Properties – Processes and cycles – Thermodynamic Equilibrium – Quasi static process – Zeroth Law Of Thermodynamics – Measurement of temperature – Thermocouple – Work transfer – pdv work – Network done by a system – Specific heats and latent heat.

First Law of Thermodynamics: Energy – Different forms of stored energy – closed systems and steady flow systems – First law applied to flow process – Mass balance and energy balance in steady flow process – Perpetual motion machine of first kind.

UNIT – II

Boyle's Law – Charles Law – Characteristic equation of gas – Avagadro's Law – Joule's Law – First Law and non flow Processes Constant volume – Constant Pressure – Isothermal – Hyperbolic – Adiabatic – free expansion and polytropic processes – Real gases Dalton's Law of pressures – Avogadro's Law – Gibb's – Dalton's Law of mixture of gases.

Second Law of Thermodynamics: Limitations of first law – Heat engines and Heat reservoirs – Kelvin Planks statement of second law – Clausius inequality – refrigeration and heat pump reversibility and irreversibility – Carnot cycle – Reversible heat engine – Carnot Theorem – Corollaries – Efficiency of reversed heat engine.

UNIT – III

Entropy and availability: Claussiu's theorem – The property of entropy – temperature entropy plot – Principle of increase of entropy – Entropy changes in various thermodynamic processes.

Availability: Availability energy referred to a cycle – The Helmholtz function and Gibb's functions – Availability in steady flow combined first law and second laws – Tds

equations – energy equation – Joules Kelvin effect – Claussius – Clapeyrm equation – Gibbs phase rule.

UNIT – IV

Gas Power cycles: Carnot cycle – Stirling cycle – Eriksson cycle – Air standard cycles – Otto cycle – Diesel cycle – limited pressure cycle Mixed cycle or duel cycle – Comparison of cycles – Brayton cycle.

UNIT – V

Fuels and Combustion: Conventional fuels – Calorific value of fuels (solid – liquid and gaseous) Experimental determination and calculation from chemical analysis – Combustion equations – Air required for complete combustion – Excess air – Determination of air fuel ratio and weight of flue gases.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

TEXT BOOKS:

1. Engineering Thermodynamics : Nag. P.K.
2. Heat Engineering : Vasandani V.P. and Kumar D.S.
3. Heat Engines : Ballaney P.L.

REFERENCE:

1. Applied Thermodynamics : Eastop and Mckankey.

MET 03 BASIC MANUFACTURING PROCESSES

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To knowledge about the casting process. Basic concept of various casting processes to develop a new product.
2. To analyze the hot working process and cold working processes.
3. To knowledge about various forging operations and their design of manufacturing.
4. To knowledge about the various sheet metals working operations.
5. To knowledge about the various types of welding operations.

Course Contents:

UNIT - I

Introduction: Classification of Manufacturing processes – various kinds of production. Casting processes – sand-mould casting – patterns – Moulding materials – cores – Gates and Risers – Different types of casting processes.

UNIT - II

Metal working processes- Nature of plastic deformation - Hot working and cold working. Rolling- Principle – Rolling stand arrangement – Roll passes – Breakdown passes – Roll pass sequences.

UNIT – III

Forging- Forging operations – Smith forging – Drop forging – Press forging – Machine forging – Forging design – Drop forging die design – Upset forging die design

Extrusion and other processes- Extrusion principle – Hot extrusion processes – Cold extrusion – Extruding tubes – Wire drawing – Rod and tube drawing – Swaging – Tube making.

UNIT – IV

Sheet metal operations- Press tool operations – Shearing action – Shearing operations – Drawing – Draw die design – Spinning – Bending – Stretch forming – Embossing and coining.

UNIT – V

Introduction to fabrication processes- Classification – General consideration - Gas Welding and cutting – Electric arc welding – Resistance welding – Other fusion welding processes – Thermit welding - Electro slag welding – Electron beam welding – Laser beam welding.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Basic Manufacturing Processes.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to carry out projects and research in interdisciplinary areas.
4. Able to understand the impact of Basic Manufacturing Processes solutions in different industrial areas.
5. An ability to use the techniques, skills, and modern engineering tools

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Rao P.N: Manufacturing Technology, Second Edition, Tata McGraw – Hill, 2007
2. Sharma P.C.: A Textbook of Production Technology: Manufacturing Processes, Seventh Edition, S. Chand & Company Limited, 2007

REFERENCES:

1. R.S. Khurmi and J.K. Gupta: A Textbook of Workshop Technology: Manufacturing Processes Seventh Edition, S. Chand & Company Limited, 2008

2. Hajra Choudhury SK: Elements of Workshop Technology Volume – 1, Indian Book Distributing Co. Calcutta

MET 04 ADVANCED ENGINEERING GRAPHICS

Lectures/Week : 2+2 periods Credits: 3

Sessional marks: 20 +20 End Examination Marks: 60

Course Objectives:

1. To understand the basics of projections of solids and auxiliary projections in different inclinations of the principle planes
2. To provide the knowledge of sections of solids and provide sufficient knowledge draw section planes perpendicular to HP and inclined to VP.
3. To provide the knowledge of development of surfaces, and to know how to unwound an object /solid when it is being cut by an inclined plane.
4. To impart the students, the ability to analyze the interpenetration of solids intersections.
5. To anlayse the isometric projections.

Course Content:

Unit – I

Projections of solids and Auxiliary projections of solid of prism, pyramid, cube, cylinder, Tetrahedron, Octahedron, and cone with axis inclined to one plane and parallel to other – Axis inclined to both the planes

Unit – II

Sections of solids of tetrahedron, cube, prism, Pyramids and cone, Section planes perpendicular to HP and inclined to VP, Section planes perpendicular to VP and inclined to HP Section plane perpendicular to both HP and VP

Unit – III

Development of surfaces: Development of lateral surfaces of right regular solids such as prisms, pyramids cylinders and cones which are cut by plane inclined to HP only.

Unit – IV

Introduction to interpenetration of solids of intersection of two prisms, cylinders and cylinder, cone and cylinder

Unit –V

Isometric Projections: Isometric projections and views such as prisms, Pyramids, cylinders and cones. Solids placed one over the other.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Advanced Engineering Graphics problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. An ability to carry out projects and research in interdisciplinary areas.
5. Acquire excellent programming, analytical, logical and problem solving skills

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

Text books:

1. Bhatt ND and V M Panchal, Engineering Drawing Revised Edition, Charotar publications, 2010.
2. Dhananjaya A Jolhe, Engineering Drawing with an introduction to Auto CAD, Tata Mc- Graw Hill – 2009.
3. Gautam Pohit, Gautam Gosh – machine Drawing with auto cad – Peason publications.
4. A text book of engineering Drawing , SCITECH Publicaitons (1999) – KL Narayana & P Kannaiah.
5. Engineering Drawing & Graphics, New age International Publishers – K. Venugopal.

MEP 02 PRODUCTION ENGINEERING LAB

Practicals/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To impart knowledge of different types of machine tools and their constructional details like lathe, milling and shaping machines. After that their specific purposes would be learnt by the students.
2. To develop knowledge about types of cutting tools, single point and multi point cutting tool and the manufacture of these tools, the speeds at which a specific type of tool will machine a particular type of material.
3. To provide knowledge about coolants and lubrication, their use and purpose while machining.
4. To analyse different types of cutting tools, single point and multi point cutting tool and the manufacture of these tools, the speeds at which a specific type of tool will machine a particular type of material.
5. To impart skills to perform different operations on lathe, milling and shaping by conducting experiments on these machine tools.

Course Contents:

LATHE

Model 1: Step Turning

Model 2: Taper Turning with Knurling

Model 3: V Threading

SHAPER

Model 4: Making Square prism on Shaper

Model 5: Slot Cutting with Shaping Machine

MILLING MACHINE

Model 6: Rectangular Slot Cutting on Vertical Milling Machine

Model 7: Hexagonal Cutting on Horizontal Milling Machine

Model 8: Spur Gear cutting on Milling

THREADING

Model 9: Square Threading

Model 10: Double Start V Threading

Model 11: Drilling and Tapping

Model 12: Joining of Two Metal Work Pieces with Arc Welding or Gas Welding

Model 13: Pattern Making Related Moulding

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Production Engineering Lab problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to carry out projects and research in interdisciplinary areas.
4. An ability to use the techniques, skills, and modern engineering tools necessary for Production Engineering Lab.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Hajra Choudhury SK: Elements of Workshop Technology Volume – 1, Indian Book Distributing Co. Calcutta
2. Hajra Choudhury SK: Elements of Workshop Technology Volume – 2, Indian Book Distributing Co. Calcutta

MEP 03 COMPUTER AIDED DRAFTING LABORATORY - 1

Lectures/Week : 2periods Credits: 1

Sessional marks: 20 +20

End Examination Marks: 60

Introduction to drafting software:

1. Involving commands in AutoCAD
2. Object snaps
3. Opening and saving a drawing
4. Drawing limits

Drawing Tools – Line, Polygon, Rectangle, circle, Spline, Ellipse, point, Hatch and Text.

Modify Tools: Erase, Copy, mirror, Offset, Array, Move, Rotate, Trim, Fillet and chamfer.

Dimensioning: Dimension varibles, linear Dimensions, Aliened Dimensions, Radius and diameter dimensions, angular dimensions, quick leader lines.

Creating 2D: drawing in Auto CAD

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

Text books

1. Bhatt ND and V M Panchal, Engineering Drawing Revised Edition, Chrotar publications, 2010.
2. Dhananjaya A Jolhe, Engineering Drawing with an introduction to Auto CAD, Tata Mc- Graw Hill – 2009.
3. Gautam Pohit, Gautam Gosh – machine Drawing with auto cad – Peason publications.

EEP43 ELECTRICAL ENGINEERING LAB

Lectures/Week : 3periods | Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To verify the kirchoff's laws.
2. To know the performance characteristics of dc shunt motor and dc generator.
3. To know different speed control techniques for dc shunt motor.
4. To find efficiency, losses and regulation of single phase transformer.
5. To know the efficiency and regulation of induction motor.

List of Experiments Prescribed and Conducted:

1. Conduct an Experiment to verify the kirchoff's laws.
2. Conduct load test on dc shunt motor to obtain performance characteristics.
3. Conduct speed control methods of dc shunt motor.
4. Conduct Swinburne's test
5. Conduct OC and SC test on single phase transformer
6. Conduct an experiment on dc generator to obtain open circuit characteristics.
7. Conduct load test on single phase transformer
8. Conduct an Experiment to obtain internal and external characteristics of dc shunt generator.
9. Conduct load test on 3-phase induction motor.
10. Conduct no load and blocked test on 3-phaase induction motor.

Course Outcomes:

1. Students are expected to verify the kirchoff's laws theoretically and practically.
2. Students are expected to find the efficiency of dc shunt machines by using losses with Swinburne's test
3. Students are expected to draw the equivalent circuit of transformer.
4. Students are expected to know the efficiency of 3-phase induction motor by using load test.
5. Students are expected to know the different motors performance and speed control techniques used in different practical applications.

Contribution to outcomes:

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes:

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

MET 05 KINEMATICS OF MACHINERY

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

UNIT-I

Kinematics Fundamentals: DOF or mobility; Types of motion; Links, joints and kinematics chains; Determining the DOF; Mechanisms and structure; Number synthesis. Linkage transformation; intermittent motion; inversion; Grashofs conditions; linkages of more than four bars; springs as links; compliant mechanisms; practical considerations.

Graphical Linkages Synthesis: Synthesis; Function, Path and Motion generation; Limiting conditions; Dimensional Synthesis; Quick Return mechanisms; Coupler curves; Cognates; Straight line Mechanisms; Dwell mechanisms; Constant velocity piston motion; Rocker arm, remote center circular motion.

UNIT-II

Position Analysis: Coordinate system; position and displacement; Translation, Rotation and complex Motion, Graphical position Analysis of Linkages; Algebraic position

Analysis of linkages; Four bar Slider-Crank position solution; An inverted Slider-Crank position solution.

Analysis of linkages: Types of kinematic synthesis; Precision points; Two position motion generation of analytical synthesis; Comparison of Analytical and Graphical Three position synthesis.

UNIT-III

Velocity Analysis: Definition of velocity; Graphical Velocity Analysis; Instantaneous centers of velocity and analysis; Centrodes; Velocity of slip; Analytical solutions for velocity analysis, Four bar pin-jointed linkage, Four bar slider crank & inverted slide and crank.

Acceleration Analysis: Definition of Acceleration; Graphical Acceleration Analysis; Analysis Solution for acceleration analysis Four Bar pin-jointed linkage, Four Bar Slider Crank & Inverted Slide and Crank, Coriolis acceleration.

UNIT-IV

Gear Trains: Rolling Cylinders; Fundamental of Law of Gearing; Gear tooth nomenclature; interference and undercutting; contact ratio; Gear types; Simple gear trains; Compound Gear trains; Epicyclic and Planetary gear trains; Efficiency of gear trains; Transmissions; Differentials.

UNIT-V

Cams :Cam Technology and types; SVAJ Diagrams; Double Dwell cam design, single Dwell Cam Design- choosing S V A J Functions and Polynomial Functions; Cam profiles for specified motions- Disc, Flat, Roller followers.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)0
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Design of Machinery : Robert Norton
2. Theory of Machines and Mechanisms : Joseph Edward Shigley
3. Mechanisms and Dynamics of Machinery : Hamilton Mabie H. and F.W.Ovirk
4. Theory of Machines : S.S.Rathan

MET 06 MACHINE TOOL TECHNOLOGY AND ADVANCED MANUFACTURING PROCESSES

Lectures/Week : 4periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To impart overall Knowledge of about the metal cutting operations.
2. To knowledge about the basic features of lathe, and their operations performed on the lathe machine and also different types of single point cutting tool.
3. To analyze the various types of multipoint cutting tools and also know about indexing method.
4. To know about the various types of gear manufacturing processes and also about super finishing process.
5. To analyze about various types of unconventional machining process.

Course Content:

UNIT – I

Cutting tools : Classification- Nomenclature of Single Point Cutting Tool-Difference between orthogonal and oblique cutting-Mechanism of metal cutting-Types of Chips-Chip Breakers-Forces acting on a tool-merchant Circle Diagram-Velocity Relations-Specific Energy in cutting-Tool life-Tool life equation.

UNIT – II

Lathes : Types-operations done on Lathe. Work holding devices. Boring machines-types and constructional details-jig boring machine, shaper, planer and slotting machines-constructional details-Quick return mechanisms-Estimation of machining time in lathe, shaper and planer.

UNIT – III

Drilling Machines: Types-constructional details-operations performed on them. Twist drill-elements. Milling machines- classification- constructional details of various types. Operations performed on milling machines. Milling methods- up cut and down cut milling. Estimation of machining time in milling. Indexing head and types of indexing methods- simple, compound, differential and angle indexing.

UNIT - IV

Gear cutting by Milling: Spur and Helical Gears. Gear generating methods-gear shaping and gear hobbing. Finishing of gear by gear shaving, gear grinding and gear lapping. Broaching-types of broaches- broaching operations-types of broaching machines-vertical, horizontal, continuous and rotary broaching machines. Grinding-Grinding wheels-manufacturing, specification-wheel selection. Wheel dressing and truing. Different types of grinding machines. Use of magnetic chucks, precision grinding processes lapping, honing and super finishing.

UNIT – V

Non- Conventional Machinning:Brief introduction to capstan and Turret lathes. Non-conventional machining processes- CM, ECM, ECG, EDM, LBM, EBM, USM, WJM, AJM-process capabilities of each process.

Course Outcomes:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
3. Able to understand the impact of Machine Tool Technology and Advanced Manufacturing Processes solutions in a global, economic, environmental, and societal context by participating at national level competitions like technical paper presentation, quiz programs, essay writing competitions, cultural activities, Industrial tours.
4. Graduates will be aware of emerging technologies in Machine Tool Technology and Advanced Manufacturing Processes and current professional issues. And also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.
5. An ability to use the techniques, skills, and modern engineering tools necessary for Machine Tool Technology and Advanced Manufacturing Processes.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz

4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Work shop Technology Vol.II. : Hazra choudary and Bose S.K
2. Work shop Technology Vol.II : Raghuvamshi
3. Production Engineering : Sharma P.C.
4. Manufacturing Engineering and Technology : Kalpakjian
5. Manufacturing Technology : Haslehurst M.
6. Production Technology : Gupta S.C. and Jain.R.K

REFERENCES:

1. Production Engineering- Machine Tools : Dent R.
2. Production Technology : HMT

MET 07 APPLIED THERMODYNAMICS -I

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To understand the need for various mechanical and electrical systems for operation of SI and CI engines and be able to understand and explain the procedure of performance evaluation of IC engines based on various efficiencies.
2. To understand the properties, process and importance of steam as source of power in engineering applications and explain the working and construction of steam generation and also the important aspects of their performance evaluation.
3. To explain the construction, working and design aspects of steam engines and solve the related problems.

4. To be able to apply thermodynamic principles to understand, analyze and design steam nozzles and steam condensers for steam turbine operation and also to appreciate and solve problems on nozzle and condenser efficiencies.
5. To understand the principle of operation of Impulse and Reaction turbines and to draw the velocity triangle and deduce the necessary equations to solve the turbine problems on various performance parameters and efficiencies.

Course Contents:

UNIT – I

Internal Combustion Engines : classifications – principles of operation – SI and CI engines – methods of fuel supply – ignition – cooling – lubrication and method of governing – multi cylinder engines.

Performance of IC Engines: Valve and port time diagrams – indicator diagrams – testing of engines – indicated power – Brake power – efficiencies – air fuel ratio – volumetric efficiency and heat balance.

UNIT – II

Steam properties and stream generators: Properties of steam – use of steam tables – PV, TS, HS diagrams – steam processes – constant volume – constant pressure – Isothermal – Adiabatic and Hyperbolic processes – Throttling expansion.

Steam Generators: Classification of fire tube and water tube boilers – introduction to high pressure boilers – boiler mountings and accessories – boiler performance – boiler draught.

UNIT – III

Steam Engines: Basic steam power cycles – Carnot cycle and ranking cycle – Modified ranking cycle – principles of operation of steam engine condensing – non-condensing – single &double acting – valve events – hypothetical and actual indicator diagrams – diagram factor determination of cylinder dimensions – performance of steam engine – governing of steam engines.

UNIT – IV

Steam Nozzles: Type – isentropic flow of steam through nozzles – velocity & enthalpy drop – variation of velocity – area – specific volume – critical pressure ratio for maximum discharge effect of friction – super saturated flow.

Steam Condensers: Functions of a condenser – classification – jet condenser – parallel flow and counter flow – surface condenser – vacuum efficiency – loss of vacuum & air leakage – air removal.

UNIT – V

Steam Turbines: Principles of operation-classification-impulse and reaction turbines-velocity diagrams-work done-diagram efficiency-effect of blade friction-stage efficiency turbine reheat factor-height of turbine blade-axial thrust-losses in steam turbine-governing of turbines-reheat and regenerative cycles.

Course Outcomes:

1. Able to design setup and conduct experiments for applied Thermodynamics problems and for verification of theoretical concepts and knowledge with practices
2. Able to carry out projects and research in inter disciplinary areas
3. 3.Able to understand the impact of solutions of Thermodynamics in global, economic, environmental and social context by participating in technical paper presentation competitions, quiz programs and industrial visits
4. Will possess Managerial and Leadership skills with professional ethical practices and will understand proper use of technical papers, copy rights and patents and recent advances in the field thermodynamics
5. Recognize the need for and ability to engage in lifelong learning and comprehend the current professional issues

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.

4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Vasandani V.P and Kumar D.S.: Heat Engineering, 4th Edition, Metropolitan Book Co Pvt Ltd., 2008
2. Domukundwar & Kothandaraman: A Course in Thermal Engineering, Dhanpat Rai & Co. Pvt ltd., 2008

REFERENCE:

1. Eastop and Mckankey: Applied Thermodynamics, 5th Edition, Longman, 1993

CET 62 FLUID MECHANICS

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To learn fluid properties
2. To understand fluid flow concepts
3. To derive fundamental equations of fluid flow
4. To know about pressure, velocity and discharge measuring devices
5. To analyze the dimensions of parameters for model studies

Course Contents:

UNIT – I

Fluid properties: Mass density, weight density, specific volume, relative density, viscosity, compressibility, surface tension and capillarity and standard atmosphere pressure, Vapour pressure.

Fluid static's: Fluid pressure Pascal's law, absolute and gauge pressure, hydrostatic force on surfaces- total pressure and center of pressure on plane surfaces.

UNIT –II

Fluid kinematics: Type of fluid flow, type of flow lines, rate of flow, velocity potential and stream function continuity equation.

Fluid dynamics: Eluer's equation- Bernoulli's equation and its application momentum equation and moment of momentum equation.

UNIT –III

Pressure Measurements: Piezometer, manometer differential manometers, micro manometers, velocity measurements- Pitot tube.

Discharge measurement: Orifice and mouthpiece- venturimeter, Orifice meter and Nozzle-meter.

UNIT –IV

Laminar flow: Relationship between shear stress and pressure gradients- laminar flow through circular pipes- Hagen poisulle law- loss of head due to friction.

Turbulent flow: Loss of head due to friction in pipe- Darcy- Wersbach equation Minor head losses- pipes in series and parallel siphon.

UNIT – V

Boundary layer concept: Boundary layer growth over a flat plate- Boundary layer thickness, displacement thickness, momentum thickness and energy thickness- turbulent boundary layer-separation of boundary layer.

Flow around submerged objects: Drag and lift- types of drag on flat and cylinder lift on circular and air foils.

Course Outcomes:

1. To solve fluid flow problems using fundamental principles
2. To measure pressure, velocity and discharge
3. To perform model analysis

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

TEXT BOOKS:

1. Anthony Esposito: Fluid Mechanics with Applications, 4th Edition, Prentice Hall, 1998.
2. Rajput R.K.: Fluid Mechanics and Fluid Machinery, S. Chand & Company Limited, 2008.
3. Bhansal R.K.: Fluid Mechanics and Fluid Machinery, 9th Edition,Laxmi Publication,2005.

REFERENCES:

1. P. N. Modi, S. M. Seth: Hydraulics and Fluid Mechanics,8th Edition, Standard Book House, 1987.

CET 63 MECHANICS OF SOLIDS - 1

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course objectives:

1. To acquire the knowledge about behavior of members subjected to various types of forces on the members.

Course Content:

UNIT –I

Complex Stresses: Stresses on an inclined plane under different uniaxial, biaxial and triaxial stress conditions, Principal planes and principal stresses, Mohr's circle, Lateral Contraction.

UNIT – II

Bending Moments and Shear Forces: Beam – Types of loads, Types of supports, S.F. and B.M. diagrams for cantilever, simply supported and over hanging beams.

UNIT –III

Bending Stress in beams: Theory of simple bending – Assumptions – Derivation of bending equation. Position of N.A. – Moment of Resistance of rectangular section, I-Section and triangular section.

Shear stress: Equation for shear stress distribution across any cross section of beam – shear stress distribution across rectangular, circular, triangular, I-Sections.

UNIT –IV

Deflections of Beams: Relation between curvature, slope and defection, double integration method, Macaulay's method, Moment area method.

Torsional Stresses in shafts and springs: Analysis of torsional stresses, Power transmitted, combined bending and torsion, Closed and open coiled helical springs. Laminated springs.

UNIT –V

Cylinders and Spherical Shells: Stresses and strains in thin cylinders, Thin Spherical shell.

Course out comes:

Ability to analyze stress state of members in tension, shear and bending.

Ability to construct the SFD, BMD, TMD diagrams and to drain their stress diagrams.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

TEXT BOOK:

1. Vaizirani and Ratwani: Analysis of Structure, Vol. 1, 17th Edition, Khanna Publishers, 1997.

REFERENCE:

1. Timoshenko: Strength of Materials, 3rd Edition, Krieger Publications, 1983.

CEP 61 STRENGTH OF MATERIALS LAB

Lectures/Week : 3periods — Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

Course objectives:

1. The experimental work involved in the laboratory should make the student understand the fundamental modes of loading of the structures and to determine mechanical properties of materials.

List of experiments:

1. Tension test on mild steel bar
2. Tension test on HYSD steel bar
3. Compression test on wood
4. Shear teat on wood
5. Torsion test on steel
6. Test on close coiled helical spring
7. Bending test on rolled steel joist
8. Bending test carriage spring
9. Charpy impact test
10. Deflection test on a beam under Uniform Bending
11. Deflection test on simple supported beam
12. Deflection test on fixed beam

Course out comes:

1. To a quire the basic knowledge and behavior in finding the properties of different materials.

Contribution to outcomes:

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes:

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

MEP 04 MECHANICAL ENGINEERING LAB – 1

(FUELS AND TESTING)

Lectures/Week : 3periods Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

(Any Eight of the following experiments will be given)

LIST OF EXPERIMENTS:

1. Measurements of Viscosity of Various Lubricating oils.
2. Test on Flash and Fire Point Apparatus.
3. Test on Carbon – Residue Apparatus.
4. Test on Distillation Apparatus.
5. Value Timings diagrams on Petrol & Diesel Engine cut models
6. Port Timings Diagrams on petrol and diesel engine cut models.
7. Calibration of Pressure Gauge.
8. Test on Aniline Point Apparatus.
9. Test on Pour point and Cloud Point Apparatus.
10. Test on Gas Calorimeter (Junkers / Bomb).

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

MET 08 APPLIED THERMODYNAMICS - II

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To understand the principle of operation and design of reciprocating compressors for single and multistage compressors and to appreciate the importance of various efficiencies in compressor operation.
2. To apply the basic principles of fluid dynamics in design of rotary and centrifugal compressors and to explain the implications of various efficiencies in compressors operation.
3. To understand the operating and design principles of gas turbines and jet propulsion units and comprehend the different efficiencies for performance evaluation.
4. To know the working and design aspects of vapour compressor and vapour absorption refrigeration systems and the parameters affecting their performance .
5. To understand the various psychrometric terms and the design procedure of air-conditioning systems for different applications and conditions.

Course Contents:

UNIT-I

Reciprocating Compressors

Mechanical details – Methods of compression – shaft work and isothermal efficiency of a single stage compressor indicator diagram – effect of clearance – volumetric efficiency – losses during compression – multistage compression optimum pressure condition in two stage compression inter coolers and after coolers

UNIT - II

Rotary Compressors

Classification – positive displacement and rotary dynamic (non-positive displacement) compressors – fans – blowers and compressors – static and total head – centrifugal compressors velocity diagrams – type of impeller vanes – slip factor – diffuser isentropic efficiency – axial flow compressors – velocity diagrams – degree of reaction – isentropic efficiency

UNIT – III

Gas Turbines & Jet propulsions

Simple gas turbine cycle constant volume cycles – open and closed cycle – constant pressure cycle – efficiency and work output – cycle with inter coolers – reheat and regeneration practical cycles losses in a turbine

Jet Propulsion

Specific thrust – thermal efficiency and propulsion efficiency turbo prop – turbo jet – rocket propulsion – performance evaluation

UNIT – IV

Refrigeration

Performance and capacity of refrigeration – refrigeration cycles – vapour compression cycles – properties of common refrigerants – vapour absorption cycles

UNIT – V

Air Conditioning

Psychometry – psychometric chart – principles of air conditioning – bypass factor – simple systems for winter and summer air conditioning

Course Outcomes:

1. Able to design setup and conduct experiments for applied Thermodynamics problems and for verification of theoretical concepts and knowledge with practices
2. Able to carry out projects and research in inter disciplinary areas

3. Able to understand the impact of solutions of Thermodynamics in global, economic, environmental and social context by participating in technical paper presentation competitions, quiz programs and industrial visits Will possess Managerial and Leadership skills with professional ethical practices and will understand proper use of technical papers, copy rights and patents and recent advances in the field thermodynamics
4. Recognize the need for and ability to engage in lifelong learning and comprehend the current professional issues

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Vasandani V P and Kumar D S: Heat Engineering, Third Edition, Metropolitan, 1979.
2. Nag P K: Engineering Thermodynamics, Third Edition, Tata McGrew Hill, 2006.
3. Russel B Scott: Cryogenic Engineering, Volume 39, Cryogenic Engineering conference
4. Publication, 2005.

5. Ballaney P L: Heat Engines, Sixteenth Edition, Khanna Publication, 1987.

REFERENCE BOOKS:

1. Eastop and Mcconkey: Applied Thermodynamics, Fifth Edition, Pearson Publication, 2009.

MET 09 DYNAMICS OF MACHINERY

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Transmission of Motion:

Types of belts and belt drives materials used for belts, velocity ratio in belt drive, lengths of open and crossed belt drives, slip in belt, Ratio of tensions for flat belts, V belts initial tension, Power transmitted by belt, centrifugal tension. Condition for the transmission of maximum power, advantages and disadvantages of various belt drives.

UNIT –II

Friction

Inclined planes, friction of screws and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis

Clutches

Friction clutches, single Disc or plate clutch, multiple disc clutch, cone clutch, Centrifugal clutch

Breaks and Dynamometers

Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers absorption and transmission types, General description and methods of operations.

UNIT-III

Centrifugal Governors

Sleeve loaded governors, spring loaded governors, Hartnell, Hartung governors and governors with auxiliary springs, sensitiveness, isochromism, stability and hunting in governors- governor effort and power – controlling force diagrams –insensitiveness.

UNIT-IV

Turning Moment Diagrams and Flywheel

Construction of crank effort and torque diagrams-fluctuation of energy and speed in flywheels – flywheel of an I.C.engine, flywheel of a punching press – determination of moment of interia- design considerations.

UNIT-V

Gyroscopic Couple and Processional Motion

Gyroscopic couple – effect of precession on stability of moving vehicles such as motor cars, motor cycles, aero planes and ships – gyroscopic stabilization.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)0
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Theory of machines : Khurmi R. S.

2. Mechanisms and Machine Theory : Rao J. S. and Dukkipati R. V.
3. Theory of Machines : Thomas Bevan

REFERENCES:

1. Mechanism and Dynamics of Machinery : H. Hamilton Mabie and Oevirk F. W.
2. Theory of Machines : Joseph Edward Shigely
3. Theory of Machines : Rattan S. S.
4. Theory of Machines and Mechanisms : Joseph Edward Shigely

MET 10 DESIGN OF MACHINE MEMBERS-I

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. Ability to understand Design Principles and their applications in the real world. To break the design problem into different elements and find the relevant solutions.
2. Learning of basic design of various industrial components and justify the designed parameters with the selected existing problem, students will analyze failures subject to torsion, shear and bending and with combinations and also to predict effectively and accurately the reasons of failure and then correlate it to the theoretical knowledge.
3. Students will be able to learn; designing the mechanical components subject to fluctuating loads and design the components for finite life and infinite life.
4. Students will be able to analyze and design structural joints and ability to design detachable and permanent joints (bolted joints and welded) subject to concentrated loading and eccentric loading.
5. Acquaintance with Spring Terminology and different types of springs and ability to design and analyze coils springs, leaf springs etc. subject different loading conditions.

Course content

UNIT-I

Engineering Design

What is designing? ; The process of Design; design by evolution; The Morphology of design; Identification and analysis of need; True need; Specifications ; Standards of performance ; use of checklists ; Morphological Analysis ; Brainstorming; measure of physical realizibility; Economic and financial feasibility ; Designing for shipping, handling and installation; Design for maintenance ; Detailed design

UNIT-II

Mechanical Engineering design

Traditional Design methods; Design Synthesis; design considerations and standards; Engineering classification and selection; BIS designation of steels; Mechanical properties.

Design against static load

Modes of failure; factor of safety; Stress-strain relationships; shear stress and shear strain relationships; Axial, Bending, Torsional stresses; principles stresses; Theories of failure.

UNIT-III

Design against Fluctuating loads

Stress Concentration factors; Reduction of stress concentration effects ; Fluctuating stresses; fatigue Failure; Endurance limit; Notch sensitivity; Endurance limit; Soderberg and Goodman Diagrams; Modified Goodman's diagrams; Fatigue design under combined stresses.

UNIT-IV

Design of fasters

Threaded joints-Thread joints; ISO metric screw threads, Bolted joint in tension; Torque requirement for bolt tightening; bolted joint under fluctuating load; eccentricity loaded bolted joints in shear; bolted joints with combined stresses; Bolt of uniform strength.

Welded joints-types of welded joints; stresses in butt and fillet welds; strength of welded joints; eccentricity welded joint; weld joint subject to bending moment and fluctuating forces; welding symbols; weld inspection.

UNIT-V

Mechanical springs

Helical springs-stress equation and deflection equation; spring materials; spring end formation; design against-static and fluctuating loads; Design of helical and Torsional springs; Compound springs ; equalized stress in spring leaves ; multi leaf springs; nipping and shot peening.

Course Outcome:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
3. An ability to carry out projects and research in interdisciplinary areas.
4. Graduates will possess managerial and leadership skills with professional ethical practices and will understand the proper use of technical papers, copyrights, and patents, recent advances in Design of Machine Members and shall acknowledge whenever referred.
5. Graduates will be aware of emerging technologies in Design of Machine Members and current professional issues and also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test

2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

TEXT BOOKS:

1. Fundamental of Design and Manufacturing : Lal G. K., Vijay Guptha, Venkata Reddy N.
2. Design of Machine Elements : Bhandari V. B.
3. Mechanical Engineering Design : Shigley J. E.
4. Design of Machine members : P. Kannaiah
5. Machine Design Data Hand book : K. Mahadevan, Balaveera Reddy

REFERENCES:

1. Machine Design : Schaum Series
2. Design of Machine Elements : .Faires V.M
3. Machine Design : Sharma P.C. & Aggarwal D.K.
4. Machine Design : Jain R.K.

MET 11 MATERIALS SCIENCE & METALLURGY

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To develop the students an overall sound knowledge of atomic structure of metals crystal structure and as such produce engineers that are capable of participating effectively in the main areas of materials industry.
2. To analyze the testing of engineering materials.

3. To impart the students, the ability to analyze phase transformations in iron-carbon diagram and provide knowledge about time, temperature and transformation curves.
4. To develop in the students an overall sound knowledge of blast furnace and effect of alloying elements in steels.
5. To expose the students to general principles and applications of heat treatment methods.

Course Content:

UNIT -I

Space lattice and unit cells, Crystal structures of common metallic materials – bcc –fcc-hcp – Atomic packing factor – Miller indices –spacing of lattice planes –Relation between density and lattice constant. Crystal imperfections –point, line and surface defects. Edge and screw dislocations – Burger's vector.

Plastic deformation by slip and twinning .Critical resolved shear stress for slip. Work hardening – mechanism and sages of work hardening. Cold working and ho working. Recovery, Re-crystallization and Grain growth.

UNIT – II

Testing Engineering materials –tensile, compressive, hardness and impact tests. Creep – creep test-creep curve-Mechanism of creep. Fatigue – fatigue stress cycles – fatigue test – S-N- curve –Mechanism of fatigue. Fracture – Ductile and brittle fracture –Griffith's criterion.

UNIT – III

Construction of cooling curves for a pure metal and a solid solution / alloy – Gibb's phase rule for a metal system – Construction and interpretation of binary phase diagrams-Types of phase diagrams –Eutectic ,Eutectoid, Peritectic, Peritectoid.-Iron-Carbon system – cooling curve of pure iron. Iron – carbide equilibrium diagram – Effect of alloying elements on Iron-Iron carbide diagram.

UNIT – IV

Production of Pig – Iron in the Blast furnace. Production of steel in Bessemer, Open Hearth and Basic Oxygen steel making. Plain carbon steels – Uses and limitations of plain carbon steels. Alloy steels. Effect of alloying elements in steels. High speed tool steel, stainless steels, High nickel and High chromium steels. Codification of steels .IS.AISI –SAE classifications. Cast irons-grey, white, malleable and SG irons. Non- Ferrous metals and alloys –Copper, Aluminum, Magnesium, Nickel and Zinc-Properties and applications.

UNIT –V

Transformation points – Construction of TTT diagram – TTT diagram and cooling curves. Heat treatment of steels – Annealing, Normalizing, Hardening, Tempering, Austempering, Mar tempering. Surface hardening of steels – Carburizing, Nitriding, Cyaniding, Flame Hardening and induction hardening. Heat treatment of non- ferrous alloys-Age hardening.

Powder Metallurgy –production of metal powders- Basic steps in powder metallurgy - advantages limitations and applications of powder metallurgy. Introduction to Nano materials.

Course Outcomes:

1. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
2. An ability to function on multidisciplinary teams
3. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context
4. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
5. The course will transform their ability to impart mechanical properties using heat treatment processes.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)0

2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Introduction to Physical Metallurgy : Avner
2. Materials Science and Engineering : William D. Callister, Jr.
3. Materials Science and Metallurgy : Daniel Yesudian C.D. & Harris Samuel.D.G.
4. Materials Science and Metallurgy : Kodgire V.D.

REFERENCE BOOKS:

1. Physical Metallurgy : Raghavan V
2. Physical Metallurgy : Clark and Verney
3. Physical Metallurgy : Guy A.G Engineering

MET 12 MACHINE DRAWING

Lectures/Week : 3periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

Unit – I

Orthographic Views: Conversion of Pictorial views into Orthographic views with sectioning.

Unit - II

Machine Elements: Drawing views of the following machine elements: Thread profiles, Bolted joint, machine and cap screws, types of nuts, locking devices for nuts, Foundation Bolts.

Keys: Sunk Keys, Feather Keys, Spline Shaft, Wood – Ruff Key and round Key.

Unit - III

Shaft Couplings: Muff Coupling, Split muff Coupling, Flanged Coupling, protective type flanged coupling.

Riveted Joints: Different types of rivet heads, Different types of lap joints and butt joint.

Unit - IV

Assembly Drawing: Preparation of assembly drawing of Plumber Block, Foot Step Bearing, Swivel Bearing, Screw jack, Stuffing Box, Pipe Vice, Lathe tail Stock, Clapper box, Drill Jig, Cross head, Air cock.

Unit - V

Part Drawing: Preparation of part drawing of IC engine connecting rod, Revolving Centre, Square tool post, Eccentric, V- Belt drive, Drill jig, Cross head.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam

3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Machine Drawing : Narayana K.L, Kannaiah P. and Venkata Reddy K.
2. Production Drawing : Narayana K.L, Kannaiah P. and Venkata Reddy K.

REFERENCES:

1. Machine Drawing : Bhatt N.D., Charotor Publishers.
2. Machine Drawing : Dhawan R.K.

CET 64 MECHANICS OF SOLIDS - II

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course objectives:

1. To be well conversant in analyzing the internal forces in structural members with classical method of analysis in transferring the loads acting on it.

Course Content:

UNIT – I

Theories of Failure: Applications to Machine Elements. Fixed Beams: Fixing moments for a fixed beam of uniform section, Effect of sinking support, Slope and Continuous deflection.

UNIT – II

Beams: analysis of continuous beam, Reaction at the supports, Effect of sinking of supports. Energy methods-castigliabo's theorems I&II applications.

UNIT- III

Columns and struts: Columns with one end free and the other fixed, Both ends fixed, One end fixed and other hinged, Limitations of Euler's formula, column with initial curvature, column carrying eccentric load, Laterally loaded columns, Empirical formulae.

UNIT- IV

Unsymmetrical bending and shear center. Principle axes of sections, circle of inertia shear center to rectangular sections, I-section, L-section.

UNIT- V

Stresses due to rotation: Wheel rim, disc of uniform thickness, disc of uniform strength. Thick cylinders subjected to internal and external pressure and compound cylinders.

Course out comes:

1. Ability to apply knowledge of general structures in practice.
2. Ability to analyze statically determinate stress, beams, frames.
3. Familiarity with professional and ethical issues and the importance of lifelong learning in structural Engineering

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

TEXT BOOKS:

1. Vazirani and Ratwani: Analysis of structures .Vol.1, 14th edition, Khanna, 1991
2. Shah L.B. & Shah R.T.: Advanced Topics in strength of Materials.

REFERENCE:

1. Timoshenko: Strength of Materials, First Edition, Courier Dover Publications, 1953.

CET 65 HYDRAULIC MACHINES AND CONTROL SYSTEMS

Lectures/Week : 4periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course objectives:

1. To learn laminar and turbulent characteristics of pipe flows
2. To understand boundary layer concept, its separation and control.
3. To determine drag and lift forces on submerged bodies.
4. To study the characteristics of pumps and turbines
5. To study the construction and working of various hydraulic machines.
6. To know about pneumatic control systems.

Course Content:

UNIT –I

Impact of Jets

Impact of water jets Hydrodynamic forces of jets on stationary and moving flat, inclined and curved vanes – Jet striking centrally and at tip- Velocity triangle at inlet and outlet – work done and efficiency.

UNIT –II

Turbines

Turbines – Classification of Hydraulic turbines – Pelton Wheel, Francis turbine, Kaplan working principle - Work done and efficiency of Pelton wheel, Francis, Kaplan turbine - Draft tube - Specific speed unit quantities – Specific speed - Performance characteristics – Model testing.

UNIT –III

Centrifugal Pumps

Centrifugal pumps – Classification of pumps – Working of a centrifugal pump work done by the impeller on liquid – Heads and efficiencies – Multi – stage centrifugal pumps – Specific speed – Performance characteristics – Model testing.

UNIT –IV

Reciprocating Pumps

Classification of Reciprocating Pumps – Working of a reciprocating pump – Coefficient of discharge and slip – Single acting and double acting reciprocating pumps.

UNIT –V

Hydraulic Systems, Pneumatic Control Systems and Actuators

Hydraulic devices - Hydraulic accumulator, Hydraulic intensifier, Hydraulic press, Hydraulic ram, Hydraulic crane and Hydraulic lift – Hydraulic coupling Hydraulic torque converter – Introduction to pneumatic control systems and actuators.

Course out comes:

1. To analyze and solve pipe flow problems.
2. To design submerged bodies based on drag and lift characteristics.
3. To select suitable pumps and turbines based on the requirement.
4. Abet to use the various hydraulic machines.
5. Able to understand the preliminary things about pneumatic control systems.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

TEXT BOOKS:

1. Rajput R.K.: Fluid Mechanics and Hydraulic Machines, Fourth Edition, S. Chand & Company Limited, 2008.
2. Modi and Seth: Hydraulic & Hydraulic Machines, 17th Edition, Standard Book House, 2011.
3. Bansal R.K.: Fluid Mechanics and Hydraulic Machines, First Edition, Laxmi Publications.

REFERENCES:

1. Anthony Esposito: Fluid Power with Applications, Fifth Edition Pearson Education, 2008.

MEP 05 MACHINE TOOL LAB

Lectures/Week : 3periods

Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

(Any Eight of the following experiments will be given)

List of Experiments:

1. Force Measurement on Lathe.
2. Power Measurement on Lathe.
3. Production of Single point cutting tool using and cutter grinder.
4. Differential Indexing.
5. Fit Exercise on Capstan Lathe.
6. Alignment Test on Lathe.
7. Alignment Test on Radial Drilling Machine.
8. Thrust and Torque Measurement in Drilling Operation.
9. Study of tool wear (flank wear)
10. Study of Weld Bead generator in Arc.
11. Measurement of Forces in Milling.
12. Study of Impact strength tests on Welding joints.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

MET 13 INDUSTRIAL ENGINEERING AND MANAGEMENT

Lectures/Week : 3 periods Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To explain the concept ,scope and functions of management, the organizing process, the structure of organization and functions of managers and the importance of job evaluation and merit rating in personnel management.
2. To explain about the objectives of a good plant location and plant layout and understand the need for effective integration of material handling equipment into the plant layout.
3. To explain the need and techniques of sales forecasting and the importance and objectives of production planning and control functions.
4. To appreciate the importance of work measurement techniques and work study principles in improving productivity.
5. To understand the importance of maintaining safety and accident prevention in industry and to understand the causes and remedies for industrial disputes and importance of worker participation in management.

Course Content:

UNIT-I

Administration, Management and Organization. Scientific Management. Functions of Management . Principles of Management. Types of Organization. Principles of Organization. Fayol's and Taylor's contributions to Management.

Personnel Management – A brief review of functions of personnel management. Concepts of job evaluation and merit rating.

UNIT-II

Plant Location – Location factors, concept of Weber theory. Choice of city, Suburban and country locations.

Plant Layout – Definition, Objectives, Salient features of product, process and fixed position layouts.

Material Handling – Definition, Objectives, Classification of material handling equipment and factors influencing their selections

UNIT-III

Sales forecasting – need, Classification moving average exponential smoothing and linear regression technique.

Production Planning and Control – Objectives, Salient features of functions of PPC.

UNIT-IV

Work study – Definition, objectives and uses. Method study – definition. Objectives procedure and uses.

Time study – Definition, needs, functions, and basic concepts of break down, preventive, predictive and total productive maintenance.

UNIT-V

Safety in industry – need safety programs, accident prevention, economic aspects, causes of accidents, accident prevention.

Industrial disputes – Causes and methods of settling Labour participation in management concept. Types and advantages A brief outline of Factories Act, Industrial disputes Act and Workmen's Compensation Act.

Course Outcomes:

1. Will be able to possess Managerial and leader skills with professional, ethical practices

2. Able to apply Mathematics, Science, Computing and Engineering knowledge to Industrial Management activities of Sales Fore-casting and Production Planning and Control
3. Able to apply programming, analytical, logical and problem solving skills to improve productivity by application of work study and work measurement techniques
4. Able to communicate effectively for bring out a harmonious industrial environment and favorable conditions for worker participation in management and also to maintain safe and accident free working environment
5. Able to understand need coordination with various agencies and sponsorships in mobilizing finances

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Khanna O P: Industrial Engineering And Management , 7th Edition, Dhanpat Rai & Sons, 2002
2. Mortand Telsang: Production And Operation Management, 2nd Edition, S. Chand, 2006

3. Ralph Barnes: Principles Of Motion And Time Study, Tata McGraw Hill, 1956
4. Joseph G Monks: Operation Management, 3rd Edition, McGraw-Hill, 1987

REFERENCES:

1. Adam & Edbert: Production/Operation Management, 5th Edition, Prentice Hall, 1992
2. Chary S.N.: Production and Operation Management,14th Reprint, Tata McGraw Hill, 2007
3. Buffa E S: Modern Production/Operation Management, 8th Edition, Wiley India, 2007
4. Clade S. George Jr : Management For Business Industry,1972.

MET 14 COMPUTER CONTROLLED MACHINE TOOLS AND METROLOGY

Lectures/Week : 4 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To discuss the numerical control and advances in numerical control with its applications.
2. To impart the knowledge in CNC Machines and part programming both by manual and by using APT Language.
3. To develop a knowledge in metrology by discussing basics and a discussion on screw thread measurement and gear measurement.
4. To develop a knowledge in comparators, angle measurement, straightness measurements, flatness and roundness measurement and co-ordinate measuring machines.
5. To develop a knowledge in surface measurement and different acceptance tests for machine tools and interferometry.

Course Content:

UNIT-I

Automatic screw lathes, Multi spindle automatic lathes, Turret lathes, Numerical Control, NC operation, Coordinate system, data input devices, Data storage, Programme editing, Machining centres, Turning centres. Vertical turning centres, Milling centres. Advantages of NC, Computers & NC, CNC, DNC, CAD/CAM, Computer graphics, Computer aided manufacturing, Robots, Flexibility in manufacture, Automatic sensing for FMS, Areas affected by FMS, Steps toward automatic factory.

UNIT-II

CNC part programming: Designation of co-ordinate axes for CNC machines, Functions of machine control units, Tape format, Manual part programming and computer assisted part programming (using APT language). Exercises involving simple contours and positioning of Part Drawings.

UNIT-III

ISO system of limits, Fits and Tolerances, Interchangeability, Plain limit gauges, Measurement of screw threads, major diameters, Minor diameters and effective diameter, Pitch, Limit gauges for internal and external threads, Measurement of spur gears, pitch, profile, lead, backlash, tooth thickness.

UNIT-IV

Tool maker's microscope, Straightness measurement, Slip gauges, Twisted strip mechanical comparator, Optical lever comparator, Optical projector, Sine bar, Angle gauges, Precision level, Autocollimeter, Angle dekkor, Optical dividing heads and rotary tables, Flatness measurement, Roundness measurement. Co-ordinate measuring machines.

UNIT-V

Surface Measurement: Parameters, sampling length, Specification, Stylus instruments. Acceptance tests for machine tools: Lathe, Milling machine, Radial drill, Laser equipment.

Interferometry – Types of interferometers – Laser Interferometer – Optimal Interferometer

Course Outcome:

1. Able to apply mathematics, science, computing and engineering knowledge to Computer Controlled Machine Tools and Metrology problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. An ability to carry out projects and research in interdisciplinary areas.
5. Acquire excellent programming, analytical, logical and problem solving skills.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries..
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Process & Materials of Manufacture : Lindberg R.A.
2. A Text Book of Engineering Metrology : Gupta I.C.
3. CNC and Computer Aided Manufacturing : Kundra T.K., Rao P.N. &
4. Tewari N.K.

REFERENCES:

1. Hand book of Industrial Metrology : A.S.T.M.E.
2. Hand book of Manufacturing Engineering : A.S.T.M.E.
3. Manufacturing Processes & Materials for Engineers : Doyle L.E. & others
4. Manufacturing Technology : Adithan
5. CAD & CAM / CIM : Radha Krishna P.

MET 15 OPERATIONS RESEARCH

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To formulate organizational problems into OR models like LPP, Transportation model for seeking optimal solutions.
2. To develop and analyze the transportation and transhipment problems.
3. To understand the replacement models and game theory models.
4. Conceptualize the Industrial problems related to Inventory models and fixed order interval systems.
5. To analyze the basic structure of queuing models and simulation.

Course Content:

UNIT-I

Introduction to general nature of operations research Models and their types

Introduction to LP Problems, examples, Graphical method of solution. Simplex Algorithm. Duality.

UNIT-II

Transportation and Assignment problems, Transhipment models and Traveling Salesman Problems

UNIT-III

Replacement models – replacement of items that deteriorate with time and group replacement of items that fail suddenly.

Game theory models – two persons zero sum games.

UNIT-IV

Inventory models, costs used in inventory models, Basic inventory models – deterministic and static demand. Models with price breaks - Models with restrictions. Single period models with probabilistic demand and without set up cost.

Inventory control: ABC Analysis. Fixed order quantity, Fixed order interval systems and S-s policy.

UNIT-V

Waiting line models – Basic structure of queuing models, single server and multi server models- Stress is only on applications.

Simulation – simple models in inventory and queuing systems.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Operations Research problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to carry out projects and research in interdisciplinary areas.
4. Acquire excellent programming, analytical, logical and problem solving skills.
5. An ability to use the techniques, skills, and modern engineering tools necessary for Operations Research.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test

2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Quantitative Techniques in Management : Vohra N. D.

REFERENCES:

1. Introduction to Operations Research : Hamdy A Taha
2. Introduction to Operations Research : Hiller and Lieberman
3. Introduction to Operations Research : Hira and Gupta
4. Operations Research : Pannerselvam R.

MET 16 DESIGN OF MACHINE MEMBERS-II

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

(Note: Use of Design data book is permitted during exam.)

Course Objectives:

1. Ability to understand Design Principles and their applications in the real world. To break the design problem into different elements and find the relevant solutions. Students will be able analyze and design the power transmission shafts carrying various elements with geometrical features.
2. Student will be able to understand the three aspects of bearing i.e friction, wear and lubrication. And also involving in designing of radial and thrust bearings.

3. Students will be able to design and analyze anti-friction bearings under static and dynamic load carrying capacities. Also, importance of manufactures catalogue in selection of bearing number and other related aspects.
4. Learning the terminology, force analysis and design of spur gears, helical gears and bevel gears along with the importance of dynamic and wear load.
5. Students will be able to learn in designing the engine components such as piston, connecting rod and crank shaft and manufacturing of engine components.

Course content

UNIT-I

Keys and Couplings:

Keys: Types of Keys; Design of shunk key. Effect of key way. Design of Splines.

Introduction, Types of Shaft Couplings: Design of Sleeve or muff couplings, Clamp or Compression coupling, Flange Couplings. Design of Bushed pin type flexible coupling.

UNIT-II

Sliding Contact Bearings:

Classification of Bearings, Hydrodynamic lubricated bearings; Materials for sliding contact bearings; Lubricants – Properties and their selection Terminology used in Hydrodynamic journal bearings. Design procedure for journal bearings – Design of bearing caps and bolts. Heat in bearings.

Thrust Bearings: Design of footstep bearing and collar bearings.

UNIT-III

Rolling Contact Bearings:

Merits and demerits of rolling contact bearings over sliding contact bearings. Types of rolling contact bearings. Static and dynamic load capacities. Equivalent bearing load. Design for cyclic loads. Reliability of a bearing. Selection of radial ball bearings. Stribeck's equation.

UNIT-IV

Gears:

Gears: Types of gears and their applications, gear materials allowable stresses. Law of gearing.

Spur gears: Terminology, force analysis, Design of spur gears – Lewis equation. Check for dynamic load and wear load. Gear wheel proportion.

Helical Gears: Terminology, design of helical gears. Check for wear load. Force analysis.

Bevel Gears: Terminology, Design of bevel gears.

UNIT-V

Engine parts:

Connecting rod: Thrust in Connecting rod – Stress due to whipping action on connecting rod ends – Cranks and Crank Shafts, Strength and proportions of overhang and center cranks – Crank pins, Crank shafts.

Pistons, forces acting on pistons – Construction Design and proportions of Pistons.

Course Outcome:

1. Able to apply mathematics, science, computing and engineering knowledge to Design of Machine Members problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. An ability to carry out projects and research in interdisciplinary areas.
5. Graduates will be aware of emerging technologies in Design of Machine Members and current professional issues and also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's

3. Suggested research papers.
4. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test
2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

TEXT BOOKS:

1. Machine Design : Kannaiah P.
2. Machine Design : Khurmi R.S. & Gupta
3. Design of Machine Members : Bandari V.B.
4. Mech. Engg. Design Data Hand Book : Mahadevan & Balaveera Reddy

REFERENCES:

1. Machine Design : Sundararaja Murthy T.V. & Shanmugan N.
2. Machine Design : Sarma and Agarwal
3. Machine Design : Jain R.K.
4. Data Book : P.S.G.College of Technology
5. Mech Engg. Design : Shigley J.E.
6. Machine Design : Pandya and Shah

MET 17 AUTOMOBILE ENGINEERING

Lectures/Week : 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT-I

Power Plants:

Types of engines, arrangement of cylinders, value arrangement of overhead, T-head, L-head, F-head engines, combustion chambers for petrol and diesel engines.

Liners- dry and Wet type, function and constructional details, Crank shaft – function and construction details.

UNIT-II

Air Cleaners:

Function and construction details. Exhaust manifolds – function and construction details. Fuel supply system – function and constructional details.

Carburetors:

Function and constructional details for simple, S.U.Solex, Carter, Zenith carburetors.

UNIT-III

Cooling system:

Need, thermo siphon and forced systems of water cooling, air cooling.

Lubrication:

Methods of engine lubrication. Lubrication and chassis transmission, SAE grading of lubricants and properties of lubricants.

Ignition System:

Coil and magneto systems. Storage battery, function and constructional details and rating of batteries, dynamo, cut-out, voltage and current regulator starter, drives, Bendix and over running clutch drive systems.

UNIT-IV

Transmission Systems:

Function of clutch, single plate and multiple plate, and centrifugal clutches and clutch materials, fluid coupling, torque converter.

Gear box, need, sliding type, constant and synchromesh type. Automatic transmission. Propeller shaft; need and constructional details.

UNIT-V

Front Axle:

Independent suspension systems, torsion bar, stub axle and front hub.

Rear axle:

Semi, three fourth and full floating systems, steering, linkages- Wheel alignment, caster camber, toe-in and toe-out. Power steering.

Brakes:

Mechanical, Hydraulic, Vacuum, Air and Pneumatic Systems. Arrangements of brake shoes, vehicle electrical and electronic systems.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries..
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Automobile Engineering : Narang G.B.S.
2. Automobile Engineering Vol. I & II : Kirpal Singh.

REFERENCES:

1. Automotive Mechanics : Heitner J.
2. I.C.Engines : Mathur M.L. & Singh R.P.
3. Fundamentals of Motor Vehicle Technology : Hillier & Pittuck
4. High Speed Combustion Engines : Heldt P.M.

5. Automotive Mechanics Services : Course W.H.
6. Motor Manuals Vol. I to VII : Judge A.W.

MET 18 COMPUTER GRAPHICS

Lectures/Week : 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. Students will be able to understand basic technology proficiency with industry standard hardware, software and protocols applicable to computer graphics, Graphic terminals and workstations.
2. Students will be able to learn the algorithms in generation of line, circle and 2D and 3D transformations of points and lines, such as translation, rotation, Scaling and mirroring
3. Students will learn generation of surfaces and their modeling techniques and also 2D and 3D modeling aspects of wireframe, surface and solid modeling.
4. Students will be able to analyze and generate Spine, Bezier, B-Spline curves and surfaces.
5. Students will be able to learn surface detection methods and their classifications.

Course content

UNIT-I

Fundamentals of CAD – The design process – Application of Computer for design benefits of CAD – Computer configuration of CAD applications – computer peripherals for CAD – Design work station – Graphic terminal.

UNIT-II

Geometry and line generation, computer graphics: Transformations – Points and lines transformation – translation, rotation, scaling, Mirror reflection; 2D and 3D transformations with routines – Mathematical formulations – Windowing and clipping

UNIT-III

Curve generation – plane curves – space curves – Surfaces description and generation – hidden line algorithm; modelling concepts:2D and 3D modelling – wireframe, Surface and solid modeling

UNIT-IV

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods.

UNIT-V

Visible surface detection methods: Classification, back-face detection, depthbuffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods

Course Outcome:

1. Able to apply mathematics, science, computing and engineering knowledge to Computer Graphics problems.
2. An ability to carry out projects and research in interdisciplinary areas.
3. Acquire excellent programming, analytical, logical and problem solving skills.
4. An ability to use the techniques, skills, and modern engineering tools necessary for Computer Graphics.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's

3. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test
2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

TEXT BOOKS:

1. "Computer Graphics C version", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

REFERENCES:

1. "Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
3. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
4. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
5. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
6. Computer Graphics, Steven Harrington, TMH.

CEP 62 FLUID MECHANICS AND HYDRAULICS MACHINERY LAB

Lectures/Week : 3periods

Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

Course objectives:

1. To conduct experiments on flow measuring devices, pipe-loss coefficients and performance characteristics of pumps and turbines.

List of Experiments:

2. Discharge Measurements:
3. Small Orifice
4. Venturi Meter
5. Orifice Meter
6. Triangular Notch
7. Rectangular Notch
8. Elbow Meter (Pipe-bend Meter)
9. Losses in Pipes:
10. Pipe Friction
11. Sudden Contraction
12. Sudden Expansion
13. Gate Value
14. Bend Loss
15. Determination of Efficiency in Pumps and Turbines:
16. 0.4 K.W Centrifugal Pump
17. 0.8 K.W Centrifugal Pump
18. 5.5 K.W Centrifugal Pump
19. Francis Turbine
20. Kaplan Turbine

Course out comes:

1. To calibrate the flow measuring devices.
2. To calculate loss coefficients for use in the pipe-flow analysis.
3. To prepare the characteristics curves of the pumps and turbines.

Contribution to outcomes:

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's

3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes:

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

MEP 06 MECHANICAL ENGINEERING LAB - II

Lectures/Week : 3periods

Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

(Any Eight of the following experiments will be given)

List of Experiments:

1. Load Test and Smoke Test on I.C. Engines.
2. Morse Test on Multi-Cylinder Engine.
3. Heat balance sheet on I.C. Engines.
4. Study of Multi-Cylinder and determination of its firing order.
5. Performance Test on Air Compressor.
6. Determination of pressure distribution around the given (1) cylinder (2) airfoil specimens kept in a uniform flow wind-tunnel.

7. Study of Automobile Mechanisms.
8. Verification of laws of balancing.
9. (a) Determination of ratios of angular speeds of shafts connected by Hooke's joint.

   (b) Determination of the ratio of times and ram velocities of Withwoth quick return motion mechanism.
10. To draw curves of slider displacement and crank angle and linear velocities w.r.t. times for a slider crank mechanism and compare with theoretical values.
11. To draw the crank angle vs. pressure diagram for an I.C. engine using pressure transducer and cathode ray oscilloscope.
12. Load Test and Emission Test with 5-Gas Analysis 2 smoke meter on four stroke diesel engine with Bio-diesel fuel.
13. Performance Test on centrifugal blower.
14. Economical Speed Test on volumetric efficiency test on I.C engine.
15. Retardation Test on an I.C. Engine.
16. Air fuel ratio & volumetric efficiency test on I. C. Engine.
17. Test for optimum flow rate of cooling water for an I. C. Engine.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test
2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

MEP 07 COMPUTER GRAPHICS LABORATORY

Lectures/Week : 3periods Credits: 2

Sessional marks: 40

End Examination Marks: 60

(Any Eight of the following experiments will be given)

Course Objectives:

1. Students will be able to understand basic technology proficiency with industry standard hardware, software and protocols applicable to computer graphics, Graphic terminals and workstations.
2. Students will be able to learn the algorithms in generation of line, circle and 2D and 3D transformations of points and lines, such as translation, rotation, Scaling and mirroring
3. Students will learn generation of surfaces and their modeling techniques and also 2D and 3D modeling aspects of wireframe, surface and solid modeling.

Course content

1. Writing Computer programs for line Algorithms
2. Writing Computer programming for Circle generation
3. Simple two dimensional transformation
4. Writing Computer programs to perform rotation for a given plane
5. Writing Computer program to perform translation for a given plane
6. Writing Computer program to perform scaling for a given plane
7. Writing Computer program for perform mirror reflection for a given plane.
8. Simple three dimensional transformations

9. Writing Computer programs to perform rotation of a unit cube
10. Writing Computer program to perform translation of a unit cube
11. Writing Computer program to perform scaling of a unit cube

Course Outcome:

1. Able to apply mathematics, science, computing and engineering knowledge to Computer Graphics problems.
2. An ability to carry out projects and research in interdisciplinary areas.
3. Acquire excellent programming, analytical, logical and problem solving skills.
4. An ability to use the techniques, skills, and modern engineering tools necessary for Computer Graphics

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test
2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

MET 19 ANALYSIS AND CONTROL OF PRODUCTION SYSTEMS

Lectures/Week : 4periods — Credits: 4

Sessional marks: 20 + 20

End Examination Marks: 60

Course Objectives:

1. Ability to understand analyzing the Manufacturing and production Principles and their applications to the humanity in the globe.

2. Learning of different layouts and basic layout facilities design principles of various industries and justification of space utilization in the manufacturing plant.
3. Development by learning through various techniques, capability to analyze and select the various criteria of developing different forecasting techniques, trend analysis based on the demand.
4. Planning effective schedules of any manufacturing system in order to meet the demand and target of customer's satisfaction levels.
5. Controlling utilization of manufacturing resources in the plant. And optimal stock maintenance of inventory levels. Effective material requirement planning and material flow path network diagrams in shop floor discussed.

Course Content

UNIT –I

The Production Paradigm – Production as a System – Types of Production Systems – Job type, Batch type, flow type and Project type – Group technology – Lean and Agile manufacturing

UNIT –II

Facility Location and Layout – Multi plant location – Locational dynamics – use of REL charts and Travel charts – Computer based layout technique viz. CRAFT, CORELAP etc.

UNIT –III

Planning – Manufacturing and Service Strategies – Aggregate Planning – Graphical Analysis - Forecasting – Moving Average, Exponential Smoothing. Assembly Line Balancing – Heuristics for Line Balancing.

UNIT –IV

Operations Scheduling – Job shops and flow shops: Sequencing n jobs – 2 machines, n jobs 3 machines, n jobs m machines – 2 jobs m machines. Priority Scheduling rules – Criteria and effectiveness – "Traveling salesman" Problem.

UNIT –V

Controlling – Project planning and controlling with PERT / CPM – MRP, JIT, KANBAN systems – LOB technique – MRP-II

Course Outcome:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
3. An ability to carry out projects and research in interdisciplinary areas.
4. Acquire excellent programming, analytical, logical and problem solving skills.
5. Graduates will be aware of emerging technologies in Analysis and Control of Production Systems and current professional issues. And also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Daily class room interaction

TEXT BOOKS:

1. Production and Operations Management : Adam and Ebert
2. Modern Production Management : Buffa E S

REFERENCES:

1. Automation, Production Systems and CIM : Groover M.P.
2. Operations Management : Joseph Monks
3. Production Planning and Inventory Control : Narasimhan Etal
4. Analysis and Control of Production Systems : Elsayed Etal

MET 20 MACHINE DYNAMICS AND VIBRATIONS

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Content

UNIT-I

FORCE ANALYSIS:

Introduction, Newton's Laws, applied and constraints forces, free body diagrams, condition for equilibrium, two and three force members and four force members, friction force modern, Static analysis of shaper.

Forces on reciprocation parts of engines, Inertia force analysis.

UNIT-II

BALANCING OF MACHINES:

Static and dynamic balance – balancing of rotating masses analysis and graphical methods. Balancing of reciprocating masses – Single and multi cylinder in line engines –

firing order. Balancing of radial and V engines. Partial balancing locomotive balancing – Variation of tractive effort, swaying Couple and Hammer blow – Practical Methods of balancing of rotors.

UNIT-III

VIBRATIONS:

Introduction – Single degree freedom system, Differential equation of motion – linear vibrations, Transverse vibrations of beams with concentrated and distributed loads – Dunkerly's Method – energy Method – equivalent shaft – torsional Vibration of two and three rotor systems – torsional vibrations of geared system – Whirling or critical speeds of shafts.

UNIT-IV

Damped and forced vibrations – Critical damping – damping ratio logarithmic decrement forced vibrations – Harmonic excitation amplitude and phase determination – dynamic magnifier, phase-plane representation.

UNIT-V

Forced transmitted and transmissibility vibration and shock isolation- Introduction to multi degree freedom system – differential equation of motion- general solutions, Normal modes, modal analysis, Practical applications.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries..
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Theory of Machines : Khurmi R.S.
2. Theory of Machines : Rattan S.S.
3. Mechanisms and Machine Theory : Rao J.S. and Dukkipati R.V.
4. Theory of Vibrations : Thomson

REFERENCES:

1. Theory of Machines and Mechanism : Joseph Edward Shigely
2. Theory of Machines : Thomas Bevan
3. Mechanical Vibrations : Denhartog
4. Principles of Vibration : Benson H.Tongue

MET 21 HEAT TRANSFER

Lectures/Week : 4 periods

Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To understand the various modes of heat transfer and the underlying principle and mechanism of heat transfer by conduction under steady state conditions and to acquire the necessary knowledge and ability to solve engineering heat transfer problems in one dimensional steady state conduction.

2. To understand the implications of unsteady state heat conduction phenomena and to comprehend the relevant equations and apply them to solve unsteady state heat conduction problems.
3. To be able to appreciate the radiation heat transfer phenomena and to acquire the necessary knowledge and abilities to analyze a given radiation heat transfer problem and find suitable design solution.
4. To comprehend the free and forced convection heat transfer phenomena and to understand the basic analytical and empirical approaches available for solving convective heat transfer problems commonly encountered in engineering practice.
5. To consolidate the basic knowledge of heat transfer and to apply the same to design heat transfer equipment and heat exchangers.

Course Content:

UNIT – I

General Modes of Heat Transfer – Fourier law of heat conduction, Newton's law of Cooling Basic equations – Coefficient of thermal conductivity convective

Heat transfer coefficient – Stephan Boltzmann constant – Overall heat transfer coefficient.

Conduction in steady state

Theory of heat conduction – conduction through slabs, cylinders and spheres

Homogeneous and composite – Concept of thermal resistance – critical thickness insulation – logarithmic mean area – concept of shape factor – one dimensional steady state conduction with heat addition

UNIT – II

Conduction in unsteady state periodic and a periodic temperature variance – infinite semi and infinite solids general equations for conduction in unsteady state – lumped capacitance method – transfer heat flow in semi infinite solid – convection boundary conditions – use of Grober / Heisler charts

UNIT – III

Radiation

Physical mechanism – radiation properties – concept of black body – gray body – Planck's Law – Stephan Boltzmann law – Radiation shape factor relations – Heat exchange between black bodies – heat exchange between non black bodies – introduction to radiation network analysis

UNIT – IV

Convection

Heat transfer due to free convection

Free convection heat transfer on a vertical flat plate – Empirical relations Free convection from vertical planes and cylinders – horizontal planes and cylinders

Heat transfer due to forced convection

Principles of convection – Laminar boundary layer on a flat plate thermal boundary layer – empirical relations – laminar and turbulent flows – heat transfer in laminar flow over a flat plate – heat transfer in turbulent flows – relations between fluid friction and heat transfer – heat transfer in laminar tube flow – turbulent flow in pipes – flow across cylinders and spheres

UNIT – V

Heat Exchangers

Introduction – overall heat transfer coefficient – fouling factors – types of heat exchangers – log mean temperature difference – effectiveness of heat exchangers – NTU method – Compact heat exchangers – different considerations

Heat transfer through extended surfaces

Theory of fins – fins of uniform cross sectional area – heat transfer calculations – fin efficiency – fin effectiveness

Course Outcomes:

1. Able to design, set up, and conduct engineering experiments for solving heat transfer problems and for verification of theoretical concepts and knowledge with practice.
2. Able to carry out projects and research in Heat Transfer in inter disciplinary fields.

3. Able to understand the impact of solutions to Heat Transfer problems in global, economic, environmental and social context by participating in technical paper presentation competitions ,quiz programs ,essay writing competitions and industrial visits.
4. Graduates will possess managerial and leadership skills with professional ethical practices and will understand the proper use of technical papers, copyrights, and patents, and recent advances in the field of Heat Transfer.
5. Recognize the need for and an ability to engage in life–long learning and comprehend the current professional issues.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Holman J P: Heat Transfer, 7th Edition, McGraw-Hill, 1989.
2. Sachdeva R C: Fundamentals of Engineering Heat and Mass Transfer, New Age
3. Science, 2009.
4. Kothandaraman: Fundamentals of Heat and Mass Transfer, Revised 3rd Edition, New Age International

REFERENCES:

1. Frank P Tancropera David P Dewitt: Introduction to Heat Transfer, 5th Edition, J. Wiley, 2002.

2. Ozisik: Heat Transfer, 1st Edition, McGraw-Hill, 1985.
3. Frank Kreith: Principles of Heat Transfer, 7th Edition, Cengage Learning, 2010.

MET 22 MECHANICAL MEASUREMENTS AND CONTROL

Lectures/Week : 3 periods Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To impart knowledge about the static characteristics and dynamic characteristics of a measurement system to estimate the performance of the system and also a discussion on a generalized measurement system by taking an example.
2. To introduce knowledge about types of transducers and a knowledge in pressure measurement.
3. To analyse the temperature measurement and flow measurement.
4. To study the strain measurement.
5. To develop a knowledge in various control systems used in the measurement systems.

Course Content:

Unit-I

Basic concepts: Introduction, Definition of terms – Span and Range, Readability, Sensitivity, accuracy, Precision, Threshold, Resolution and Hysterisis – Calibration standards. The generalized measurement system. Basic concepts in dynamic measurement – amplitude response, frequency response, phase response, delay time and time constant.

Analysis of experimental data and types of experimental errors. Combination of component errors in overall system accuracy. Method of least squares, Graphical analysis and curve fitting.

Unit-II

Transducers – Introduction, Loading of the Signal Source, Impedance matching, Electric transducer elements – advantages Variable resistance, Differential transformer, Capacitance, Piezoelectric and Ionization transducer.

Measurement of Pressure and Vacuum: Pressure measurement – liquid column elements, elastic elements, very high pressure measurement. High vacuum measurement – Mcleod gauge, Pirani gauge and Thermocouple vacuum gauge.

Unit-III

Measurement of Flow: Positive displacement meters, rotameters, turbine meter and magnetic flow meter, Measurement of fluid velocities – Pitot tubes, Yaw tubes, hot wire and hot film anemometer flow visualization methods.

Expansion Thermometers, Thermocouples, Resistance thermometers and Pyrometers.

Measurement of Force and Torque: Basic force measurement methods. Mass balance methods, hydraulic and pneumatic load cells and elastic elements for force measurement.

Unit-IV

Strain Measurement: Strain measurement by Electrical Resistance Strain gauge – Principle, Method of fixing, Measurement of output, Temperature compensation. Basic concepts on stress-strain measurement using photoelectric methods.

Vibration and acceleration measurement: Seismic instruments – Principle, application in the measurement of vibration and acceleration.

Unit-V

Control Systems: Classification of control systems – Open loop, Closed loop and automatic control systems, Concepts of servomechanism, process control and regulator. Transfer function, block diagrams, signal flow graphs and stability criterion . Hydraulic and pneumatic control systems.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Mechanical Measurements and Control problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. Recognition of the need for, and an ability to engage in lifelong learning and through Industry Institution Interaction programs.
4. Graduates will be aware of emerging technologies in Mechanical Measurements and Control and current professional issues. And also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.
5. An ability to use the techniques, skills, and modern engineering tools necessary for Mechanical Measurements and Control.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Mechanical measurements and Control Engg. : Kumar D.S.

REFERENCES:

1. Mechanical measurement : Sirohi R.S. and Radha Krishna H.C.
2. Experimental methods for Engineers : Holmen J.P.
3. Mechanical measurements : Beckwith T.G. & Lewis Buck N.
4. Measurement Systems(Application & Design) : Ernest O.Doebelin
5. Basic Instrumentation : Higgins O.
6. Engineering Measurements : Collet C.V.&Hope A.D.
7. Process Instruments and Controls Handbook :Doublas M.Considine

MEP 08 METROLOGY LAB

Lectures/Week : 3 periods

Credits: 2

Sessional marks: 40

End Examination Marks: 60

Course Objectives:

1. To understand the basic measurements.
2. To know the different types of measuring instruments .
3. To understand the different types of measurements.
4. To know how to determine the angle measurements.
5. To analyze the basic structure of surface measurement.

Course Content:

1. Calibration of any two of the following instruments: (using slip gauges)
    a. Calibration of Micrometer.
    b. Calibration of Mechanical Comparator.
    c. Calibration of Vernier Caliper.
    d. Calibration of Dial Gauge.
2. Measurement of taper angle using
    a. Bevel Protractor
    b. Dial Gauge
    c. Sine-Bar
    d. Auto-Collimator.

3. Alignment tests:
    a. Parallelism of the spindle
    b. Circularity & Concentricity of the spindle
    c. Trueness of running of the spindle.
    d. Gear testing:
4. To find;
    a. diameter, pitch/module
    b. pitch circle diameter
    c. pressure angle
    d. tooth thickness.
5. Check the straightness of a surface plate
    a. Using spirit level (or)
    b. Using Auto-collimator
6. Check the flatness of a surface plate using one of the above methods.
7. Using light wave interference:
    a. Study of flatness of slip gauges
    b. To find the height of a slip gauge.
8. Tool Maker's Microscope:
    a. Establish the thread details
    b. To find the cutting tool angles.
9. Miscellaneous:
    a. To find the diameter of a cylindrical piece
    b. Central distance of two holes of a specimen.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Metrology Lab problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. An ability to use the techniques, skills, and modern engineering tools necessary for Metrology Lab.

Contribution to outcomes

1. Laboratory Practice
2. Through Hands on experience
3. Visits to industries
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. A Text Book of Engineering Metrology : Gupta I.C.
2. CNC and Computer Aided Manufacturing : Kundra T.K., Rao P.N. & Tewari N.K.

MEP 09 HEAT TRANSFER AND DYNAMICS LAB

Lectures/Week : 3periods Credits: 2

Sessional marks: 40

End Examination Marks: 60

Course Objectives:

1. To know about different types of measuring instruments and test rigs.
2. Design and assemble experimental setup to determine the parameters affecting heat transfer rates in different modes of heat transfer and analyze and draw inferences on results of experimentation.
3. To understand the importance and to design and assemble suitable experimental set-ups for measurement of important machine design parameters such as cam profile analysis, vibration analysis, torsion measurement,

gyroscopic couple and balancing of reciprocating masses and to verify theoretical knowledge with experimental results and draw meaningful inferences.

4. Develop, design, modify, utilize and experiment with commonly available simple tools and materials to determine relevant heat transfer parameters.

List of Experiments:

1. Test on Conduction in Composite Slab System.
2. Test on Thermal Conductivity of Solids.
3. Test on Thermal Conductivity of a Metal Rod.
4. Test on Emissivity Measurement Apparatus.
5. Test on Lagged Pipe Apparatus.
6. Test on Steffan-Boltzman Apparatus.
7. Test on Concentric Tube Fin Type-Heat Exchanger.
8. Test on Natural Convection Apparatus.
9. Test on Forced Convection Apparatus.
10. Test on Drop-wise Condensation Apparatus.
11. Test on Vapour Compression Refrigeration System.
12. Test on Air-Conditioning Test Rig.
13. Test on Gyroscopic Unit.
14. Test on Balancing of Reciprocating Masses.
15. Test on Critical Speed Analyzer.
16. Test on Vibration Test Rig.
17. Test on Cam Apparatus.
18. Study on Instrumentation
19. Strain Measurement Module.
20. Torque Measurement Module.
21. Load Cell.
22. Pressure Measurement.
23. Calibration of Pressure Gauge.

Course Outcomes:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
3. An ability to carry out projects and research in interdisciplinary areas.
4. Recognition of the need for, and an ability to engage in lifelong learning and through Industry Institution Interaction programs.
5. An ability to use the techniques, skills, and modern engineering tools necessary for Heat Transfer and Dynamics Lab.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

MEP 10 CAD AND CAM LAB

Lectures/Week : 3periods

Credits: 2

Sessional marks: 20 +20

End Examination Marks: 60

CAD Laboratory

The following drafting tools should learn by the student using any Drafting software and using these tools the student should be able to plot orthographic projections and 3D assembly drawing

1. Drafting Aids
2. Editing of Drawing,
3. Symbols library
4. 2D Drawing
5. 3D Geometric Modeling
6. 3D Wire frame Modeling
7. 3D Surface Modeling
8. 3D Solid Modeling
9. Commands to generate profiles based on 3D Solids and
10. 3D Drawing.

Using above drawing tools, drawing of machine components are given as exercises. Minimum of 8 components of detailed drawings should be drawn.

Text Books:

1. Bhatt N D and VM Panchal, Engineering Drawing Revised Edition, Chrotar Publications, 2010
2. Dhananjaya A Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata Mc- Graw Hill – 2009.
3. Gautam Pohit, Gautam Gosh – Machine Drawing with Auto Cad- Pearson Publishers

CAM Laboratory

1. Part programming on Turning and Milling Machines and Execution on simulator
2. Exercises on Coordinate Measuring machine CMM:
3. Determination of dimensions of the given object.
4. Determination of angle between two surfaces

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Daily class room interaction

MEP 26 FINITE ELEMENT METHOD

Lectures/Week : 4periods Credits: 4

Sessional marks: 20+20

End Examination Marks: 60

Course Objectives:

1. Possess a good understanding of the theoretical basis of the weighted residual Finite Element Method.
2. Be able to implement the Galerkin residual weak formulation into the Finite Element Method for the solution of Ordinary and Partial Differential Equations, using mathematical software such as Maple.
3. Be able to use the commercial Finite Element package ANSYS to build Finite Element models and solve a selected range of engineering problems.
4. Be able to validate a Finite Element model using a range of techniques.
5. Be able to communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.
6. Be able to discuss the accuracy of the Finite Element solutions.

Course Content

UNIT-I:

Basic Concepts of the Finite Element Method – Introduction, How does the FEM work – Comparison of Finite Element and Exact Solutions and Comparison of Finite Element and Finite Difference Methods. A General Procedure for Finite Element Analysis – Pre-Procession, Solution and Post-Processing. Brief History of Finite Element Method, Examples of Finite Element Analysis.

UNIT-II:

Stiffness Matrices, Spring and Bar Elements – Linear Spring as a Finite Element – System Assembly in global coordinates, Elastic Bar, Spar/Link/Truss Element, Strain Energy, Castigliano's First Theorem, Minimum Potential Energy.

UNIT-III:

Method of Weighted Residuals – Approximate Solution by Ritz, Galerkin Methods. Finite Element Formulation of one-dimensional problems – Derivation of Element Stiffness and Element Force Matrices – Solving 1D Structural engineering problems and 1D heat transfer problems – fins and composite walls.

UNIT-IV:

Flexural Elements – Introduction, Elementary Beam Theory, Flexure Element, Flexure Element Stiffness Matrix, Element Load vector, Work Equivalence for Distributed loads. Hermite Shape functions. 2D elements – linear triangular, bilinear rectangular and quadrilateral elements.

UNIT-V:

FEA of 2D structural and heat transfer problems, Constant Strain Triangle (CST), Jacobian, isoparametric and serendipity elements – Numerical Integration – Gauss Quadrature – Computer Implementation in FEM.

Course Outcome:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to carry out projects and research in interdisciplinary areas.
3. Graduates will possess managerial and leadership skills with professional ethical practices and will understand the proper use of technical papers, copyrights and patents, recent advances in Finite Element Method field.
4. Able to understand the impact of Finite Element Method solutions in a global, economic, environmental, and societal context by participating at national level competitions like technical paper presentation, quiz programs, essay writing competitions, Industrial tours, Alumni association.
5. Recognition of the need for, and an ability to engage in lifelong learning and comprehend the current professional issues.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Video lectures through NPTEL (if required).

Assessment of outcomes

1. Sessional test
2. End term exam
3. Tutorials for each unit
4. Daily class room interaction

TEXT BOOKS:

1. Fundamentals of Finite Element Analysis : David V. Hutton.
2. An Introduction to Finite Element Method : Reddy J.N.

REFERENCES:

1. Introduction to Finite Elements in Engineering : Chnandrupatla T.R.& Belegundu A.D.
2. Finite Element Procedures : Klaus-Jurgen Bathe

MET 29 TOOL DESIGN (SI UNITS)

Lectures/Week : 4periods Credits: 4

Sessional marks: 20+20

End Examination Marks: 60

Course Objectives:

1. To impart overall Knowledge of about the metal cutting operations.
2. Ability to analyse wear and tool life of single point cutting tool.
3. To analyse material characteristics, and the knowledge about basic need for various types of tools.
4. To know about the various press working operations and their capable analyzing the economic costs of tools.
5. To impart the basic principles of jigs and Fixtures.

Course Content:

UNIT –I

Cutting Tools Classification – Nomenclature of single point cutting tool – Difference between orthogonal and oblique cutting – Mechanism of metal cutting – Types of chips – chip breakers – Forces acting on a tool – Merchant circle diagram – Velocity relations – specific energy in cutting.

UNIT-II

Tool Wear – Tool life – Factors affecting tool life – Taylor's Tool life Equation – Tool wear mechanisms – Types of tool wear – Heat distribution in metal cutting – Measurement of temperature in metal cutting – Lathe tool Dynamometer – Cutting fluids – Selection and applications.

UNIT-III

Cutting Tool Materials- Requirements of tool materials, advances in tool materials, HSS, Coated HSS, Carbides ,Coated Carbides, Ceramics, Cold pressed, Hot Pressed , Ceramic composites, CBN, Diamond- properties, Advantages and limitations; Specifications for Inserts and tool holders. Design of single point cutting tool and form for Lathe work- Design of Milling and Broach tools.

UNIT- IV

Press Working and Economics of Machining: Press working operations- Press selection and Tonnage- Centre of Pressure- Cutting forces and clearances for Die Design – Compound and Progressive Die, Strip layout. Costs associated with machining operations- Optimum cutting speed for minimum cost and maximum production, cutting speed for minimum cost in Turning.

UNIT-V

Jigs & Fixtures- Uses- Locating devices, 3-2-1 principle of location – pin location- Radial location- 'V' location- Diamond locators. Types of clamping devices- principles of clamping. Design principles to Jigs & Fixtures – Drill Jigs, types- Drill Bushes, types- Fixtures for Turning, Milling and Welding.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Tool Design problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. Graduates will be aware of emerging technologies in Tool Design and current professional issues. And also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.
4. An ability to use the techniques, skills, and modern engineering tools necessary for Tool Design.

5. Recognition of the need for, and an ability to engage in lifelong learning and through Industry Institution Interaction programs.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries..
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Fundamental of Tool Design : ASTME
2. Tool Design : Donaldson

REFERENCES:

1. Fundamental of Metal Cutting and Machine Tools : Juneja and Sekhan
   (New Age International Publishers)
2. Metal Cutting Principles : Milton C.Shaw
   (Oxford University Press)
3. Jigs and Fixtures : Kempster
4. Tool Design : Pollack

MET 28 QUALITY CONTROL AND RELIABILITY ENGINEERING

Lectures/Week : 4periods Credits: 4

Sessional marks: 20+20

End Examination Marks: 60

Course Objectives:

1. To analyse the concept of statistical quality control and also to draw the variable interpretation of control charts.
2. To expose the process capability and their limited control limits.
3. To develop in the students an overall knowledge about new product design,producer risk and consumer risk activities.
4. To analyse the reliability and failure rate for development of new product.
5. To impart knowledge in the students about the specifications and standards of total quality management.

Course Content:

Unit-I

Introduction to Inspection and Quality Control, Objectives of Statistical Quality Control, Chance and Assignable Causes of variation, Control chart basic principles, Choice of control limits, Sample frequency and rational subgroups.

Control charts for variables: X and R charts and σ charts, Interpretation of control charts.

Unit-II

Process Capability Analysis: Specification limits and Control limits, Natural tolerance limits, Specifications and Process Capability, Process Capability indices, setting tolerances on assemblies and components.

Control Charts for Attributes: P chart, C chart, U chart, Sensitivity analysis of P charts, Quality Rating System.

Unit-III

Acceptance Sampling Plans for Attributes: Types of Sampling Plans, Advantages and disadvantages of Sampling Plans, Evaluation of Sampling Plans – OC, Curve, Characteristics of OC Curve, Producer risk and Consumer risk, AOQ, AQL, ATI, ASN. Multiple and Sequential sampling plans. Brief introduction to Acceptance Sampling plans for continuous production and Acceptance sampling plan for variables.

Unit-IV

Reliability: Concepts of reliability, Scope, Importance of reliability, Reliability data collection- Failure data analysis: MTTF, MTBF, Failure rate, Hazard rate, reliability, Failure rate curve, Types of failures – Hazard models (Exponential and Weibull).

System Reliability: Series, Parallel and Mixed configurations.

Reliability Improvement: Active and Standby redundancies, Introduction to Fault Tree Analysis, Maintainability and Availability.

Unit-V

Quality Costs: Prevention, Appraisal, Internal failure and External failure costs, Quality and Productivity, Total Quality Management, Quality function deployment, Tools for continuous quality improvement. Quality Circles: Concepts, Objectives and advantages. Introduction to Six Sigma Concept. Features of ISO 9000 quality system-Classification, Need, advantages and limitations.

Course Outcomes:

1. Able to apply mathematics, science, computing and engineering knowledge to Quality Control and Reliability Engineering problems.
2. Able to design, set up, and conduct engineering experiments and analyze the results.
3. Graduates will be aware of emerging technologies in Quality Control and Reliability Engineering and current professional issues.
4. Also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.
5. An ability to use the techniques, skills, and modern engineering tools necessary for Quality Control and Reliability Engineering.

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries..
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

TEXT BOOKS:

1. Fundamentals of Quality Control and Improvement : Amitava Mitra
2. Statistical Quality Control : Gupta R.C.

REFERENCES:

1. Quality Control – A Practical Approach : Besterfield H.Dale
2. Statistical Quality Control : Grant E.L.
3. Concepts in Reliability Engineering : Srinath L.S.

MET 30 COMPUTER INTEGRATED MANUFACTURING

Lectures/Week : 4periods Credits: 4

Sessional marks: 20+20

End Examination Marks: 60

Course Objectives:

1. To get sufficient knowledge on the present level of automotives use in the global industries and train the students according to current trends in the firms.
2. Getting the required knowledge on the different machining environments and machinery used in global industries.
3. Training and giving sufficient knowledge on how to handle materials in the firm operating from one machine to another machine during a process.

4. Acquiring sufficient knowledge and expertise of sharing and getting information of the process parameters by using different sharing technologies used in global environment.
5. Expertise the students in different simulation techniques used in firm and global environment.

Course Content

UNIT-I

AUTOMATION:

Types of Automation, Reasons for Automation, CAD, CAM, CIM, FMS, CAPP, Concepts. Conventional Manufacturing Vs CIM, Functions in Manufacturing, Processing Operations, Organization, Database for CIM, Shop Floor Control, Factory data collection systems, Business Functions, e-Governance, e-Manufacturing.

UNIT-II

NC, DNC and CNC:

NC- Position and Motion control in NC, Accuracy and Repeatability, Basic types of Machining Processes – Punched tape and Taped format – Part Programming Methods: Manual Part Programming, Computer Assisted Part Programming (including APT and Mohr's statements), Manual Data Input, NC Part Programming using CAD/CAM, Computer Automated Part Programming.

UNIT-III

Materials Handling:

Analysis of M.H. Systems, Design Considerations of conveyor systems. Automated Guided Vehicle Systems (AGVS). Definition, Types, Vehicle guidance technologies, applications. Analysis of AGVS. Applications of Robots in Material Handling.

Material Storage:

Storage system performance, Automatic Storage and Retrieval Systems(AS/RS), Definition, concepts, types, basic components, application. Concept of automated WIP storage, advantages. Interfacing handling and storage with manufacturing.

UNIT-IV

Adaptive Control (AC): Concepts, Types of AC Systems, Working and benefits. Automatic identification of Bar code, Radio frequency, magnetic strip, OCR, and Machine Vision Technology (concepts). Information Retrieval; Computer Networks in Manufacturing. Hierarchy of concepts in Manufacturing, Advantages

Network Topologies:

Star, Ring, Bus, LAN, WAN, Communication and Transmission – Twisted Pair Wire, Coaxial Cable, Fibre Optic lines, Manufacturing Automation Protocol (MAP).

UNIT-V

Simulation in Manufacturing: Definition, different types of Simulation, simulation methodology, applications of simulation in manufacturing, advantages and drawbacks of simulation, salient features of the simulation languages like GPSS, SIMSCRIPT, SIMAN/ CINEMA and SLAM. Salient features of simulation packages in manufacturing and materials handling like Auto Mod-II, Promodel, SIM FACTORY, X cell +, and Quest. Economic Justification of CAD/CAM/CIM Technologies in Indian Context.

Course Outcome:

1. Able to design, set up, and conduct engineering experiments and analyze the results.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
3. An ability to carry out projects and research in interdisciplinary areas.
4. Graduates will be aware of emerging technologies in Computer Integrated Manufacturing and current professional issues. And also graduates will be able to gain insight into the recent advancements and the current changes in Industrial scenario.

5. An ability to use the techniques, skills, and modern engineering tools necessary for Computer Integrated Manufacturing.

Contribution to outcomes will be achieved through

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Suggested research papers.
4. Video lectures through NPTEL.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Daily class room interaction

TEXT BOOKS:

1. System Approach to CIM : Nana Singh
2. Computer Integrated Manufacturing : Vajpay

REFERENCES:

1. Automation, Production System and CIM : Groover M.P.
2. CAD/CAM/CIM : Radha Krishnan, S.Subramanyam
3. CAD/CAM : Besant and Lui
4. CAD/CAM : Rao P.N.
5. Simulation Modeling and Analysis : Law, Kelton

MET 61 MECHANICAL TECHNOLOGY

Lectures/Week : 4 periods Credits: 4

Sessional marks: 20 +20

End Examination Marks: 60

Course Objectives:

1. To introduce basics of gears
2. To impart knowledge about the boilers.
3. To discuss the IC Engines and its types
4. To know about gas turbines and classification, merits and working of gas turbines, uses and fuels of gas turbines.

Course Content:

UNIT-1:

TRANSMISSION OF MOTION: Gears- Introduction, type of gears, fundamental law of gears, relative velocity between gear teeth, gear tooth forms, comparison between involutes and cycloidal tooth profiles, Introduction to gear trains.

BELTS AND ROPES: Introduction, types of belts, velocity ratio, effect of slip, law of belting, Length of open and cross belt, Angle of arc of contact, Ratio of belt tensions, Power transmitted, Initial belt tension, effect of initial tension on power transmission, belt materials.

UNIT- 2:

BOILERS – Classification of boilers, comparison between fire tube and water tube boilers-selection of boiler, Essentials of good steam boiler-boiler terms-fire tube boilers-simple vertical and locomotive boiler, water tube boilers-Babcock and Wilcox boiler-boiler mounting and accessories (functions only)

UNIT- 3:

STEAM ENGINES: Steam Engines parts and description, working of single cylinder steam engines and compound steam engine.

STEAM TURBINES: Classification, advantage of steam turbine, uses of steam turbines, description, common type of turbines.

CONDENSORS: Classification, organs of steam condensing plant, principles of working condensers such as jet condenser and surface condenser.

UNIT– 4:

I C ENGINES- Classification, application of IC Engines,different part of IC Engines,two stroke and four stroke cycle engine, comparison of two stroke and four stroke cycle engines, comparison of spark ignition(SI) and combustion ignition(CI) engines-fuel system,cooling system and lubrication system.

TESTING OF IC ENGINES-Indicated power (IP), Brake power (BP), Friction power (FP), Mechanical and brake thermal efficiencies (simple problems)

UNIT-5:

GAS TURBINES-Classification, Merits of Gas Turbines, Constant pressure,Combustion Turbines: Open cycle gas turbine,closed cycle gas turbine,constant volume combustion turbine-uses of gas turbine,Gas turbine fuels.

JET PROPULSION- Turbojet, Ramjet and Turbo-propulsion.

Course Outcomes:

1. An ability to function on multidisciplinary teams
2. The broad education necessary to understand the impact of course solutions in a global, economic, environmental and societal context
3. A recognition of the need for and an ability to engage in life long learning
4. An ability to transform their concepts of economics into practical application.
5. An ability to technology transfer

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Practical Sessions
4. Expert lecture from industries.

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students

Text books:

1. Theory of Machines by Sadhu Singh
2. Thermal Engineering by R.K. Kurmi
3. Elements of Mechanical Engineering by Roy and Chowdary