III rd SEMESTER

CATEGORY: - BSC

SUBJECT CODE: -BE-31

SUBJECT NAME: -MATHEMATICS-III

TOTAL - 60 HOURS

OBJECTIVES:

The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and¬ transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace¬ transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering?
- To acquaint the student with mathematical tools available in Statistics needed in various¬ field of science and engineering

Module 1

Numerical Methods – 1: Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. **(08 Hours)**

Module 2:

Numerical Methods – 2 Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method. **(08 Hours)**

Module 3

Numerical Methods – 3: Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial

differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and CrankNicholson methods), Finite difference explicit method for wave equation. **(08 Hours)**

Module 4

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms. **(08 Hours)**

Module 5

Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution. **(07 Hours)**

Statistics

Module 6

Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. **(07 Hours)**

Module 7

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. **(07 Hours)**

Module 8

Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances -Chi-square test for goodness of fit and independence of attributes. **(07 Hours)**

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in calculus, Multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of

mathematics and applications that they would find useful in their disciplines.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd

III rd SEMESTER

CATEGORY: - BSC

SUBJECT CODE: -BE-32

SUBJECT NAME: -BIOLOGY

TOTAL - 60 HOURS

OBJECTIVES

Students will be introduced to the basics of biology such as cell structure and functions, inheritance & evolution, basic concepts of genetics, and an introduction to microbiology

UNIT-I

INTRODUCTION

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry. **(07 Hours)**

UNIT-II

CLASSIFICATION

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli,

S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus. **(07 Hours)**

UNIT-III

GENETICS

Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

(07 Hours)

UNIT-IV

BIMOLECULAR

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids. **(07 Hours)**

UNIT-V

ENZYMES

Purpose: To convey that without catalysis life would not have existed on earth Enzymologist: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis. **(07 Hours)**

UNIT-VI

INFORMATION TRANSFER

Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. **(07 Hours)**

UNIT-VII

MACROMOLECULAR ANALYSIS

Purpose: How to analyse biological processes at the reductionist level Proteins-structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements. **(06 Hours)**

UNIT-VIII

METABOLISM

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge. **(06 Hours)**

UNIT-IX

Microbiology

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

(06 Hours)

Course Outcomes

After studying the course, the student will be able to:

Describe how biological observations of 18th Century that lead to major discoveries.Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological Highlight the concepts of excessiveness and dominance during the passage of genetic material from parent to offspring Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine Classify enzymes and distinguish between different mechanisms of enzyme action.Identify DNA as a genetic material in the molecular basis of information transfer.Analyse biological processes at the reductionist level Apply

thermodynamic principles to biological systems. Identify and classify microorganisms.

References:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

III rd SEMESTER
CATEGORY: - BSC
SUBJECT CODE: -BE-33
SUBJECT NAME: - PHYSICS-II
INTRODUCTION TO ELECTROMAGNETIC THEORY

TOTAL -60 HOURS

OBJECTIVE:

The students are to be learn the below mentioned:

- Electrostatic in vacuum
- Electrostatic in linear dielectric medium
- Magnenostator in linear magnetic medium
- Faraday's law
- Electromagnetic waves

Module 1: Electrostatics in vacuum

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl ofelectrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect; Boundary conditions of electric fieldand electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

(9 HOURS)

Module 2: Electrostatics in a linear dielectric medium

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field. **(9 HOURS)**

Module 3: Magnetostatics

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution forgiven current densities. **(9 HOURS)**

Module 4: Magnetostatics in a linear magnetic medium

Magnetization and associated bound currents; auxiliary magnetic field ; Boundary conditions on and . Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and feromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials. **(9 HOURS)**

Module 5: Faraday's law

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field. **(8 HOURS)**

Module 6: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations

Continuity equation for current densities; Modifying equation for the curl of magnetic field tosatisfy continuity equation; displace current and magnetic field arising from time-dependent electric field; calculating magnetic field due to changing electric fields in quasi-static Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields. **(8 HOURS)**

Module 7: Electromagnetic waves

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence. **(8 HOURS)**

OUTCOME:

- Experimental exposure to electromagnetic induction and electromagnetic breaking.
- LC circuit and LCR circuit
- Resonance phenomenon in LCR circuit
- Magnetic field from Helmholtz coil
- Measurement of Lorentz force in a vacuum tube

BOOKS

(i) David Griffiths, Introduction to Electrodynamics
(ii) Halliday and Resnick, Physics
(iii) W. Saslow, Electricity, magnetism and light
(iv) edminister, j.a. electromagnetics physics, mc graw hill
(v) Walli, s. electromagnetics theory tech max pub. pune

III rd SEMESTER

CATEGORY: - ESC

SUBJECT CODE: - ME-31

SUBJECT NAME: -MACHINE DRAWING & DESIGN

TOTAL - 60 HOURS

OBJECTIVES:

This course seeks to provide an introduction to the design of machine elements commonly encountered in mechanical engineering practice, through

1. A strong background in mechanics of materials based failure Criteria underpinning the safety-critical design of machine components
2. An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations
3. An overview of codes, standards and design guidelines for different elements
4. An appreciation of parameter optimization and design iteration
5. An appreciation of the relationships between component level design and overall machine system design and performance

UNIT I

Drawing conventions; drawing and dimensioning IS codes, sectional views and sectioning, surface finish and tolerances, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, gears. Rivet heads and Riveted joints, types of welded joints and representation.

(15 Hours)

UNIT II

Assembly Machine Drawing: Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data; Cotter and Knuckle joints, pedestal and footstep bearings, crosshead, stuffing box, IC engines parts - piston and connecting rods; lath machine parts. **(15 Hours)**

UNIT III

Introduction to Compute Aided Drafting software for 2D and 3D Modeling, Basic design concepts, design process, stages/phases in design, flowchart,

problem formulation, design considerations (strength, manufacturing, maintenance, environment, economics and safety); design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design. **(15 Hours)**

UNIT IV

Design of components subject to static loads: riveted joints, welded joints threaded joints, pin, key knuckle, and cotter joints. **(15 Hours)**

COURSE OUTCOMES:

Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components.

References:

1. Bhat, ND; Machine Drawing; Charotar
2. Singh A; Machine Drawing; TMH
3. Narayana and Reddy; Machine Drawing; New age, Delhi.
4. Agarwal and agrawal; Engineering Drawing; TMH
5. Shigley JE et al; Mechanical Engineering Design, TMH
6. John KC; Text Book Of Machine Drawing; PHI Learning
7. Kulkarni SG; Machine Design; TMH
8. Mubeen and Mubeen; Machine Design.
9. Bhandari VB; Design of Machine elements; TMH
10. Sharma PC, Agarwal DK; Machine Design; Katson
11. Luzzader WJ, Duff JM; Fundamental of Engg Drawing Interactive Graphics; PHI.
12. PSG Design data book
13. Mahadevan and Reddy's Mechanical design data book

List of Experiments (Pl. expands it):

1. Computer Aided Drafting of simple machine parts
2. 3D modeling of simple solid shapes
3. Design and drawing of parts contained in the syllabus

III rd SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME-32

SUBJECT NAME: -STRENGTH AND MECHANICS OF MATERIALS

TOTAL - 60 HOURS

OBJECTIVE

The objective of this Course is to introduce to continuum mechanics and material modeling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design. The overarching theme is a unified echanistic language using thermodynamics, which allows understanding, modelling and design of a large range of engineering materials. The subject of mechanics of materials involves analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system. The behavior of a member depends not only on the fundamental laws that govern the equilibrium of forces, but also on the mechanical characteristics of the material. These mechanical characteristics come from the laboratory, where materials are tested under accurately known forces and their behavior is carefully observed and measured (learnt in the previous course on Materials, Testing & Evaluation). For this reason, mechanics of materials is a blended science of experiment and Newtonian postulates of analytical mechanics.

To familiarize the students with the fundamentals of deformation, stresses, strains in structural elements.

UNIT I

Mechanical properties of materials: Ductility, malleability, hardness, toughness, fatigue, creep; behavior of materials under tension, compression, bending, shear; ductile and brittle materials, failure of MS and CI in tension and torsion.

Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, bearing stress, analysis of simple structures, stepped rods, members in series and parallel: stress strain diagram, Hooke's law, modulus of elasticity, elastic and plastic behavior of materials, deformation under axial loading, statically indeterminate problems, stress due to

temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials, strain energy under axial loads and stresses due to impact of falling weights. **(12 Hours)**

UNIT II

Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application to two and three dimensional analysis, ductile and brittle failures, transmission shaft under combined bending and torsion; stresses in thin walled pressure vessel. **(12 Hours)**

UNIT III

Bending: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

(12 Hours)

UNIT IV

Torsion in shafts: stresses in a shaft, deformation in circular shaft, angle of twist, stepped- hollow, thin walled-hollow transmission shafts Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring, springs in series and parallel. **(12 Hours)**

UNIT V

Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions Columns: stability of structures, Euler's formula for columns with different end conditions, Rankin's formula. **(12 Hours)**

OUTCOMES:

At the completion of this course, students should be able to 1. Know the concepts of stress and strain. 2. Analyze the beam of different cross sections for shear force, bending moment, slope and deflection. 3. Understand the concepts necessary to design the structural elements and pressure vessels.

References:

1. Beer FP, Johnson ER, Dewolf JT Mechanics of Materials; TMH
2. Rattan; Strength of materials; TMH
3. Nash William; Schaum's Outline Series; Strength of Materials; TMH.
4. Negi ; strength of materials; TMH
5. Singh Arbind K; Mechanics of Solids; PHI
6. Sadhu Singh; Strength of Materials; Khanna Pub.
7. Kamal K and Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

List of experiments (Pl. expands it):

1. Standard tensile test on MS and CI test specimen
2. Direct/ cross Shear test on MS and CI specimen
3. Transverse bending test on wooden beams to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/ Charpy impact test

III rd SEMESTER

CATEGORY: - LC

SUBJECT CODE: -BE-34

SUBJECT NAME: -JAVA PROGRAMMING

TOTAL - 60 HOURS

COURSE OBJECTIVES:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. Be aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Be able to use the Java SDK environment to create, debug and run simple Java programs.

UNIT-I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes. **(12 Hours)**

UNIT-II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections. **(12 Hours)**

UNIT-III

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle.

(12 Hours)

UNIT-IV

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips. **(12 Hours)**

UNIT-V

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

(12 Hours)

COURSE OUTCOMES

1. Knowledge of the structure and model of the Java programming language, (knowledge)
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language, (application)

References:

1. Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
2. E. Balaguruswamy, "Programming In Java"; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, "Peter Norton Guide To Java Programming", Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be made (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write Programs to show Inheritance and Polimorphism.
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a Program to show Data Base Connectivity Using JAVA
10. Write a Program to show "HELLO JAVA" in Explorer using Applet
11. Write a Program to show Connectivity using JDBC
12. Write a program to demonstrate multithreading using Java.
13. Write a program to demonstrate applet life cycle.

III rd SEMESTER

CATEGORY: - PDFS

SUBJECT CODE: -BE-35

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-I

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. In this regard, an effort is made to improve the knowledge with respect to basic in English, mathematics, aptitude and reasoning.

UNIT-I

Conversational English:

Grammar mainly Tenses, 100 small sentences of daily use tense wise, Letter Writing, Standard Format for CV writing. **[12 hrs]**

UNIT-II

Basic Mathematics:

Arithmetic, Algebra, Unit Conversions.

Arithmetic

Number system, Decimals, Fractions, Simplification, HCF and LCM. Ratio and proportion, percentage, partnership, Average, profit and Losses, Simple Interest and Compound Interest, Mensuration, Time and work ,Time and Distance, Data Interpretation , Trigonometry Basics ,etc.

Algebra

Basics Algebraic Formulae, Linear Equations, quadratics Eqations,Logarithms,Functions, Permutation and Combination, Binomial Theorem , Series (AP,GP,HP).Unit conversion SI,FPS,MKS,CGS

(12 -HOURS)

UNIT-III

Aptitude / Reasoning

Quantitative Aptitude and Logical Reasoning- Level-1

Problem solving on.

Number System, problems on Ages, Number Theory, Algebra, Clocks and Calendars.

Alphabet Test, Series Completion, Coding- Decoding, Logical Sequence, Insert

missing figures. **(12 -HOURS)**

OUTCOME

The students have gained confidence after improving their English, Math, and Aptitude and reasoning abilities.

IVth SEMESTER

CATEGORY: - HSMC

SUBJECT CODE: -BE-41

SUBJECT NAME: -ENGG. ECONOMICS AND ACCOUNTING

TOTAL - 60 HOURS

OBJECTIVE

- The student be made aware of Managerial Economocs, Demand and supply Analysis, cost analysis, pricing and financial accounting.

UNIT I:

INTRODUCTION

Managerial Economics – Relationship with other disciplines – Firms: Types, objectives and goals – Managerial decisions – Decision analysis. **(12 Hours)**

UNIT II

DEMAND & SUPPLY ANALYSIS

Demand – Types of demand – Determinants of demand – Demand function – Demand elasticity – Demand forecasting – Supply – Determinants of supply – Supply function – Supply elasticity. **(12 Hours)**

UNIT III

PRODUCTION AND COST ANALYSIS

Production function – Returns to scale – Production optimization – Least cost input – Isoquants – Managerial uses of production function. Cost Concepts – Cost function – Types of Cost – Determinants of cost – Short run and Long run cost curves – Cost Output Decision – Estimation of Cost. **(12 Hours)**

UNIT IV

PRICING

Determinants of Price – Pricing under different objectives and different market structures

– Price discrimination – Pricing methods in practice – role of Government in pricing control. **(12 Hours)**

UNIT V

FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT)

Balance sheet and related concepts – Profit & Loss Statement and related concepts – Financial Ratio Analysis – Cash flow analysis – Funds flow analysis – Comparative financial statements – Analysis & Interpretation of financial statements. Investments – Risks and return evaluation of investment decision – Average rate of return – Payback Period – Net Present Value –Internal rate of return. **(12 Hours)**

OUTCOME:

- The student understood abilityto take decision for management of firms.
- The student understood Demand forecasting and determinants of supply.
- The student understood estimation of cost involving production optimization and henceforth fixing of price.
- The student understood concept of preparing balance sheet.

TEXT BOOKS:

1. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy
2. and Tactics',Thomson South Western, 10th Edition, 2005.
3. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.

REFERENCES:

1. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
2. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.

IVth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME-41

SUBJECT NAME: -MANUFACTURING PROCESSES

TOTAL - 60 HOURS

OBJECTIVES:

To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.

UNIT-I

Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.

(12 Hours)

UNIT-II

Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming(forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy. **(12 Hours)**

UNIT-III

Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining.

(12 Hours)

UNIT-IV

Additive manufacturing: Rapid prototyping and rapid tooling

Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding. **(12 Hours)**

UNIT-V

Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters

Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining . **(12 Hours)**

COURSE OUTCOMES:

Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products

Text Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems
3. Degarmo, Black & Kohser, Materials and Processes in Manufacturing

IVth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 42

SUBJECT NAME: -THERMODYNAMICS

TOTAL - 60 HOURS

OBJECTIVES:

- To learn about work and heat interactions, and balance of energy between system and its surroundings
- To learn about application of I law to various energy conversion devices
- To evaluate the changes in properties of substances in various processes
- To understand the difference between high grade and low grade energies and II law
- Limitations on energy conversion.

Unit I

Basic concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, statement and significance, concept of an Ideal gas, Gas laws, Avogadro's hypothesis, Heat and work transfer. First law of thermodynamics- Statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, Relations for flow processes, limitations of first law of thermodynamics. **(12 Hours)**

Unt II

Second law of thermodynamics, heat engine, heat reservoir, Refrigerator, heat pump, COP, EPR, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement Available energy, of second law Reversible and irreversible processes, consequence of second law, Entropy, Entropy change for ideal gas, T-S diagrams, Availability and Irreversibility. Gibbs and Helmholtz functions. **(12 Hours)**

Unit III

Real gas, Deviation with ideal gas, Vander-wall's equation, evaluation of its constants, limitations of the equation. The law of corresponding states Compressibility factor, Generalized compressibility chart, P-V-T surface of a Real gas, Thermodynamics relations, Maxwell relations and there applications .

(12 Hours)

Unit IV

Pure Substance, Phase, Phase-transformations, formation of steam, properties of steam, PVT surface, HS,TS,PV,PH,TV diagram, processes of vapor measurement of dryness fraction, Use of steam table and Mollier chart. **(12 Hours)**

Unit V

Air standard cycles, Carnot, Otto, Diesel, Dual cycles and there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gas mixtures.

(12 Hours)

Course Outcomes:

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
2. Students can evaluate changes in thermodynamic properties of substances
3. The students will be able to evaluate the performance of energy conversion devices
4. The students will be able to differentiate between high grade and low grade energies.

References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Van GJ; Thermodynamics; John Wylen
3. Cengel Y; Thermodynamics; TMH
4. Arora CP; Thermodynamics; TMH
5. Thermal Engineering by R Yadav
6. Engineering Thermodynamics by Omkar Singh New Age International.
7. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
8. Engineering Thermodynamics by M. Achuthan, PHI India

IVth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 43

SUBJECT NAME: -FLUID MECHANICS & FLUID MACHINES

TOTAL - 60 HOURS

OBJECTIVES:

- To learn about the application of mass and momentum conservation laws for fluid flows
- To understand the importance of dimensional analysis
- To obtain the velocity and pressure variations in various types of simple flows
- To analyze the flow in water pumps and turbines.

Unit-I

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Kinematics of Flow Types of flow-ideal & real , steady & unsteady, uniform & nonuniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow netstheir utility & method of drawing flow nets. **(09 Hours)**

Unit-II

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces,

orifice meter, nozzle meter, venturi-meter, weirs and notches).

Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.) **(09 Hours)**

Unit-III

Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles. **(09 Hours)**

Unit IV

Energy transfer in turbo machines: application of first and second laws of thermodynamics to turbo machines, moment of momentum equation and Euler turbine equation, principles of impulse and reaction machines, degree of reaction, energy equation for relative velocities, one dimensional analysis only.

Steam turbines: impulse staging, velocity and pressure compounding, utilization factor, analysis for optimum U.F Curtis stage, and Rateau stage, include qualitative analysis, effect of blade and nozzle losses on vane efficiency, stage efficiency, analysis for optimum efficiency, mass flow and blade height.

Reactions staging: Parson's stages, degree of reaction, nozzle efficiency, velocity coefficient, stator efficiency, carry over efficiency, stage efficiency, vane efficiency, conditions for optimum efficiency, speed ratio, axial thrust, reheat factor in turbines, problem of radial equilibrium, free and forced vortex types of flow, flow with constant reaction, governing and performance characteristics of steam turbines. **(09 Hours)**

Unit- V

Water turbines: Classification, Pelton, Francis and Kaplan turbines, vector diagrams and work-done, draft tubes, governing of water turbines.

Centrifugal Pumps: classification, advantage over reciprocating type, definition of mano-metric head, gross head, static head, vector diagram and work done.

Performance and characteristics: Application of dimensional analysis and

similarity to water turbines and centrifugal pumps, unit and specific quantities, selection of machines, Hydraulic, volumetric, mechanical and overall efficiencies, Main and operating characteristics of the machines, cavitations. **(08 Hours)**

Unit VI

Rotary Fans, Blowers and Compressors: Classification based on pressure rise, centrifugal and axial flow machines.

Centrifugal Blowers Vane shape, velocity triangle, degree of reactions, slip coefficient, size and speed of machine, vane shape and stresses, efficiency, characteristics, fan laws and characteristics. **Centrifugal Compressor -** Vector diagrams, work done, temp and pressure ratio, slip factor, work input factor, pressure coefficient, Dimensions of inlet eye, impeller and diffuser.

Axial flow Compressors- Vector diagrams, work done factor, temp and pressure ratio, degree of reaction, Dimensional Analysis, Characteristics, surging, Polytrophic and isentropic efficiencies. **(08 Hours)**

Unit VII

Power Transmitting turbo machines: Application and general theory, their torque ratio, speed ratio, slip and efficiency, velocity diagrams, fluid coupling and Torque converter, characteristics, **Positive displacement machines** and turbo machines, their distinction. Positive displacement pumps with fixed and variable displacements,

Hydrostatic systems hydraulic intensifier, accumulator, press and crane.

(08 Hours)

Course Outcomes:

- Upon completion of this course, students will be able to mathematically analyze simple flow situations
- They will be able to evaluate the performance of pumps and turbines.

References:

1. Venkanna BK; turbomachinery; PHI
2. Shepherd DG; Turbo machinery
3. Csanady; Turbo machines
4. Kadambi V Manohar Prasad; An introduction to EC Vol. III-Turbo

machinery; Wiley Eastern Delhi

5. Bansal R. K; Fluid Mechanics & Fluid Machines;
6. Rogers Cohen & Sarvan Multo Gas Turbine Theory
7. Kearton W. J; Steam Turbine: Theory & Practice
8. Modi & Seth; Fluid Mechanics; Standard Book House,Delhi
9. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; TMH
10. Som and Biswas; Fluid Mechnics and machinery; TMH
11. Cengal; Fluid Mechanics; TMH
12. White; Fluid 6. Gupta; MMeecchhaannicicss; ;P TeMarHso n
13. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
14. R Mohanty; Fluid Mechanics; PHI

List of Experiments (Pl. expand it):

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of Impulse momentum principle.

IVth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 44

SUBJECT NAME: -THEORY OF MACHINES

TOTAL - 60 HOURS

OBJECTIVES:

- To understand the kinematics and rigid- body dynamics of kinematically driven machine components
- To understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link
- To be able to design some linkage mechanisms and cam systems to generate specified output motion
- To understand the kinematics of gear trains

UNIT-I

Introduction, kinematics and kinetics, mechanisms and machines, degree of freedom, types of motions, kinematic concept of links, basic terminology and definitions, joints and kinematic chains, inversions, absolute and relative motions, displacement, velocity and acceleration diagrams, different mechanisms and applications, **(10 Hours)**

UNIT-II

kinematic synthesis of linkages, dynamic motion analysis of mechanisms and machines, D'Alembert's principle, number synthesis, free body diagrams, kinematic and dynamic quantities and their relationships, analytical method and graphical method **(10 Hours)**

UNIT-III

Cams, introduction, classifications of cams and followers, nomenclature, analysis of cam and follower motion, analytical cam design with specific contours, pressure angle, radius and undercutting, motion constrains and program, critical path motion, torque on cam shaft **(10 Hours)**

UNIT-IV

Power transmission, kinematics of belt- pulley, flat and v –belt, rope, condition of maximum power transmission, efficiency, friction, friction devices, pivot and

collars, power screw, plate and cone clutch, brakes, classifications, bock, band, internal and external, friction circle, friction axis, **(10 Hours)**

UNIT-V

Gears, laws of gearing, classification and basic terminology, tooth profiles, kinematic considerations, types of gears, spur, bevel, worm, helical, hypoid etc, gear trains, epicyclic, compound,, balancing- static and dynamic, in same/ different planes, Introduction to vibration, single degree of freedom. **(10 Hours)**

UNIT-VI

Governor: Fnctional difference with Flywheel, classification: Watt, porter and Hartwell- their construction and working. Sensitivity, stability, power and effort, hunting phenomenon and isochorisom of governor. **(10 Hours)**

COURSE OUTCOMES:

- After completing this course, the students can design various types of linkage mechanisms for obtaining specific motion and analyse them for optimal functioning

BOOKS:

[1] R.L.Norton,kinematics& dynamics of machinery,Tata McGraw Hill, ISBN13 978 0 07 014480 4

[2] A.Ghosh & A.Malik, Theory of Mechanisms and Machines,EWP Pvt Ltd,ISB 81 85095 72 8

IVth SEMESTER

CATEGORY: - LC

SUBJECT CODE: -BE- 42

SUBJECT NAME: -MATLAB

TOTAL - 60 HOURS

COURSE OBJECTIVES

Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB, and application of such languages for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Study of simulation software (any one Scilab/ MatLab etc.). Introduction to Scilab / Matab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs. Overview and Study of the key features and applications of the software. Application of the software in the Communications and Communication Systems.

1. Programs Related to Control System response plots, determining transient PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.
2. Programs Related to Communication Systems (Generation, addition of noise and Detection), AM, FM, PM, PAM, PCM, PSK, FSK etc.
3. Programs related to Data Communications line encoding techniques.

UNIT I

Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net. **(10 Hours)**

UNIT II

Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. Advanced Features Of C# Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events. **(10 Hours)**

UNIT III

Installing ASP.NET framework, overview of the ASP .net framework, overview of

CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. Windows Forms: All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls**(10 Hours)**

UNIT IV

Understanding and handling controls events, ADO.NET- Component object model,ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader Data base controls: Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services. **(10 Hours)**

I) Introduction to Matlab

1. Matlab as {best} calculator
2. Standard Matlab windows
3. Operations with variables

a) Naming b) Checking existence c) Clearing d) Operations

4. Arrays

(a) Columns and rows: creation and indexing (b) Size & length (c) Multiplication, division, power (d)Operations

5. Writing script files

(a) Logical variables and operators (b) Flow control (c) Loop operators

6. Writing functions

(a) Input/output arguments (b) Function visibility, path. (c) Example: Matlab startup

7. Simple graphics

(a) 2D plots (b) Figures and subplots

II) Data and data flow in Matlab.

1. Data types

(a) Matrix, string, cell and structure (b) Creating, accessing elements and manipulating of data of different types

2. File Input-Output

(a) Matlab files (b) Text files (c) Binary files (d) Mixed text

3. Communication with external devices

(a) Serial port (b) Parallel port (c) Sound ca

III) 1.Function minimization and parameters search.

(a) 1D and 2D fits (b) Data windowing (c) Error bounds

2. Arbitrary function fit

a) Error function b) Fixing parameters

3. Goodness of fit

a) 2 criteria (b) Error in parameters

IV) Handle graphics and user interface.

1. Pre-defined dialogs

2. Handle graphics

(a) Graphics objects (b) Properties of objects (c) Modifying properties of graphics objects

3. Menu-driven programs

(a) Controls: uimenu and uicontrol (b) Interactive graphics (c) Large program logic **(20 Hours)**

COURSE OUTCOME

Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB

REFERENCES:

1. Rudra Pratap: Getting Started with MATLAB, Oxford
2. http://www.scilab.in
3. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
4. Vinu V. Das: Programming in Scilab, New Age Publisher.
5. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
6. Proakis: Contemporary Communication System Using MATLAB; Thomson

Cengage.

7.Kuo: Automatic Control Systems, PHI Learning.

8.Singh and Chaudhari: Matlab Programming, PHI Learning

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. Web Commerce Technology Handbook by Daniel Minoll, Emma Minoli , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold,
6. ASP. Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH List of Experiments/ program

LIST OF EXPERIMENT (Pl. expand it):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page and forms using ASP .Net.
12. Data Sources access through ADO.Net,
13. Working with Data readers , Transactions
14. Creating Web Application.

IVth - SEMESTER

CATEGORY: - MC

SUBJECT CODE: -BE-43

SUBJECT NAME: - **ENVIRONMENT SCIENCE**

TOTAL - 60 HOURS

OBJECTIVE

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects this ethos.

(A) AWARENESS ACTIVITIES:

i) Small group meetings about water management, promotion of recycle use, Generation of less waste, avoiding electricity waste

ii) Slogan making event

iii) Poster making event

iv) Cycle rally

v) Lectures from experts **(30 Hours)**

(B) ACTUAL ACTIVITIES:

i) Plantation

ii) Gifting a tree to see its full growth

iii) Cleanliness drive

iv) Drive for segregation of waste

v) To live some big environmentalist for a week or so to understand his work

vi) To work in kitchen garden for mess

vii) To know about the different varieties of plants

viii) Shutting down the fans and ACs of the campus for an hour **(30 Hours)**

OUTCOME

There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities

IV th SEMESTER

CATEGORY: - PDFS

SUBJECT CODE: -BE-44

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-II

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Prepositions (550 small sentences of daily use related to day to day life **(18 -HOURS)**

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning – Level II

Problem solving on,

Partnerships, Profit Loss and Discounts, Time and Distance.

Logical sequence of Figures, Cubes, Blood Relations, Data Sufficiency, Arrangement Problems.**(18 -HOURS)**

OUTCOME

Further improvement in English, Aptitude and reasoning ability is achieved.

Vth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 51

SUBJECT NAME: -INSTRUMENTATION & CONTROL

TOTAL - 60 HOURS

OBJECTIVES:

1. To provide a basic knowledge about measurement systems and their components
2. To learn about various sensors used for measurement of mechanical quantities
3. To learn about system stability and control
4. To integrate the measurement systems with the process for process monitoring and control

UNIT-I

Introduction to instrument systems, classifications, functional elements of a measurement system, standards and calibration, static performance characteristics, measurement errors and uncertainties, analysis, sequential and random test, specifications of instrument static characteristics, data acquisition, reduction, data outliner detection, **(12 Hours)**

UNIT-II

Dynamic characteristics of the instruments, formulation of system equations, dynamic response, compensation, periodic input, harmonic signal non harmonic signal, Fourier transform, response to the transient input, response to random signal input, first and second order system compensation,

(12 Hours)

UNIT-III

(a) Temperature measurements, thermometry based on thermal expansion, liquid in glass, bimetallic, electric resistance- thermometry, thermocouples, thermistors, detectors, (b) pressure and velocity measurements, barometer, manometer, dead weight tester, pressure gauges and transducers, dynamic measurements,(c) flow measurements, pressure differential meters, orifice

meter, venturi meter, rota-meter, **(12 Hours)**

UNIT-IV

Strain gauges, strain and stress measurements, electrical circuits, compensations, motion force and torque measurements, displacement measurements, potentiometers, linear and rotary variable differential transformers, velocity measurements, electromagnetic technique, stroboscope, load cell, measurement of torque on rotating shaft, power estimation from rotating shaft. **(12 Hours)**

UNIT-V

Control systems, open loop and close loop control, mathematical modeling of dynamic systems – mechanical systems, electrical systems, fluid systems, thermal systems, transfer function, impulse response function, block diagrams of close loop systems, system modeling using software. **(12 Hours)**

COURSE OUTCOMES:

Upon completion of this course, the students will be able to understand the measurement of various quantities using instruments, their accuracy & range, and the techniques for controlling devices automatically.

BOOKS:

[1] Nakra B.C.Chaudhary K.K, Instrumentation measurement and analysisTata McGraw Hill, ISBN 0 07 451791 0

[2] Richard S, Figiola & Donal E. Beasley, John Wiley, Theory and design of mechanical measurements.

Vth SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 52

SUBJECT NAME: -MATERIALS ENGINEERING

TOTAL - 60 HOURS

OBJECTIVES:

1. Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
2. To provide a detailed interpretation of equilibrium phase diagrams
3. Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloy

Unit I

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of Refractory and Ferrous Metals: Properties uses and selection of acid, basic and natural refractory, metallurgical coke, Properties, types, uses and brief description of the manufacturing processes for iron and steel making. **(12 Hours)**

Unit II

Plastic deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure**(12 Hours)**

Unit III

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram.

(12 Hours)

Unit IV

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spherodizing, hardening, tempering, case hardening, austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys **(12 Hours)**

Unit V

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques. **(12 Hours)**

COURSE OUTCOMES:

1. Student will be able to identify crystal structures for various materials and understand the defects in such structures
2. Understand how to tailor material properties of ferrous and non-ferrous alloys
3. How to quantify mechanical integrity and failure in materials

REFERENCES:

1. GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Sriniwasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. B. K. Agrawal, Introduction to Engineering Materials, TMH.

V SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 53

SUBJECT NAME: -HEAT TRANSFER

TOTAL - 60 HOURS

OBJECTIVES:

(1) The aim of the course is to build a solid foundation in heat transfer exposing students to the three basic modes namely conduction, convection and radiation.

(2) Rigorous treatment of governing equations and solution procedures for the three modes will be provided, along with solution of practical problems using empirical correlations.

(3) The course will also briefly cover boiling and condensation heat transfer, and the analysis and design of heat exchangers.

Unit-1

Basic Concepts: Modes of heat transfer, Fourier's law, Newton's law, Stefan Boltzman law; thermal resistance and conductance, analogy between flow of heat and electricity, combined heat transfer process; **Conduction:** Fourier heat conduction equation, its form in rectangular, cylindrical and spherical coordinates, thermal diffusivity, linear one dimensional steady state conduction through a slab, tubes, spherical shells and composite structures, electrical analogies, critical-insulation-thickness for pipes, effect of variable thermal conductivity. **(12 Hours)**

Unit 2

Extended surfaces (fins): Heat transfer from a straight and annular fin (plate) for a uniform cross section; error in measurement of temperature in a thermometer well, fin efficiency, fin effectiveness, applications; **Unsteady heat conduction:** Transient and periodic conduction, heating and cooling of bodies with known temperatures distribution, systems with infinite thermal conductivity, response of thermocouples. **(12 Hours)**

Unit 3

Convection: Introduction, free and forced convection; principle of dimensional analysis, Buckingham 'pie' theorem, application of dimensional analysis of free and forced convection, empirical correlations for laminar and

turbulent flow over flat plate and tubular geometry; calculation of convective heat transfer coefficient using data book. **(12 Hours)**

Unit 4

Heat exchangers: Types- parallel flow, counter flow; evaporator and condensers, overall heat transfers coefficient, fouling factors, long-mean temperature difference (LMTD), method of heat exchanger analysis, effectiveness of heat exchanger, NTU method;

Mass transfer: Fick's law, equi-molar diffusion, diffusion coefficient, analogy with heat transfer, diffusion of vapour in a stationary medium. **(12 Hours)**

Unit 5

Thermal radiation: Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Planck's distribution law, radiation from real surfaces; radiation heat exchange between black and gray surfaces, shape factor, analogical electrical network, radiation shields. **Boiling and condensation:** Film wise and drop wise condensation; Nusselt theory for film wise condensation on a vertical plate and its modification for horizontal tubes; boiling heat transfer phenomenon, regimes of boiling, boiling correlations. **(12 Hours)**

COURSE OUTCOMES:

1. After completing the course, the students will be able to formulate and analyze a heat transfer problem involving any of the three modes of heat transfer
2. The students will be able to obtain exact solutions for the temperature variation using analytical methods where possible or employ approximate methods or empirical correlations to evaluate the rate of heat transfer
3. The students will be able to design devices such as heat exchangers and also estimate the insulation needed to reduce heat losses where necessary.

References:

1. Sukhatme SP; Heat and mass transfer; University Press Hyderabad
2. Holman JP; Heat transfer; TMH
3. Dutta Binay K; Heat Transfer; PHI
4. Kumar DS; Heat and mass transfer; SK Kataria and Sons Delhi
5. Kreith; Heat transfer,
6. Sachdeva RC; Fundamentals of engineering heat and mass transfer,.

Gupta & Prakash; Engineering heat transfer,

Suggested List of Experiments

1. Conduction through a rod to determine thermal conductivity of material.
2. Forced and free convection over circular cylinder.
3. Free convection from extended surfaces.
4. Parallel flow and counter flow heat exchanger effectiveness and heat transfer rate.
5. Calibration of thermocouple.
6. Experimental determination of Stefen-Boltzman .

V SEMESTER

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 54

SUBJECT NAME: -THERMAL ENGINEERING AND GAS DYNAMICS

TOTAL - 60 HOURS

OBJECTIVE:

- The students must understand steam generators, phase change cycles, gas dynamics, air compressors and steam condensers.

Unit I

Steam generators: classification, conventional boilers, high-pressure boilers-Lamont, Benson, Loffler and velox steam generators, performance and rating of boilers, equivalent evaporation, boiler efficiency, heat balance sheet, combustion in boilers, super critical boilers, fuel and ash handling, boiler draught, overview of boiler codes. **(12 Hours)**

Unit II

Phase Change Cycles: Vapor Carnot cycle and its limitation, Rankin cycle, effect of boiler and Condenser pressure and superheat on end moisture and efficiency of ranking cycle, modified Rankin cycle, reheat cycle, perfect regenerative cycle, Ideal and actual regenerative cycle with single and multiple heaters, open and closed type of feed water heaters, regenerative-reheat cycle, supercritical pressure and binary-vapor cycle, work done and efficiency calculations. **(12 Hours)**

Unit III

(A) Gas dynamics: speed of sound, in a fluid mach number, mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases through variable area duct-mach number variation, area ratio as a function of mach number, mass flow rate and critical pressure ratio, effect of friction, velocity coefficient, coefficient of discharge, diffusers, normal shock.

(B) Steam nozzles: isentropic flow of vapors, flow of steam through nozzles, condition for maximum discharge, effect of friction, super-saturated flow. **(12 Hours)**

Unit IV

Air compressors: working of reciprocating compressor, work input for single stage compression different, compression processes, effect of clearance,

volumetric efficiency real indicator diagram, isentropic & isothermal and mechanical efficiency, multi stage compression, inter - cooling, condition for minimum work done, classification and working of rotary compressors. **(12 Hours)**

Unit V

Steam condensers, cooling towers and heat exchangers: introduction, types of condensers, back pressure and its effect on plant performance air leakage and its effect on performance of condensers, various types of cooling towers, design of cooling towers, classification of heat exchangers, recuperates and regenerators parallel flow, counter flow and cross flow exchangers, fouling factor, introduction to LMTD approach to design a heat exchanger. **(12 Hours)**

COURSE OUTCOME:

- The students understood about high pressure boiler, their performance and Efficiency.
- The students learned about phase change cycles including reheat cycle regenerative cycle.
- The students could explain about Mach number, normal shock, steam nozzles and super saturated flow.
- The students understood types of air compressor,efficiency,and multistage compressor including rotary compressor.
- The students understood performance of condenser,cooling towers heat exchanger.

References:

1. Nag PK; Power plant Engineering; TMH
2. Thermodynamics by Gordon J. Van Wylen
3. P.K.Nag; Basic and applied Thermodynamics; TMH
4. Ganesan; Gas turbines; TMH
5. Heat Engines by V.P. Vasandani & D. S. Kumar
6. R. Yadav Steam and Gas Turbines
7. R.Yadav Thermal Engg.
8. Kadambi & Manohar; An Introduction to Energy Conversion – Vol II. Energy conversion cycles

List of Experiments (Please Expand it):

1. Study of working of some of the high pressure boilers like Lamont or Benson
2. Study of Induced draft/forced and balanced draft by chimney
3. Determination of Calorific value of a fuel
4. Study of different types of steam turbines
5. Determination of efficiencies of condenser
6. Boiler trail to chalk out heat balance sheet
7. Determination of thermal efficiency of steam power plant
8. Determination of Airflow in ducts and pipes.
9. To find out efficiencies of a reciprocating air compressor and study of multistage Compressors
10. Find Out heat transfer area of a parallel flow/counter flow heat exchanger

Vth SEMESTER

CATEGORY: - LC

SUBJECT CODE: -BE- 51

SUBJECT NAME: - RDBMS

TOTAL - 60 HOURS

Objectives :

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
3. To understand and use data manipulation language to query, update, and manage a database To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
4. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT-I

Introduction Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture.

ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables. **(12 Hours)**

UNIT-II

Domains, Relations and keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys.

Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, modification of Database, join relation, DDL in SQL. **(12 Hours)**

UNIT-III

Relational Dependencies and Normalization: basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first second, third Normal forms, dependency preservation, BCNF, multivalve dependencies and forms normal form dependency and fifth normal forms. **Distributed Database:** basic idea, distributed data storage, data replication,data fragmentation. **(12 Hours)**

UNIT-IV

Emerging Fields in DBMS object oriented Database-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing -terminology, definitions,

characteristics, data mining and it's overview, Database on www, multimedia Database-difference with conventional DBMS, issues, similarity based retrieved continuous media data, multimedia data formats, id **(12 Hours)**

Unit V

Storage structure and file organizations: Overview of physical storage media, magnetic disks- performance and optimization, basic idea of RAID, organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization.

Network and hierarchical models : basic idea, data structure diagrams , DBTG model, implementations, tree structure diagram , implementation techniques. **(12 Hours)**

COURSE OUTCOMES

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement design the databases using ER method and normalization.
3. For a given specification construct the SQL queries for Open source and

Commercial DBMS -MYSQL, ORACLE, and DB2.

4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on
concurrency control and Serializability of scheduling.

References:

1 A Silberschatz, H.F. Korth, Sudersan "Database System Concept" MGH Publication.

2. C.J. Date "An introduction to Database System''=6th ed. Elmasri & Navathe "Foundamentals of Database system"- III ed

Vth - SEMESTER

CATEGORY: - MC

SUBJECT CODE: -BE-52

SUBJECT NAME: - **ESSENCE OF INDIAN KNOWLEDGE TRADITION**

TOTAL - 60 HOURS

OBJECTIVE

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

COURSE CONTENTS

- Basic structure of Indian Knowledge System:
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

REFERENCES

Knowledge traditions and practices of India, CBSE Publication V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya• Vidya Bhavan, Mumbai. 5th Edition, 2014 Swami Jitatmanand, Modern Physics and Vedantharatiya Vidya Bhavan• Swami Jitatmanand, Holistic Science and Vedantharatiya VidyaBhavan• Fritzof Capra, Tao of Physics• Fritzof Capra, The Wave of life• VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay• Foundation, Velliarnad, Arnakulam Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata• GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya,• Vidyanidhi Prakashan, Delhi 2016 RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi• Prakashan, Delhi 2016 P B Sharma (English translation), Shodashang Hridayan•

(50 Hours)

PEDAGOGY:

Problem based learning, group discussions, collaborative mini projects. **(10 Hours)**

OUTCOME:

Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

V th SEMESTER

CATEGORY: - PDFS

SUBJECT CODE: -BE-53

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-III

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Active and Passive Voice, 250 sentences of daily use irrespective of any specific tenses**. (12 HOURS)**

UNIT-II

Conversational English:

100 sentences of daily use related to professional and formal environment Report Writing with necessary punctuations and with editor's eye, Thematic Apperception, Expression of Feelings 2-minutes Talk by the students, Smart Etiquettes and Tidiness **. (12 HOURS)**

UNIT-III

Aptitude/Reasoning

Quantitative Aptitude and Logical Reasoning – Level III

Problem solving on,

Average, Time work, percentage, Probability, Permutation and Combination.

Question- Statements, Theme Detection, Statement Assumptions, Statement Argument**. (12 HOURS)**

OUTCOME

Further improvement in reading, writing and vocal English is achieved. Aptitude and reasoning aspect shows improvement.

VI SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 61(A)

SUBJECT NAME: -AUTOMOBILE ENGINEERING (ELECTIVE–I)

TOTAL - 60 HOURS

OBJECTIVES:

To understand the construction and working principle of various parts of an automobile

Unit-I:

Chassis & Body Engg: Types, Technical details of commercial vehicles, types of chassis, lay out, types of frames, testing of frames for bending & torsion on unutilized body frame, vehicle body and their construction, driver's visibility and methods for improvement, safety aspects of vehicles, vehicle aerodynamics, optimization of body shape, driver's cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive. **(10 Hours)**

Unit-II:

Steering System: front axle beam, stub axle, front wheel assembly, principles of types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe-out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears. **(10 Hours)**

Unit-III:

Transmission System: Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching, types of gear Boxes, synchronizer, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed, automatic transmission, torque converters, fluid coupling, principle of hydrostatic drive, propeller shaft, constant velocity universal joints, differential gear box, rear axle construction. **(10 Hours)**

Unit-IV:

Suspension system: Basic suspension movements, Independent front & rear suspension, shock absorber, type of springs: leaf spring, coil spring, air spring, torsion bar, location of shackles, power calculations, resistance to vehicle motion during acceleration and breaking, power & torque curve, torque & mechanical

efficiency at different vehicle speeds, weight transfer, braking systems, disc theory, mechanical, hydraulic & pneumatic power brake systems, performance, self-energisation, air bleeding of hydraulic brakes, types of wheels and tyres, tyre specifications, construction and material properties of tyres & tubes. **(10 Hours)**

Unit-V:

Electrical and Control Systems: storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, Lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers. Importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems. **(10 Hours)**

Unit-VI:

Emission standards and pollution control: Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for

Automotive vehicles, catalytic converters, fuel additives, and modern trends in automotive engine efficiency and emission control. **(10 Hours)**

Course Outcomes:

Upon completion of this course, students will understand the function of each automobile component and also have a clear idea about the overall vehicle performance.

References:

1. Crouse, Automotive Mechanics TMH.
2. Srinivasan S; Automotive engines; TMH
3. Gupta HN; Internal Combustion Engines; PHI;
4. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
5. Kripal Singh, Automotive Engineering Khanna Pub.
6. Newton & Steeds , Automotive Engineering
7. Emission standards from BIS and Euro –I and Euro-III

List of experiments

Study of chassis, suspension, steering mechanisms, transmission, gear-box,

differential systems, and electrical systems of various light and heavy automotive vehicles;

VI SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 61(B)

SUBJECT NAME: -TOTAL QUALITY MANAGEMENT

TOTAL - 60 HOURS

OBJECTIVES:

To facilitate the understanding of total quality management principles and processes

Unit 1

Evolution of total quality management, historical perspective, teamwork, TQM and ISO 9000; information technology and Business Process Re-engineering (BPR); TPM and quality awards; aids and barriers to quality mgt, creating vision and initiating transformation, establishing programs for education and self coordination, policy setting and review, flowchart of policy mgt and relation with daily mgt. improvements, measurement of key indicators; quality mgt leader; cross functional teams. **(12 Hours)**

Unit 2

Process- definition, variation and feedback, funnel-marble experiment- rules of adjustment and its effects, quality- definition, goalpost and kaizen view, quality of design, conformance and performance; Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; Deming's theory of mgt, fourteen points and variance reduction; attributes enumerative and variables analytic studies. **(12 Hours)**

Unit 3

SQC-Control charts: basic discrete and continuous distributions, measures of central tendency, variability and shapes, sampling, size and central value theorem,

control chart structure, process plotting and stability, study of out-of-control evidences, defect detection and prevention, use of control charts in evaluating past, present and future trends; attribute control charts, count and classification charts, construction and interpretation of p , np , c and u charts, PDSA cycle(plan, do, study, act), and R charts, and s charts, individual and moving range chart, trial control limits and out of control points. **(12 Hours)**

Unit 4

Process diagnostics: Between and Within Group variations, periodic and persistent disturbances, control chart patterns-natural, level-shift, cycle, wild, multi-universe, relationship and other out of control patterns; diagnosing a process, brainstorming; cause-effect, Ishikava, interrelationship, systematic and matrix diagrams; change concepts and waste elimination. **(12 Hours)**

Unit 5

Process improvement: Performance and technical specifications, attribute-process and variable-process capability studies; unstable and stable process capability studies and examples; attribute and variable improvement studies; Inspection: acceptance sampling(AS)- lot formation, single, double and multiple/sequential sampling plans, operating characteristic (OC) curve, producer and consumer risk, theoretical invalidation of AS, kp rule for stable and chaotic processes. **(12 Hours)**

COURSE OUTCOMES:

Upon completion of this course, the students will be able to use the tools and techniques of TQM in manufacturing and service sectors

References:

1. Gitlow HS, Oppenheim et al; Quality Management; TMH
2. Gryna FM; Jurans Quality Planning and Analysis; TMH
3. Crosby Philips; Quality is still free; New Amer Library
4. Kulkarni VA and Bewoor AK; Quality Control; Wiley
5. Jankiraman B and Gopal RK; Total Quality Management- Text and Cases; PHI Learning
6. Sugandhi L and Samual A; Total Quality Management; PHI Learning
7. Subburaj R; Total Qality Management; TMH
8. Naidu Babu and Rajendran; TQM; New age International pub;
9. Chase Richard B et al; Operations management; SIE-TMH
10. Chary SN; Production and Operations Management; TMH

VI SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 61(C)

SUBJECT NAME: -MECHATRONICS

TOTAL - 60 HOURS

OBJECTIVES:

(i) To understand the structure of microprocessors and their applications in mechanical devices

(ii) To understand the principle of automatic control and real time motion control systems, with the help of electrical drives and actuators

(iii) To understand the use of micro-sensors and their applications in various fields

COURSE CONTENTS:

UNIT –I

Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modeling, Analysis and Simulation, Man-Machine Interface; Sensors and transducers: classification, Development in Transducer technology, Opto-electronics-Shaft encoders, CD Sensors, Vision System, etc. **(15 Hours)**

UNIT-II

Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servo motor and Stepper motor, Drive circuits, open and closed loop control; Embedded Systems: Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Control and Real Time Control Systems; Smart materials: Shape Memory Alloy, **(15 Hours)**

UNIT-III

Piezoelectric and Magnetostrictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.

(15 Hours)

UNIT-IV

Micromechatronic systems: Micro sensors, Micro actuators; Micro-fabrication techniques LIGA **(15 Hours)**

UNIT-IV

Process: Lithography, etching, Micro-joining etc. Application examples; Case studies Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology. **(15 Hours)**

COURSE OUTCOMES:

Upon completion of this course, students will get an overview of mechatronics applications and the use of micro-sensors and microprocessors

Text Books:

1) Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.)
2) Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education
3) A Textbook of Mechatronics ,R.K.Rajput, S. Chand & Company Private Limited
4) Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hal

VI SEMESTER

CATEGORY: - OEC-ME

SUBJECT CODE: -ME- 62(A)

SUBJECT NAME: - FINITE ELEMENT METHOD

TOTAL - 60 HOURS

OBJECTIVES:

1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

COURSE CONTENTS:

UNIT-I

Historical Background, Mathematical modeling of field problems in engineering, governing equations, discrete and continuous models, boundary and initial value problems, Weighted Residual Methods, Variation formulation of boundary value problems, Ritz technique, Basic concept of Finite Element Method. **(15 Hours) UNIT-II**

One dimensional second order equation, discretization, linear and higher order elements, derivation of shape functions, Stiffness matrix and force vectors, assembly of elemental matrices, solution of problems from solid mechanics and heat transfer, longitudinal vibration and mode shapes, fourth order beam equation, transverse deflections and natural frequencies. **(15 Hours)**

UNIT-III

Two dimensional equations, variation formulation, finite element formulation, triangular elements shape functions, elemental matrices and RHS vectors; application to thermal problems, torsion of non-circular shafts, quadrilateral and higher order elements. Plane stresses and plane strain problems, body forces and thermal loads, plate and shell elements. **(15 Hours)**

UNIT-IV

Natural coordinate systems, isoperimetric elements and shape functions, numerical integration and application to plane stress problems, matrix solution techniques, solution of dynamic problems, and introduction to FE software. **(15 Hours)**

COURSE OUTCOMES:

Upon completion of the course, students will understand the FEM formulation and its application to simple structural and thermal problems

Text Books:

1. Reddy J.N., An Introduction to Finite Element Method, 3rd ed., Tata McGraw Hill, 2005.
2. Seshu P., Text Book of Finite Element Analysis, Prentice Hall, New Delhi, 2007.
3. Rao S.S., The Finite Element Method in Engineering, 3rd ed., Butterworth Heinemann, 2004.
4. Chandraputla & Belegundu, Introduction to Finite Elements in Engineering, 3rd ed., Prentice Hall, 1990.

VI SEMESTER

CATEGORY: - OEC-ME

SUBJECT CODE: -ME- 62(B)

SUBJECT NAME: - ENERGY CONSERVATION AND MANAGEMENT

(OPEN ELECTIVE-I)

TOTAL - 60 HOURS

OBJECTIVES:

To understand the energy data from industries and carry out energy audit for energy savings.

COURSE CONTENTS:

UNIT-I

Introduction to energy & power scenario of world, National Energy consumption data, and environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing. **(15 Hours)**

UNIT-II

Components of EB billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency computation, energy efficient motors; Illumination- Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting. **(15 Hours)**

UNIT-III

Thermal systems, Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories.

(15 Hours)

UNIT-IV

Energy conservation in major utilities; pumps, fans, blowers, compressed air systems, Refrigeration& Air Conditioning systems, Cooling Towers, DG sets. Energy Economics- discount period, payback period, internal rate of return, net present value; Life Cycle costing- ESCO concept. **(15 Hours)**

Course Outcomes:

Upon completion of this course, the students will be able to perform of energy auditing for the energy consumption of industries.

Text Books:

1. Witte L.C. , Schmidt P.S. and Brown D.R., Industrial Energy Management and Utilization, Hemisphere Publ., Washington, 1988..
2. Callaghn P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford, 1981.
3. Murphy W.R. and McKay G., Energy Management, Butterworths, London, 1987.
4. Energy Manager Training Manual, Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI, 2004 (available at www.energymanager training.com).

VI SEMESTER

CATEGORY: - OEC-ME

SUBJECT CODE: -ME- 62(C)

SUBJECT NAME: - O.R. & SUPPLY CHAIN (ELECTIIVE-I)

TOTAL - 60 HOURS

COURSE OBJECTIVE:

1. To be familiar with all the OR Techniques and optimization methods.
2. To understand the role of logistics in the supply chain within a focal firm as well as between organizations linked within a given supply chain network.
3. To be familiar with various inventory control techniques.
4. To clear idea of the decision making and meta-heuristic algorithm.

COURSE CONTENTS:

Unit 1

Linear system and distribution models: Mathematical formulation of linear systems by LP, solution of LP for two variables only, special cases of transportation and assignment and its solution, Vogel's forward looking penalty method, cell evaluation degeneracy, use of SW Lindo, Tora, Excell. **(12 Hours)**

Unit 2

Supply chain (SCM): Definition, importance, expenditure and opportunities in SCM; integration of inbound, outbound logistics and manufacturing to SCM, flow of material money and information, difficulties in SCM due to local v/s system wide (global) optimization and uncertainties in demand and transportation; Bull-whip effect; customer value; IT, info-sharing and strategic partnerships; plant and warehouse-network configuration; supply contracts and revenue sharing; outsourcing; transportation, cross docking and distribution, forecasting models in SCM; coordination and leadership issues; change of purchasing role and vendor rating, variability from multiple suppliers. **(12 Hours)**

Unit 3

Inventory models: Necessity of inventory in process and safety stock, problem of excess inventory and cycle time (=WIP/ Throughput), JIT/ lean mfg; basic EOQ/ EPQ models for constant review Q-system(S,s); periodic review, base stock P-system; service level, lead time variance and safety stock;; ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot

sizing in MRP, linking MRP with JIT; evolution of MRP to ERP to SCM and e-business.

(12 Hours)

Unit 4

(a) **Waiting Line Models** Introduction, Input process, service mechanism, Queue discipline, single server (M/M/1) average length and times by Little's formula, optimum service rate; basic multiple server models (M/M/s)

(b) Competitive strategy: concept and terminology, assumptions, pure and mixed strategies, zero sum games, saddle point, dominance, graphical, algebraic and LP methods for solving game theory problems. **(12 Hours)**

Unit 5

(a) **Decision analysis**: decision under certainty, risk probability and uncertainty; Hurwicz criteria; AHP- assigning weight and consistency test of AHP

(b) Meta-heuristics Definition of heuristic and meta-heuristic algorithms; introduction to Tabu search,Simulated Annealing and Genetic algorithms and solution of traveling salesman and non linear optimization problems. **(12 Hours)**

COURSE OUT COMES: EVALUATION:

- The students become aware to linear system and distribution models, supply chain management ,optimum service rate ,basic multiple server models.
- The students become proficient in competitive strategy, decision analysis and meta-heuristics.

REFERENCES:

1. Hillier FS and Liberman GJ; Introduction to Operations Research concept and cases; TMH
2. Simchi-Levi, Keminsky; Designing and managing the supply chain; TMH.
3. Srinivasan G; Quantitative Models In Operations and SCM; PHI Learning
4. Mohanty RP and Deshmukh SG; Supply Chain Management; Wiley India
5. Taha H; Operations research; PHI
6. Sen RP; Operations Research-Algorithms and Applications; PHI Learning
7. Sharma JK; Operations Research; Macmillan
8. Ravindran , Philips and Solberg; Operations research; Wiley India
9. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
10. Bowersox DJ, Closs DJ, Cooper MB; Supply Chain Logisti Mgt; TMH
11. Burt DN, Dobler DW, StarlingSL; World Class SCM; TMH

12. Bronson R ;Theory and problems of OR; Schaum Series; TMH

List of experiments

1. Use computer and software to solve problems contained in the syllabus
2. Case studies in SCM

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 63

SUBJECT NAME: - MANUFACTURING PROCESS-II

TOTAL - 60 HOURS

OBJECTIVES :

To make the students aware of different manufacturing processes like operating different types of machines, metal cutting and gear manufacturing.

COURSE CONTENTS:

Unit I

Lathe: Classification of machine tools and their basic components; lathe-specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature. **(12 Hours)**

Unit II

Grinding: Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding. **(12 Hours)**

Unit III

Milling: Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters. **Drilling & Broaching:** Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines. **(12 Hours)**

Unit IV

Shapers: Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time. Surface qualities, equipment used for rating surfaces, rms. CLA value, causes for surface irregularities.

Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing. **(12 Hours)**

Unit V

Mechatronics: Introduction to control systems, analog control, transfer function, procedure for writing transfer function, signal flow diagram, introduction to electronic components like switches, magnetic type, electromagnetic type,

transducers and other sensors, servo motors, basics of CD-ROM players, PLC, applications, CNC machines. **(12 Hours)**

OUTCOMES :

1. Concepts of operating different types of machines.
2. Mechanical working of metals.
3. Concepts of gear manufacturing process
4. Concept of Mechatronics
5. Understanding CNC working.

References:

1. Boston; Metal Processing.
2. Hazra Chadhary; Workshop Tech.II
3. Lindberg – Materials & Processes of Manufacture.
4. Work shop technology by Raghuvanshi-Vol-II
5. Production Processes by HMT

List of Experiment

To make a complicate job on lathe machine with all operations like turning, step turning, drilling , tapper turning , thread cutting and knurling .

1. Study of center less grinding machine/ tool and cutter type grinding
2. machine.
3. Study of horizontal/ universal milling machine, diving head and indexing Mechanism of it.
4. To cut a spur gear on milling machine using rapid indexing method.
5. Study of radial drilling machine and preparing a job on it.
6. To study a sapping machine to learn about working of quick return Mechanism.

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 64

SUBJECT NAME: - MACHINE DESIGN-I

TOTAL - 60 HOURS

OBJECTIVE:

- The student to be able to design shafts, spring, brakes & clutches, journal bearing taking into account stress concentration and fatigue.

COURSE CONTENTS:

Unit I-

Stress concentration and fatigue: causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor. **(12 Hours)**

Unit II

Shafts: Design of shaft under combined bending, twisting and axial loading; shock and fatigue factors, design for rigidity; Design of shaft subjected to dynamic load; Design of keys and shaft couplings. **(12 Hours)**

Unit III:

Springs: Design of helical compression and tension springs, consideration of dimensional and functional constraints, leaf springs and torsion springs; fatigue loading of springs, surge in spring; special springs, **Power Screws** design of power screw and power nut, differential and compound screw, design of simple screw jack. **(12 Hours)**

Unit IV:

Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories, Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches. Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes. **(12 Hours)**

Unit V

Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-

element Bearings: Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing. **(12 Hours)**

OUTCOME:

- The students become proficient in designing and sketching shaft, keys, and coupling subjected to dynamic load. Further components include. power screw, screw jack, disc clutch, cone & centrifugal clutch ,internal expanding brakes, disc brakes journal bearing, roller bearing, needle bearing, ball bearing .The effect of lubrication and sealing has been stressed.

References:

1. Shingley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machnine Design;

List of Experiment

Designing and sketching of components contained in the Syllabus.

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 65

SUBJECT NAME: -I.C.ENGINE

TOTAL - 60 HOURS

OBJECTIVES:

1. To familiarize with the terminology associated with IC engines.
2. To understand the basics of IC engines.
3. To understand combustion, and various parameters and variables affecting it in various types of IC engines.
4. To learn about various systems used in IC engines and the type of IC engine required for various applications

COURSE CONTENTS:

Unit I

Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing. **(12 Hours)**

Unit II

Combustion in SI engines: Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects of detonation, effect of engine and fuel variables on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., action of dopes, pre-ignition, its causes and remedy, salient features of various type combustion chambers, valve timing and firing order. **(12 Hours)**

Unit III

Combustion in C.I. Engines: Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, octane number, knock inhibitors, salient features of various types of combustion chambers, fuel, ignition, cooling, exhaust and lubrication systems; Simple problems on fuel injection, various types of engines, their classification and salient features. Rotary I. C. engines, their principles of working. **(12 Hours)**

Unit IV

I.C. Engine System: Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI & TBI), Theory of carburetion, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine and simple problems, various types of engines, their classification and salient features.

Fuels: Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, un-burnt hydro carbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as alternate fuel. **(12 Hours)**

Unit V

Supercharging: Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines. **(12 Hours)**

COURSE OUTCOMES:

Students who have done this course will have a good idea of the basics of IC engines and how different parameters influence the operational characteristics of IC Engines

References:

1. A. Course in IC engines by M.L. Mathur & R.P. Sharma
2. Internal Combusion engines by V. Ganeshan
3. Internal Combusion Engines Theory & Practice by G.F. Taylor
4. Introduction to IC Engines by Richard Stone.
5. Internal Combustion Engines by DomKundwar Dhanpat rai Publications.

Suggested List of Experiments

Determination of Valve timing diagram

1. Load test on Petrol Engine
2. Heat Balance of SI engine
3. Heat Balance of CI Engine
4. Study of Battery Ignition system and Electronic Ignition System
5. Study of Diesel fuel pump
6. Study of Diesel fuel injectors

7. Study of a Carburetors
8. Study of Fuel Injection system in SI Engine
9. Study of lubricating system in CI Engines

CATEGORY: - PROJ-ME

SUBJECT CODE: -ME- 66

SUBJECT NAME: -MINOR PROJECT

TOTAL - 60 HOURS

OBJECTIVES:

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the College. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.

VI th SEMESTER

CATEGORY: - PDFS

SUBJECT CODE: -ME- 61

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

(LEVEL-IV)

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Emphasis to be made in reading, writing and vocal English, quantitative aptitude and logical reasoning to be stressed.

UNIT-I

Final Finishing:

Final Preparation of CV. Final Compilation of Database of Students with Necessary Mapping, Mock Interviews, Group Discussions. **(18 HOURS)**

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning- Level IV

Problem solving on.

Ratio and Proportions, Solutions and Mixtures, Sets, Simple Interest and Compound Interest, Simple and Quadratic Equations. **(18 HOURS)**

OUTCOME

Attainment of confidence the students to be able to face interviews, group discussion and presentation ability. Knowledge on basic mathematical ability attained. Hence forth a student become competent to face the challenges of the world after attainments of knowledge at college level

VII SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 71(A)

SUBJECT NAME: -REFRIGERATION & AIR CONDITIONING (ELECTIVE –II)

TOTAL - 60 HOURS

OBJECTIVES:

1. To familiarize with the terminology associated with refrigeration systems and air conditioning
2. To understand basic refrigeration processes
3. To understand the basics of psychometric and practice of applied psychometrics
4. To acquire the skills required to model, analyse and design different refrigeration as well as air conditioning processes and components.

COURSE CONTENTS:

Unit-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule' s cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles. **(12 Hours)**

Unit-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop;multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling;low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system. **(12 Hours)**

Unit-III

(a) **Vapour absorption system**: Theoretical and practical systems such as aqua-ammonia, Electrolux & other systems; (b) **Steam jet refrigeration**: Principles and working, simple cycle of operation, description and working of

(b) simple system, (c) **refrigerants:** nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties. **(12 Hours)**

Unit-IV

Psychometric: Calculation of psychometric properties of air by table and charts; psychometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body. **(12 Hours)**

Unit-V

Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems. **(12 Hours)**

COURSE OUTCOMES:

A student who has done the course will have a good understanding of the working principles of refrigeration and air-conditioning systems

References:

1. Arora CP; Refrigeration and Air Conditioning; TMH
2. Sapali SN; Refrigeration and Air Conditioning; PHI
3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH
4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
5. Ameen; Refrigeration and Air Conditioning; PHI
6. Pita ; Air conditioning Principles and systems: an energy approach; PHI
7. Stoecker W.F, Jones J; Refrigeration and Air conditioning; McGH, Singapore
8. Jordan RC and Priester GB Refrigeration and Air Conditioning, PHI USA
9. Arora RC; Refrigeration and Air conditioning; PHI Learning

List of Experiments

1. General Study of vapor compression refrigeration system.
2. General Study of Ice Plant
3. General Study and working of cold storage
4. General Study Trane Air Condition (Package Type).
5. General Study of Electrolux Refrigeration
6. General Study One tone Thermax refrigeration unit.
7. General Study of Water cooler
8. General Study of Psychrometers (Absorption type)
9. General Study of Leak Detectors (Halide Torch).
10. General Study and working of Gas charging Rig.
11. General Study of window Air Conditioner.
12. General Study and working of Vapor compression Air conditioning Test rig.
13. Experimentation on Cold Storage of Calculate COP & Heat Loss.
14. Experimentation on Vapor compression Air Conditioning test rig.
15. Changing of Refrigerant by using Gas Charging Kit.

VII SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 71(B)

SUBJECT NAME: -INDUSTRIAL ENGINEERING (ELECTIVE-II)

TOTAL - 60 HOURS

OBJECTIVE:

- The students to be exposed to production and productivity.
- The student exposed to techniques used such as work-study, method study, and work measurement.
- Quality control such as statistical quality control and control chartor for attributer.

COURSE CONTENTS:

UNIT-I

Introduction: Definition of industry and industrial engineering, scope and role of industrial engineering fields of a applications.

Productivity: Production and productivity, production systems and their impact on productivity, its significance and benefits of higher productivity. Long term and short term factors affecting productivity, productivity cycle.

Work Study: Introduction, its relation with productivity aims, objectives and application of work study, basic procedure and techniques of work study. Human factors in work study. Role of manager, supervisor and workers. Working conditions, environment of industry affecting work study. **(12 Hours)**

UNIT-II

Method Study: Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods.

Principles of Motion Economy: Meaning, basic rules design of efficient work place-layout, classification of human body movements and their preferred order.

Material Handling and Plant Layout : Importance and its effects on productivity, requirements of good material handling system, classification and selection of material handling equipment. Requirements of good layout. Effect of bad layout, Factors affecting plant layout, types of layout, advantages and limitations of each type of layout selection of layout, factors affecting the plant location. on and

objectives, techniques of micro motion study, therbligs and their symbols, use of therbligs, SIMO chart and its application. **(12 Hours)**

UNIT-III

Work Measurement: Definition, Basic procedure and technique to work measurement. Stop watch time study, types of stop watch study, factors considered in selecting a job for time study, qualified and representative workers, procedure of stop watch time study, job element and their need of identification,

general rules for breakdown of job into elements, work cycle, methods of time measurement, performance rating, its meaning, standard rating, rating of operators, conditions for operators variation at work place rating scales, rating factors, calculation of basic time. Allowances- purpose, types. Calculation of standard time synthesis method- meaning, data, complication, advantages and limitations. PMTS- Definition principle and use, calculation of standard time. MIM - Meaning, tables and use. Application of MIM analysis for LH-RH charts, calculation of standard time. Work/ Activity Sampling: Definition, statistical basics, determination of number of observation for given accuracy, sources of error, application and calculation of standard time.

MOST Technique for work measurement: Definition of terms, concept of the MOST, Basic MOST sequence models, Time Units, Parameter Indexing, Method Accuracy and Sensitivity, Levels of Work Measurement, Compatibility of MOST systems, Application of MOST SEMESTER: Evaluation, Wages and Incentives: Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations. Wage: Definition, wage components, wage fixation, real, minimum and fair wage. Financial and non-financial incentives and their examples. Wage plans- Halsey, Taylor, differential plan, Gantt task and bonus plan, 100% premium plan. **(12 Hours)**

UNIT-IV

Statistical Quality Control: Definition of quality and total quality, three stages of quality, quality control and SOC. difference between inspection and quality control, concept of variability, natural variation, its importance to quality control , classification of quality, characteristics, basic tools of SOC and their application, frequency distribution, measures of central tendency and dispersion, their need and calculations. Normal Curve: Definition, characteristics, calculation of area

under normal curve and its application, statistical tolerance their calculation and

application. Process capability meaning calculation and use.

Control Charts for Variables: Statistical basic for control Charts for variables, construction of X and R Charts- their interpretation, use of X and R chart in Establishment of process capability. **(12 Hours)**

UNIT-V

Control Charts for Attributes: Limitation of X and R charts, Meaning and use of attributes, their advantages, Calculation, construction, interpretation and application of p- chart, c- chart, ph-chart. Need of calculating the revised values of mean, and control limits and their calculation. Sampling: Meaning different techniques procedure involved sampling inspection meaning and comparison with 100 % inspection. Factors affecting sampling and their effects. Single and double sampling plans, use of IS codes. O.C. Curves : Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans. Reliability: Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing. M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availability. **(12 Hours)**

OUTCOME:

At the end of the course, the student will be able to:

CO1 Explain the different types of layout and plant maintenance with safety

CO2 List and explain the need of method study and work measurements

CO3 Explain the production planning and quality control, and its functions

CO4 Understand the basic principles, approaches and functions of management and identify concepts to specific situations

CO5 List and explain the different financial sources and methods of inventory management

LIST OF EXPERIMENTS

1. Preparation of flow process chart for existing and improved process.
2. Preparation of man and machine chart for existing and improved process.
3. Preparation of L.H. and R.H. charts for existing and improved process.
4. Use of decimal minute watch.
5. Performance rating.

6. Establishing standard time for given operation using time study techniques.
7. Use of Shewharts bowl and actual production for frequency distribution.
8. Preparation of X and R charts.
9. Preparation of p- chart and c- chart.
10. Work measurement using MOST
11. Acceptance sampling by attributes (single and double sampling plans)
12. Determination of the percentage utilization of equipment (work sampling)
13. Application of principals of motion economy

REFERENCE BOOKS

1. Introduction To Industrial Engineering by Philip Hicks (McGraw Hills)
2. Productivity Means Property (Asian Productivity Organisation, Tokyo)
Introduction
3. To Work Study (International Labour Office)
4. Work Study by M.D. Schmid & Subrammaniam
5 Motion and Time Study by Ralph M. Barnes John Willey New York
6 Work Study by Dalela.
7. Wage Administration by D.K. Roy. (N.P.C. Publication).
8. Quality Assurance Engineering by M.D. Schmid & Subramanian.
9. S.Q.C. by E.L.Grant.
10. S.Q.C. by R.C. Gupta.
11. Industrial Engineering & Management by 0. P. Khanna.
12. Industrial Engineering by Saxena.
13. MOST Work Measurement Systems, Kjell B. Zandin, Marcel Dekkar Inc. New York.
14. Material Handling Equipment (N. Rudenki Place Pub)
15. Learning Package In Industrial Engineering by O.D.C., T.T.T.I Bhopal
16. Laboratory Manual Industrial Engineering by O.D.C. , T.T.T.I
17. Audyogiki Abhiyantran (Hindi) by J.C.Varshneya. (Deepak Prakashan, Gwalior)
18. Audyogik Engineering (Hindi) by K.D. Saxena. (Deepak Prakashan, Gwalior)

VII SEMESTER

CATEGORY: - PEC-MEL

SUBJECT CODE: -ME- 71(C)

SUBJECT NAME: -ROBOTICS

TOTAL - 60 HOURS

COURSE OBJECTIVES:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To select the robots according to its usage. Mechanical Engineering Curriculum Structure 258
- To discuss about the various applications of robots, justification and implementation of robot.
- To Conceptualize automation and understand applications of robots in various industries

Unit 1

Introduction: Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, motion characteristics, resolution, accuracy, repeatability, robot applications. **(12 Hours)**

Unit II

End Effectors and Drive systems: Drive systems for robots, salient features and comparison, different types of end effectors, design, applications. **(12 Hours)**

Unit III

Sensors: Sensor evaluation and selection, Piezoelectric sensors , linear position and displacement sensing, revolvers, encoders, velocity measurement, proximity, tactile, compliance and range sensing. Image Processing and object recognition. **(12 Hours)**

Unit IV

Robot Programming: Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications. **(12 Hours)**

Unit V

Safety and Economy of Robots: Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots. **(12 Hours)**

OUTCOME:

At the end of the course, the student will be able to:

CO1 Explain the robot anatomy, classification, characteristics of robot, advantages and disadvantages.

CO2 Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.

CO3 Explain about various types of sensors and concepts on robot vision system.

CO4 Explain the concepts of robot programming languages and various methods of robot programming.

CO5 Explain the various applications of robots.

References:

1. Mittal RK, Nagrath IJ; Robotics and Control; TMH
2. Groover M.P,Weiss M, Nagel,OdreyNG; Industrial Robotics-The Appl□; TMH
3. Groover M.P; CAM and Automation; PHI Learning
4. Spong Mark and Vidyasagar; Robot Modelling and control; Wiley India
5. Yoshikava ; Foundations of Robotics- analysis and Control; PHI Learning;
6. Murphy ; Introduction to AI Robotics; PHI Learning
7. FU KS, Gonzalez RC, Lee CSG; Robotics □Control, sensing□; TMH
8. Shimon, K; Handbook of Industrial Robots; John Wiley & Sons,.
9. Ghosal Ashitava; Robotics Fundamental concepts and analysis; Oxford
10. Saha S; Introduction to Robotics; TMH
11. Yu Kozyhev; Industrial Robots Handbook; MIR Pub.

VII SEMESTER

CATEGORY: - OEC-ME

SUBJECT CODE: -ME- 72(A)

SUBJECT NAME: -RENEWABLE ENERGY SYSTEM (OPEN ELECTIVE-II)

TOTAL - 60 HOURS

OBJECTIVE:

The student should be exposed to alternative sources of energy such as Solar, Wind, Nuclear, Fuel cells, Biomass, Biogas, Hydrogen, and Geothermal.

COURSE CONTENTS:

UNIT-I

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. **Solar thermal conversion:** Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells. **(12 Hours)**

UNIT-II

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; **Wind Energy Conversion:** Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics; power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy. **(12 Hours)**

UNIT-III

Production of biomass, photosynthesis-C3 & C4 plants on biomass production; Biomass resources assessment; Co2 fixation potential of biomass; Classification of biomass; Physicochemical characteristics of biomass as fuel **Biomass conversion** routes: biochemical, chemical and thermochemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production

mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values.

Biomass Gasification: Different types, power generation from gasification, cost

benefit analysis of power generation by gasification. **(12 Hours)**

UNIT-IV

Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues. **Ocean Energy:** Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion. **(12 Hours)**

UNIT-V

Geothermal energy: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants; **Hydrogen Energy:** Hydrogen as a source of energy, Hydrogen production and storage. **Fuel Cells:** Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics. **(12 Hours)**

COURSE OUTCOMES:

At the end of the course:

1. Student should update about the technological status of implementation of NCES in India.
2. Student should capable to analyze various techno economical obstacles in the commercial development of NCES in India.
3. Student should capable to conceptually model and design general NCES systems and predict the long term performance.
4. Student should suggest and plan hybrid NCES solutions to conventional energy systems

References:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging

Technologies, PHI Learn

2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publ
5. Koteswara Rao, Energy Resources, Conventional & Non-Conventional, BSP Publication.
6. Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and Application, PHI L
7. Abbasi Tanseem and Abbasi SA; Renewable Energy Sources; PHI Learning
8. Ravindranath NH and Hall DO, Biomass, Energy and Environment, Oxford University Press.
9. Duffie and Beckman, Solar Engineering of Thermal Process, Wiley
10. Nikolai, Khartchenko; Green Power; Tech Book International
11. Tester, Sustainable Energy-Choosing Among Options, PHI Learning.
12. Godfrey Boyle, Renewable Energy: Power for a sustainable future, Oxford OUP

VII SEMESTER

CATEGORY: - OEC-ME

SUBJECT CODE: -ME- 72(C)

SUBJECT NAME: - COMPUTER AIDED ENGINEERING (OPEN ELECTIVE-II)

TOTAL - 60 HOURS

OBJECTIVES

All phases of manufacturing or construction require the conversion of new ideas and design concepts

into the basic line language of graphics. Therefore, there are many areas (civil, mechanical,

electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in

the design and development of new products or construction. Students prepare for actual work

situations through practical training in a new state-of-the-art computer designed **CAD laboratory**

using engineering software. This course is designed to address:

· To prepare you 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 to prepare you to communicate effectively

· To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

UNIT-I

Fundamentals of Computer Graphics- Product cycle, sequential and concurrent engineering,Computer Aided Design, CAD system architecture, computer graphics, Coordinate systems, 2D and 3D transformations, viewing transformation. **(15 Hours)**

UNIT-II

Geometric Modeling- representation of curves, Hermite curves, Bezier curves, B-spline curves,rational curves, Techniques of surface modelling, surface patch, Coons and bicubic patches, Bezierand B-spline surfaces, Solid modelling techniques, CSG and B-rep. **(15 Hours)**

UNIT-III

Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, computer animation Assembly of parts- assembly modelling, interferences of positions and orientation, tolerance analysis, mass property calculations, mechanism simulation and interefence checking CAD standards- Graphical Kernel . **(15 Hours)**

UNIT-IV

System (GKS), standards for vexchange images, Open Graphics Library (OpenGL), Data exchange standards- IGES, STEP, CALS etc., Communication standards.

(15 Hours)

OUTCOMES:

· Introduction to engineering design and its place in society

· Exposure to the visual aspects of engineering design

· Exposure to engineering graphics standards

· Exposure to solid modelling

· Exposure to computer-aided geometric design

· Exposure to creating working drawings

· Exposure to engineering communic

Text Books:

1. Ibrahim Zeid, Mastering CAD CAM, Tata McGraw Hill Publishing Co. 2007.

2. C. McMohan and J. Browne, CAD/CAM Principles, II edition, Pearson Education, 1999.

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 73

SUBJECT NAME: - MACHINE DESIGN-II

TOTAL - 60 HOURS

OBJECTIVE :

- The student to get insight into design of belt,rope,chain drives, spur and helical gears, bevel gears,I.C. engine components and miscellaneous components with a view to optimize the design procedure.

COURSE CONTENTS:

Unit I

Design of Belt, Rope and Chain Drives: Methods of power transmission, selection and design of flat belt and pulley; Selection of V-belts and sheave design; Design of chain drives, roller chain and its selection; Rope drives, design of rope drives, hoist ropes. **(12 Hours)**

Unit II

Spur and Helical Gears: Force analysis of gear tooth, modes of failure, beam strength, Lewis equation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears.

Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewis equation for bevel gears; Strength against wear; Design of bevel gear. **(12 Hours)**

Unit III

Design of I.C. Engine Components: General design considerations in I C engines; design of cylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft. **(12 Hours)**

Unit IV

Design of Miscellaneous Components: design of Flanged coupling; Rigid coupling, Design of Pressure vessels subjects to internal pressure, external pressure, design of penetration, design of flanges, cone cylinder junctions ,Materials, Fabrication. **(12 Hours)**

Unit V

Optimization: Basic concept of optimization, classification of optimization, optimization techniques, engineering applications of optimization. Classical optimization techniques: unconstrained optimization single-variable optimization, multivariable optimization, solution by direct search method, solution by Lagrange-multipliers method. **(12 Hours)**

COURSE OUTCOMES:

- The student understands in details of belt, force analysis of gear tooth, lewis equation for bevel gears.
- The student understood general design consideration of cylinder piston, piston rings, connecting rod, and crank shaft.
- The students evaluated design of flange coupling, pressure vessel and section of materials and fabrication aspect.

References:

1. Shigley J.E.; Machine Design; TMH
2. BhandariVB; Design of Machine Elments; TMH
3. Sharma CS and Purohit K; Design of Machine Elements; PHI Learning.
4. Hall and Somani; Machine Design; Schaum Series; TMH
5. Wentzell TH; Machine Design; Cegage Learning
6. Sharma & Agrawal; Machine Design; Katson
7. Kulkarni SG; Machine Design; TMH
8. Abdul Mubeen; Machine Design; Khanna Publishers
9. Juvinall RC, Marshek KM; Fundamentals of Machine Component Design; Wiley
10. Norton R; Design Of Machinery; TMH

List of Experiment

Designing and sketching of components contained in the syllabus

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 74

SUBJECT NAME: - AUTOMATION IN MANUFACTURING

TOTAL - 60 HOURS

OBJECTIVES:

1. To understand the importance of automation in the of field machine tool based manufacturing
2. To get the knowledge of various elements of manufacturing automation CAD/CAM, sensors, pneumatics, hydraulics and CNC
3. To understand the basics of product design and the role of manufacturing Automation

COURSE CONTENTS:

UNIT-I

Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing. **(15 Hours)**

UNIT-II

Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC-Adaptive Control. **(15 Hours)**

UNIT-III

Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies. **(15 Hours)**

UNIT-IV

Introduction to Modeling and Simulation: Product design, process route modeling, Optimization techniques, Case studies & industrial applications.

(15 Hours)

COURSE OUTCOMES:

Upon completion of this course, the students will get a comprehensive picture of computer based automation of manufacturing operations

Text Books:

(i) Mikell P. Groover, Automation, Production Systems, and Computer-integrated
(ii) Manufacturing, prentice Hall
(iii) SeropeKalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology, 7th edition,Pearson
(iv) YoramKoren, Computer control of manufacturing system, 1st edition
(v) Ibrahim Zeid , CAD/CAM : Theory & Practice, 2nd edition.

CATEGORY: - PCC-ME

SUBJECT CODE: -ME- 75

SUBJECT NAME: - MECHANICAL VIBRATION & CONTROL

TOTAL - 60 HOURS

OBJECTIVE:

- The students to be exposed to fundamental aspects of vibration.
- The students to understand the difference between undammed free vibration, damped free vibrations, harmonicallyexcited vibration.
- The students to understand whirling motion and critical speed & two degrees of freedom.
- **To understand the basics of noise engineering.**

COURSE CONTENTS:

Unit 1

Fundamental Aspects of Vibrations: Vibration, main causes, advantages and disadvantages; engineering applications of vibration and noise; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon, work done by harmonic forces on harmonic motion; periodic, non-harmonic functions- Fourier series analysis; evaluation of coefficients of Fourier series; elements of vibratory system; lumped and distributed parameter systems.

Undamped Free Vibrations: Derivation of differential equation of motion: the energy method, the method based on Newton' s second law of motion, and Rayleigh' s method. Solution of differential equation of motion: Natural frequency of vibration. Systems involving angular oscillations: the compound pendulum. **(12 Hours)**

Unit 2

Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; under damped, over damped and critically damped systems; logarithmic decrement; frequency of damped free vibration; Coulomb or dry friction damping; frequency, decay rate and comparison of viscous and Coulomb damping; solid and structural damping; slip or interfacial damping. **(12 Hours)**

Unit 3

Harmonically excited Vibration: One degree of freedom- forced harmonic vibration; vector representation of forces; excitation due to rotating and reciprocating unbalance; vibration Isolation, force and motion transmissibility; absolute and relative motion of mass (Seismic Instruments). Whirling Motion and Critical Speed : Whirling motion and Critical speed : Definitions and significance .Critical – speed of a vertical , light – flexible shaft with single rotor : with and without damping .Critical speed of a shaft carrying

multiple discs (without damping), Secondary critical speed. **(12 Hours)**

Unit 4

Systems With Two Degrees of Freedom : Un-damped free vibration of 2 d.o.f and Principal modes of vibration; torsion vibrations; Forced, Un-damped vibrations with harmonic excitation ; Coordinate coupling; Dynamic vibration absorber; torsion Vibration Absorber; Pendulum type of dynamic vibration. **(12 Hours)**

Unit 5

Noise Engineering – Subjective response of sound: Frequency and sound dependent human response; the decibel scale; relationship between, sound pressure level (SPL), sound power level and sound intensity scale; relationship between addition, subtraction and averaging, sound spectra and Octave band analysis; loudness; weighting networks; equivalent sound level, auditory effects of noise; hazardous noise, exposure due to machines and equipments; hearing conservation and damage risk criteria, daily noise doze. Noise: Sources, Isolation and Control: Major sources of noise on road and in industries, noise due to construction equipments and domestic appliances, industrial noise control, strategies- noise control at source (with or without sound enclosures), noise control along the path (with or without partitions and acoustic barriers); noise control at the receiver, ear defenders, earplugs, semi-insert protectors. **(12 Hours)**

References:

1- Ambekar A.G.,' Mechanical Vibrations and Noise Engineering; PHI 2- Meirovitch Leonard; Element of Vibration Analysis; TMH

3- Dukikipati RV Srinivas J Text book of Mechanical Vibrations; PHI

4- Kelly SG and kudari SK; Mechanical Vibrations; Schaum Series;TMH

5- Thomson , W.T., Theory of Vibration with Applications , C.B.S Pub & distributors .

6- Singiresu Rao, 'Mechanical Vibrations ' , Pearson Education

7- G.K. Grover, ' Mechanical Vibration , Nem chand and Bross , Roorkee

OUTCOMES :

- The student found the effect of load on natural frequency of vibration.
- The student found the frequency of damped free vibration and rate of decay of vibration amplitude in the system.
- The student found the natural frequency and damped free frequency of a Torsion pendulum.
- The student interpreted sources, isolation and control of noise.

LIST OF EXPERIMENTS

1- To find out effect of load on natural frequency of vibrations of a lever pin supported at one end carrying adjustable load on a vertical screwed bar and spring supported at some intermediate point (i) When the dead weight of rods is neglected and (ii) when their dead weight is taken into account .

2- To find out frequency of damped free vibration and rate of decay of vibration- amplitude in the system.

3- To find out natural frequency and damped free frequency of a torsion pendulum and , hence to find out coefficient of damping of the oil

CATEGORY: - PROJ-ME

SUBJECT CODE: -ME- 76

SUBJECT NAME: -MAJOR PROJECT-I

TOTAL - 60 HOURS

OBJECTIVES:

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the College. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.