VINAYAKA MISSIONS RESEARCH FOUNDATION
SALEM, TAMILNADU

FACULTY OF ENGINEERING AND TECHNOLOGY

CURRICULAM AND SYLLABUS
(REGULATION - 2012)

B.E MECHANICAL ENGINEERING (FULLTIME) - CBCS
### CURRICULUM & SYLLABUS

#### SEMESTER I

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SALEM – 636 308.
AND
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, CHENNAI

SCHOOL OF MECHANICAL SCIENCES

BOARD : MECHANICAL ENGINEERING
REGULATION : 2012
PROGRAM : B.E – Mechanical Engineering - Full Time
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**Aim:** To Strengthen the basic LSRW (Listening, Speaking, Reading and Writing) skills.

**Objectives:**
1. To make the students of Engineering courses learn English for Effective communication
2. To make them competent enough in the use of English in today’s global scenario.
3. To make our Engineering graduates fit for any MNC today.

**Outcome:**
1. It is hoped that the students who are taught the revised English for Effective communication syllabus will be able to communicate in English.
2. This syllabus will enable our U.G Engineering graduates to face any challenges with confidence and they will prove with their counter part any where in the globe.

**UNIT – I**
Word formation with prefixes and suffixes, Antonyms & Synonyms-Tense Forms , Active and Passive voices- Different kinds of Nouns and Pronouns - Use of Verbs and Adverbs – Adjectives, Degrees of Comparison - Conditional Sentences --- Common Errors in English-Reported Speech- Articles.

**UNIT – II**
Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines - Vocabulary (Homophones).

**UNIT – III**
Principles of Communication - Defining and Describing Objects -.Role Play- Debate-Telephonic Etiquettes.

**UNIT – IV**
How to write reports, report writing – Recommendations - Discussing data and coming to conclusions –Technical Reports –Project proposals- Brochures- News Letters- Memorandum (or) Memo

**UNIT – V**
Flowcharts - Pie-charts – Bar charts- Interpreting tables- Formal and Informal letters - Resume Writing.

**TEXT BOOK**
1. *English for Effective Communication*, Departments of English, VMKV & AVIT.

**REFERENCE BOOKS**
2. Pickett and Laster.*Technical English: Writing, Reading and Speaking*.


AIM: To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

OBJECTIVES: The syllabus for the Engineering Mathematics I have been framed catering to the needs of the Engineering students. It is purely applications oriented. To mention a few i) To utilize the powerful features of MATLAB one has to be an expert in Matrix theory (ii) The matrix theory plays an vital role in simplifying large arrays of equation and in determining their solution. (iii) Partial differential equation frequently occurred in the theory of elasticity and Hydraulics. (iv) In circuit branches the current flow can be calculated by using Laplace transform when EMF, resistance and inductions are known.

OUTCOME: At the end of this course the students will be in a position to apply the knowledge of Mathematics in the respective Engineering branches.

UNIT I MATRICES
Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II DIFFERENTIAL CALCULUS
Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute

UNIT III FUNCTIONS OF SEVERAL VARIABLES

UNIT IV LAPLACE TRANSFORMS

UNIT V APPLICATIONS OF LAPLACE TRANSFORMS
Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

Tutorial Hours: 15 Lecture Hours: 45 Total hours: 60
1. “Engineering Mathematics” by Department of Mathematics, VMU

REFERENCE BOOKS
**AIM:** To study the basics of Computer, Hardware, Software Applications, Algorithms and Problem solving methodologies

**OBJECTIVE:** The proposed course exposes the students to IT Essentials. The Core Modules of this paper includes Programming, Database and Operating system and other related topics.

**OUTCOMES:**
At the end of this course, student shall be able to:
Do Problem Solving using Programming and algorithms, Describe working of Internet based applications, Document artifacts using common quality standards, Design simple data store using DBMS concepts and implement, Develop a working website with all above learning.

**UNIT I**
**Basics of Computer and Information Technology:** Digital computer fundamentals-Block diagram of a computer-component of a computer system Hardware and software definitions-Categories of software-Booting-Installing and Uninstalling Software-Software piracy-Software terminologies-Application of Computer-Role of Information Technology-History of Internet-Internet Services.

**UNIT II**
**Problem Solving Methodologies and Techniques:** Problems solving Techniques-Program development cycle-Algorithm-Design-Flow chart-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems. Top down and Bottom up approaches of software development.

**UNIT III**
System Software-Assemblers-Loaders and linkers-Compilers and interpreters.

**UNIT IV**
**Basics of Operating System and DBMS:** Introduction-Basics of memory management schemes-Scheduling-threads. Introduction to File and Database systems- SQL-DDL statements-DML statements-DCL statements.

**UNIT V**
**Software Applications:** Office Automation: Application Packages-word processing-Spread sheet Application and Basics of HTML.

**TOTAL HOURS : 45**
TEXT BOOK:
1. Faculties, School of Computer Science, VMKVEC, “An Introduction to Computer Foundation Program”.

REFERENCES
AIM: To provide the knowledge about the environmental science.

OBJECTIVE: It is the branch of science which deals with the effects of human activities & modern technology on environment. It creates awareness among the engineering students about environmental pollution and the role of the engineers in conservation of environment.

OUT COME: The students will get the knowledge about environment and they will work their corresponding field with eco-friendly. It will protect our environment from pollution

UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10
Definition, scope and importance – need for public awareness- forest resources: use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems-mineral resources: use effects on forests and tribal people-water resources: use and over-utilization of surface and exploitation, environmental effects if extracting and using mineral resources, case studies-food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies-energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification –role of an individual in conservation of natural resources-equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets-river/forest./grassland/hill/mountain.

UNIT – II ECOSYSTEMS AND BIODIVERSITY 14
Concept of and ecosystem –structure and function of an ecosystem-producers, consumers and decomposers-energy flow in the ecosystem-ecological succession-food chains, food webs and ecological pyramids-introduction, types, characteristic features, structure and function of the (a)forest ecosystem (b). grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)-introduction to biodiversity- definition: genetic, species and ecosystem diversity- biogeographical classification of India-value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values-biodiversity at global, national and local levels-India as a mega-diversity nation-hot-spots of biodiversity.

Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT - III ENVIRONMENTAL POLLUTION 8
Definition-causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – solid waste management: caused, effects and control measures of urban and industrial wastes-role of an individual in prevention of pollution-pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site-urban / rural / industrial / agriculture
UNIT - IV SOCIAL ISSUES AND THEIR ENVIRONMENT  


UNIT – V HUMAN POPULATION AND THE ENVIRONMENT  


Total Hours : 45

TEXT BOOK:
1. Raman Sivakumar, Environmental Science and Engineering, Vijay Nicole imprints Pvt.Ltd.

REFERENCE BOOKS:
1. Bharucha Erach, The Biodiversity of India, publishing Pvt. Ahmedabad, India,
AIM: To Strengthens the fundamental knowledge in physics will improve the scientific thinking of students.

OBJECTIVE:
To familiarize students with the basic concepts of Physics and their application in Engineering & Technology

OUTCOME: Students will gain knowledge in the basic concepts of physics which can be applied in Engineering & Technology

UNIT – I Lasers

UNIT – II Fibre Optics
Principle and propagation of light in optical fibres – numerical aperture and acceptance angle – types of optical fibres (material, refractive index, mode) – Applications: Fibre optic communication system (block diagram only) – fibre optic sensors (displacement sensor and pressure sensor).

UNIT – III Crystal Physics

UNIT – IV Acoustics

UNIT- V Non – Destructive Testing
TEXT BOOK


REFERENCE BOOKS

Aim: To provide the knowledge about mechanics and statics

Objective: It is the branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the bodies at rest.

Outcome: The students would have learned the fundamental of Mechanics systems of forces which are very essential for engineering students to further build up his studies in the mechanical engineering branch.

Unit – I

Element of Vector Algebra: Introduction, Magnitude and Multiplication of a Vector by a Scalar, Addition and Subtraction of Vectors, Resolution of Vectors: Scalar Components, Unit Vectors, Useful Ways of Representing Vectors, Scalar or Dot Product of Two Vectors, Cross product of Two Vectors, Scalar triple Product, Note on Vector Notation.

Unit – II


Unit – III

Unit-IV

Unit-V
Properties of Surfaces: Introduction, First Moment of an Area and the Centroid and Other Centers, Theorem of Pappus-Guldinus, Second Moments and the Product of an Area of a Plane Area, Transfer Theorems, Computations Involving Second Moments and Products of Area, Relation Between Second Moments and Products of Area, Polar Moment of Area, Principal Axes.

Total: 45 Hours

Text Book:

Reference:
Aim: To provide the knowledge about basics of physics

Objective:
To gain the knowledge of taking precise readings from equipments

Outcome: Students will have the knowledge of taking measurements precisely

List of Experiments

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer
Aim: The aim of the lab is to learn Business fitting, Carpentry, and welding techniques.

Objective: To learn the experience of practice in basic sections of the workshop, namely fitting, Carpentry, and welding, to understand the various methods involved in making parts of various machines.

Outcome: The students would have been completely exposed to the various basic methods that are going to play in the manufacture of even very heavy machines.

FITTING
1. Vee Joint
2. Square Joint
3. Dove Tail Joint

Carpentry
1. Planning
2. Half lab
3. Dove Tail Joint

Welding
1. Arc Welding of butt Joint.
2. Arc Welding of Lap Joint

Demonstration
1. Sheet Metal – Fabrication of tray and cone
2. Black Smithy – Round to square rod.
3. Foundry – Mould Preparation using single piece and split pattern

Reference:
1. “Basic Workshop Practice“, Department of Mechanical Engineering, VMKV Engineering College, 2008
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**AIM:** To give the knowledge about computer programs

**OBJECTIVE:** The proposed course exposes the students to IT Essentials. The Core Modules of this paper includes Programming, Database and Operating system and other related topics.

**OUTCOME:**
At the end of this course, student shall be able to:
Do Problem Solving using Programming and algorithms, Describe working of Internet based applications, Document artifacts using common quality standards, Design simple data store using DBMS concepts and implement, Develop a working website with all above learning.

**I. OFFICE AUTOMATION**
1. Create a document with all formatting effects.
2. Create a document to send mails using mail merge option.
3. Create an Excel File to analyze the student's performance. Create a chart for the abovedata to depict it diagrammatically.
4. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
5. Create a Power Point presentation for your personal profile with varying animation effects with timer.

**II. SQL QUERIES**
1. Write SQL Commands for Data Definition, Table Creation with constraints.
2. Write SQL Commands for Insert, Select, Update and Delete operations.
3. Write SQL Commands for aggregate functions.

**III. HTML**
1. Write HTML code to develop a web page having the background in red and title “My First Page” in any other color.
2. Design a page having background color given text color red and using all the attributes of font tab.
3. Create a web page, when user clicks on the link it should go to the bottom of the page.
4. Create a web page, showing an ordered & unordered list of name of your five friends.
5. Create a web page with appropriate content and insert an image towards the left hand side of the page when user clicks on the image. It should open another webpage.
6. Create a web page which should contain a table having two rows and two columns.
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**Aim:** To provide the basic knowledge of business English.

**Objectives:**
1. To make the students understand the principles of Basic English grammar and use it in their day today life.
2. To make the engineering graduates employable and industry ready.
3. To make our students that they are second to none in the best use of the English language.

**Outcome:** Outcome of the revised Business English syllabus for the second semester UG Engineering students for the academic year 2012-2013.
1. By teaching this syllabus, it is believed that the UG Engineering graduates will develop their fluency level of using English.
2. Students, who undergo this syllabus, will fulfill the expectations of the industries and find themselves employable in any field.

**UNIT – I**

**UNIT – II**

**UNIT – III**
Understanding Ideas and Making Inferences- Interview Questions (Direct, Open-ended and Closed Questions) - E-mail Netiquette, Sample E-mails- Group Discussion and Mock interview.

**UNIT – IV**
Instruction - Check-list - Minutes of the Meeting and Writing Agenda - Note making. Rearranging the jumbled sentences- Technical Articles- Project Proposals.

**UNIT – V**
TEXT BOOK
1. English for Effective Communication,
   Departments of English, VMKV & AVIT.

REFERENCE BOOKS
5. Prof. K.R. Lakshmi Narayanan & Dr. T. Murugavel. Communication Skills for Engineers,
Aim: To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

Objectives: The syllabus for the Engineering Mathematics II have been framed catering to the needs of the Engineering students. It is purely applications oriented. To mention a few (i) Differential equation plays a vital role in finding the solutions of problems related to oscillations of Mechanical and Electrical systems, bending of beam, conduction of heat, velocity of chemical reaction etc., and as such play an very important role in all modern scientific and engineering studies.(ii)The complex functions are useful in the study of Fluid mechanics, Thermodynamics and electric fields.

Outcome: At the end of this course the students will be in a position to apply the knowledge of Mathematics in the respective Engineering branches.

UNIT I  ORDINARY DIFFERENTIAL EQUATIONS  09
Solutions of third and higher order linear ordinary differential equation with constant coefficients– Method of variation of parameters– Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II  MULTIPLE INTEGRALS  09
Double integration–change of order of integration- Cartesian and polar coordinates – Area as a double integral – Triple integration – volume as a triple integral.

UNIT III  VECTOR CALCULUS  09

UNIT IV  ANALYTIC FUNCTIONS  09
Function of a complex variable – Analytic function – Necessary conditions - Cauchy Riemann equations – Sufficient conditions (excluding proof) – Harmonic conjugate– Constructions of analytic functions-conformal mapping(w=z+c,w=z^2,w=1/z)-bilinear transformation

UNIT V  COMPLEX ANALYSIS  09
Statement and application of Cauchy’s integral theorem and integral formula – Taylor’s and Laurent’s expansions – Residues – Cauchy’s residue theorem-contour integration over unit circle.

Tutorial Hours: 15 Lecture Hours: 45 Total hours: 60
TEXT BOOKS
1. “Engineering Mathematics” by Department of Mathematics, VMU

REFERENCE BOOKS
AIM

To impart in basic knowledge in chemistry so that the student will understand the engineering concept and they can face the competitive examinations effectively.

OBJECTIVE

With a solid foundation in basic scientific and engineering principles, while allowing specialization in Engineering chemistry and ability to assess the impact of engineering solutions in a global and societal context.

OUTCOME

The student will come out with the ability to assess the impact of engineering solutions.

UNIT I: WATER TECHNOLOGY & CORROSION


UNIT II: ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS


UNIT III: CHEMISTRY OF ADVANCED MATERIALS

Portland cement – setting and hardening – RCC – Special cements. Organic electronic material, solid oxide materials, shape memory alloys, nanomaterials, polymers, fullerenes, ceramics, fibers, lubricants, refractories & composites (definition, classification and applications)

UNIT IV: PHASE EQUILIBRIA & NUCLEAR CHEMISTRY

UNIT V: CHROMATOGRAPHY AND SPECTROSCOPY

Chromatography — classification & principles (Paper, column, thin layer, gas, HPLC).

REFERENCES:

2. Engineering Chemistry by Jain & Jain.

Total: 45 hours
AIM:
The aim is to introduce C programming to the students.

OBJECTIVES:
To enable the student to learn programming knowledge in C.

Outcomes:
Do develop the skill of the student to develop the programming in C language.

UNIT I Introduction
Algorithms & flowcharts-Overview of C-Features of C-IDE of C Structure of C program-
Compilation & execution of C program-Identifiers, variables, expression, keywords, data types,
constants, scope and life of variables, local and global variables. Operators: arithmetic, logical,
relational, conditional and bitwise operators- Special operators: size of () & comma (,) operator-
Precedence and associativity of operators & Type conversion in expressions.
Basic input/output and library functions
Single character input/output i.e. getch(), getchar(), getche() & putchar()-Formatted input/output:
printf() and scanf()-Library Functions: concepts, mathematical and character functions.

UNIT II Control structures
Conditional control-Loop control and Unconditional control structures.
Functions: The Need of a function-User defined and library function- Prototype of a function-
Calling of a function-Function argument-Passing arguments to function- Return values-Nesting of
function- main()-Command line arguments and recursion. Storage class specifier – auto, extern,
static, & register.

UNIT III
Arrays: Single and multidimensional arrays-Array declaration and initialization of arrays-Array as
function arguments.
Strings: Declaration-Initialization and string handling functions.
Structure and Union: Defining structure-Declaration of structure variable-Accessing structure
members-Nested structures-Array of structures-Structure assignment-Structure as function
argument-Function that returns structure- Union.

UNIT IV
Pointers: The ‘&’ and * operators-Pointers expressions-Pointers vs arrays-Pointer to functions-
Function returning pointers-Static and dynamic memory allocation in C.
DMA functions: malloc(), calloc(), sizeof(), free() and realloc()-Preprocessor directives.

UNIT V
File management: Defining, opening & closing a file, text file and binary file- Functions for file
handling: fopen, fclose, gets, puts, fprintf, fscanf, getw, putw, fputs, fgets, fread, fwrite-Random
access to files: fseek, ftell, rewind-File name as Command Line Argument.

TEXT BOOKS:

**REFERENCE BOOKS:**

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<tr>
<th>SEMESTER</th>
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<td>II</td>
<td>MATERIAL SCIENCE (Common to Mechanical, Auto, Aero &amp; Civil of B. E.)</td>
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**Aim:** To provide the knowledge about various materials used in engineering

**Objective**
To familiarize students with the classical and quantum aspects of materials and their application in Engineering & Technology

**Outcome**
Students will be enabled in applying their knowledge of materials in Engineering & Technology

**UNIT- I Conducting Materials**

**UNIT- II Semiconducting Materials**

**UNIT – III Magnetic and Dielectric Materials**

**UNIT – IV Dielectric Materials**
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss - uses of Dielectric materials

**UNIT- V Nano Materials**
Synthesis of nanostructured materials – Top-down and Bottom-up methods- Lithography - sol-gel method - carbon nanotubes - synthesis of carbon nanotubes - applications
TEXT BOOKS:


REFERENCES:

Aim: To study about mechanics and dynamics in engineering.

Objective: It is the branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the bodies in motion.

Outcome: The students would have learned the fundamental of Mechanics systems of forces Kinematics of particle, Impulse–Momentum Methods for Rigid bodies which are very essential for engineering students to further build up his studies in the mechanical engineering branch.

Unit-I
Kinematics of a Particle – Simple Relative Motion
Introduction, General Notions, Velocity and Acceleration Calculations, Simple, Kinematical Relations and Applications
Particle Dynamics
Introduction, Rectangular Coordinates, Rectilinear Translation, Cylindrical Coordinates, central Force Motion, System of Particles

Unit – II
Energy Method for Particles
System of particles: Work-Energy Equations, Kinetic Energy Expression Based on Center of Mass, Work-Kinetic Energy Expression Based on Center of Mass

Unit – III
Kinematics of Rigid Bodies: Relative Motion
Introduction, Translation and Rotation of Rigid Bodies, Chasles’ Theorem, Applications of the Fixed-Vector Concept, General Relationships between Time Derivatives of a Vector for Different References, General Relationships between Velocities of a Particle for Different References, Acceleration of a Particle for Different References.

Unit – IV
Kinetics of Plane Motion of Rigid Bodies
Introduction, Moment-of-Momentum Equations, Pure Rotation of a body of Revolution About its Axis of Revolution, Pure Rotation of a body with Two Orthogonal Planes of Symmetry, Pure Rotation of Slab Like Bodies, Rolling Slab Like Bodies, General Plane Motion of a Slab Like Bodies, Pure Rotation of an Arbitrary Rigid Body.

Unit – V
Energy and Impulse–Momentum Methods for Rigid Bodies

Total: 45 PERIODS

Text Book:

Reference:
PROGRAMMING IN C LAB
(COMMON TO CSE, IT, CSSE, M.Sc, MECH, AUTO, AERO, CIVIL, BIO-TECH, BIO-INFO)

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**AIM**
To practice and develop applications using C Programming languages.

**OBJECTIVES:**
To enable the student to learn programming knowledge in C.

**Outcomes:**
Do develop the skill of the student to develop the programming in C language.

**Experiments:**
1. Implementation of Sine and cosine series.
2. Generation of Fibonacci series.
3. To find the i) Factorial number.
   ii) Sum of n natural numbers.
4. Reversing the digits of an integer
5. Conversion of decimal number to octal number
6. Conversion of character integer to decimal number
7. Finding the square root of a given number by applying algorithm
8. (a) Find GCD of two numbers
   (b) Generate Prime numbers between 1 and n.
9. Greatest of three numbers using if statement and conditional operator.
10. Read two numbers and swap those two numbers using temporary variable and without using temporary variable.
11. Quadratic equation for different sets of inputs.
12. Use of switch….Case statements.
13. Matrix operations
   a) Addition   b) Transpose   c) Multiplication
14. Ascending and Descending order.
15. Given a set of n numbers, find the length of the longest monotone increasing subsequence.
16. Sort by exchange, selection and partitioning method
17. Use of pointers and array of pointers
18. Linear search.
20. Files operations.
Aim: To study about basics of engineering graphics

Objectives: To develop in student’s graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Outcome: The students would have learned the engineering graphics which is the basic language for an engineer to communicate is idea in manufacturing the various items.

Concepts and conventions (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Free hand sketching:
Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT I PLANE CURVES AND FREE HAND SKETCHING
Curves used in engineering practices:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES
Sectioning of above solids in simple vertical position by cutting planes inclined to onereference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Total: 45 PERIODS
TEXT BOOKS:

REFERENCES:

Note: 1. Mini drafter is to be used for unit-I&II
2. Free hands sketch and drafting software is to be used for Unit-III, IV&V.
AIM:
To impart in basic knowledge in chemistry so that the student will understand the engineering concept.

OBJECTIVE
To learn the relevant experience using laboratory experiments

OUTCOME
The student will have the experience in handling the instruments relevant to his/her theory.

1. Estimation of total hardness of water sample by EDTA method.
2. Determination of alkalinity by indicator method.
3. Estimation of ferrous ion by Potentiometry.
4. Titration of strong acid with strong base by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.
Aim | The aim of the subject is to provide knowledge in various methods and techniques to solve the problems.
--- | ---
Objective 1. | To study about various methods to solve partial differential equations.
1. | To learn the concept of fourier series techniques.
2. | To study and analyze various methods for solving boundary value problem.
2. | To learn the concepts and applications of fourier transforms and Z transforms.
Outcome | The students would be able to understand the various methods and techniques for solving different types of problems.

UNIT –I PARTIAL DIFFERENTIAL EQUATIONS 9
Formation - Solutions of standard types f(p,q)=0, clairauts form, f(z,p,q)=0,f(p,x)=g(q,y) of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

UNIT –II FOURIER SERIES 9
Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity – Harmonic Analysis.

UNIT –III BOUNDARY VALUE PROBLEMS 9
Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

UNIT –IV FOURIER TRANSFORMS 9

UNIT –V Z - TRANSFORMS 9

TUTORIAL : 15 PERIODS
TOTAL HOURS : 60 PERIODS
TEXT BOOK:
A. Singaravelu, “Transforms and Partial Differential Equations”, Meenakshi Agencies, Chennai

REFERENCES:
### SEMESTER III
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**Aim**
The aim of the subject is to provide a fundamental knowledge of thermodynamics.

**Objective**
1. To achieve an understanding of fundamentals of thermodynamic systems and first law of thermodynamics.
2. To provide an in-depth study of availability and second law of thermodynamics.
3. To understand the concept of working fluid and its properties.
4. To provide in-depth study of power cycles applying the different working fluids studied in the previous chapter.
5. To understand the Thermodynamic Relations and also to understand combustion equations.

**Outcome**
The students would understand the basic fundamentals in thermodynamics and its applications.

### UNIT –I  BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS  
9  
First law of thermodynamics – Applications to closed and open systems, Internal energy, Specific heats, Enthalpy, Steady and unsteady flow conditions. Problems.

### UNIT –II  SECOND LAW OF THERMODYNAMICS  
9  

### UNIT –III  WORKING OF PURE SUBSTANCES  
9  
Definition of working fluid, Thermodynamic properties of pure substances, property diagram, PVT surface of water and other substances, calculation of properties. First law and second law analysis using tables and charts.

### UNIT –IV  POWER CYCLES  
9  

### UNIT –V  THERMODYNAMIC RELATIONS AND COMBUSTION OF FUELS  
9  
Exact differentials, T-Ds relations, Maxwell relations, Clausius Clapeyron equations, Joule-Thomson coefficient. Heat value of fuels, Combustion equations, Theoretical and excess air, Air fuel ratio, exhaust gas analysis, Problems.

**TUTORIAL HOURS** :15  
**TOTAL HOURS** :60
TEXT BOOKS

REFERENCES
1. Spalding & Cole., Engineering Thermodynamics, ELBS.
3. Rogers & Mayhew, Engineering Thermodynamics – Addision Wesley.
# Manufacturing Technology – I

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**Aim**  
The aim of the subject is to provide a fundamental knowledge in manufacturing sector.

**Objective**  
1. To acquire the knowledge about mould making, metal melting and casting process.  
2. To acquire the knowledge about various metal joining processes.  
3. To acquire the knowledge about various hot and cold working processes.  
4. To acquire the knowledge about various sheet metal forming processes.  
5. To acquire the knowledge about various plastic processing.

**Outcome**  
The students would understand the basic working principle of joining and cutting operations and can perform casting and welding process.

## UNIT – I  METAL CASTING PROCESSES


## UNIT – II  FABRICATION PROCESS


## UNIT – III  BULK DEFORMATION PROCESSES

Hot working and cold working of metals – Forging processes – Open and close die forging – Types of Forging Machines – Typical forging operations- economics of forging.  
Rolling of metals – Types and operations, Extrusion – types and operations. Wire drawing & Tube piercing

## UNIT – IV  SHEET METAL FORMING PROCESSES


## UNIT – V  PROCESSING OF PLASTICS

Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics –Injection moulding-principle and applications – Blow moulding – Rotational moulding:  
Thermoforming – Processing of Thermosets - Compression moulding – Transfer moulding – Bonding of Thermoplastics – Fusion and solvent methods – Induction and Ultrasonic methods.

**TOTAL HOURS :** 45 PERIODS
TEXT BOOKS

REFERENCES
Aim
The aim of the subject is to provide a fundamental knowledge in fluid mechanics and machinery.

Objective
1. To learn the fundamentals in Fluid Mechanics
2. To understand the kinematics of the fluid flow.
3. To understand the fluid flow concepts
4. To learn the working principle, applications & design of various hydraulic turbines
5. To learn the working principle, applications & design of various hydraulic pumps.

Outcome
The students would be able to understand the basic fluid properties and could understand the working principle of pumps.

UNIT –I - BASIC CONCEPTS AND PROPERTIES
Fluid – Definition - solid and fluid - Units and dimensions - Properties of fluids – Temperature - Viscosity - Compressibility - Vapour pressure - Capillary and surface tension - Fluid statics: concept of fluid static pressure - Pressure measurements by manometers and pressure gauges. Introduction to CFD, geophysical fluid dynamics. Velocity and density measurement methods.

UNIT –II - FLUID KINEMATICS AND SIMILARITIES

UNIT –III - INCOMPRESSIBLE FLUID FLOW

UNIT –IV - HYDRAULIC TURBINES

UNIT –V - HYDRAULIC PUMPS
Pumps: definition and classifications - Centrifugal pump: classifications - Working principle-velocity triangles - Specific speed - Efficiency and performance curves - Reciprocating pump:
classification - Working principle - Indicator diagram - Work saved by air vessels and performance curves - Cavitations in pumps - Rotary pumps - Applications.

**TOTAL HOURS : 45 PERIODS**

**TEXT BOOKS**


**REFERENCES**

**Aim**
The aim of the subject is to provide basic knowledge in electrical machines and drives.

**Objective**
- To study the basic concept of D.C. and A.C. circuits and to learn the concept of transformers and do simple problems.
- To study the performance characteristics of D.C. motors, three phase induction motor and single phase induction motor.
- To study the methods of speed control of D.C. and A.C. motors and methods of starting of D.C. and A.C. motors.
- To study the basics of selection of drive for a given application.
- To study the concept of controlling the speed of D.C. and A.C. motors using solid state devices.

**Outcome**
The students would be able to understand the working principle of various drives.

**UNIT I CIRCUITS AND TRANSFORMERS**
6

**UNIT II ELECTRICAL MOTORS**
12
Constructional details, principle of operation and performance characteristics of D.C. motors, single phase induction motor, three phase induction motor, synchronous motors, universal motors, stepper motors and reluctance motor.

**UNIT III SPEED CONTROL AND STARTING**
9

**UNIT IV ELECTRICAL DRIVES**
9
Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

**UNIT V SOLID STATE DRIVES (QUALITATIVE TREATMENT ONLY)**
9

**TOTAL: 45 PERIODS**
TEXT BOOK

REFERENCES
Aim
The aim of the subject is to provide a fundamental knowledge in kinematics of machines

Objective
1. To learn the basic mechanisms of kinematics.
2. To learn to calculate the velocity and acceleration of links using graphical and vectorial approach.
3. To study about Cams and to draw their profiles.
4. To learn about Gear terminology and types of gear trains.
5. To study about effect of friction in Transmission devices.

Outcome
The students would understand the basic link mechanisms and would draw cam profiles.

UNIT – I – BASICS OF MECHANISMS
Terminology and Definitions-Degree of Freedom -Mobility-Kutzbach criterion-Grashoff’s law-

UNIT – II - KINEMATICS OF LINKS

UNIT – III - KINEMATICS OF CAM
Classifications - Displacement diagrams-parabolic- Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion - Pressure angle and undercutting.

UNIT – IV - GEARS

UNIT – V – FRICTION
Surface contacts-Sliding and Rolling friction - Friction drives – Friction in screw threads - Friction clutches - Belt and rope drives- Friction aspects in Brakes – Friction in vehicle propulsion and braking

TOTAL HOURS: 45 PERIODS
TEXT BOOKS

REFERENCES

STANDARDS
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<tr>
<td>III</td>
<td>MACHINE DRAWING LAB</td>
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**Aim**
The aim of the subject is to provide a fundamental knowledge in Drawing Softwares

**Objective**
- To study about fits and tolerances and enable students apply them in assembly of components.
- To make students assemble simple machine components, measure and create assembly drawings on A2 Sheets using Mini Drafter or using Computer Aided Drafting software.

**Outcome**
The students would be enable to learn the basic drafting procedures, allowances, 2D and 3D drawings.

**UNIT I: LIMITS, FITS AND TOLERANCES**


Fits - Terminology, classification, basic systems, selection of fits, Methods of indicating fits on drawing. Geometrical Tolerances.

**UNIT II: ASSEMBLY DRAWING**

Preparation of assembled views of given parts details - conventional symbols and standards-couplings: flange- universal - Bearing: footstep-Plummer block-Lathe tailstock-Stop valves - etc.

**UNIT III: COMPUTER AIDED DRAWING - 2-D drawing:**


Some Machine components of Interest are:
1. Lathe Chuck
2. Gear Reducer
3. Gear Pump
4. Steam Stop Valve
5. Centrifugal pump assembly
6. I.C.Engine Cylinder - Piston- Connection rod and Crankshaft assembly
7. Automobile Gear Box
8. Clutch Assembly

**TOTAL HOURS:** 45

Note: The end semester examination will be conducted by using mini-drafter or by using CAD software.
TEXT BOOKS

REFERENCES
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Aim  
The aim of the subject is to provide make the students to understand the basic mechanism in hydraulics.

Scope  
To understand the concepts of fluid mechanics and performances of various pumps.

Outcome  
The students can perform operations in hydraulic machineries and test various pumps.

LIST OF EXPERIMENTS:

1. Determination of the Coefficient of discharge of Orifice meter.
2. Determination of the Coefficient of discharge of Venturimeter.
3. Calculation of the rate of flow using Roto meter.
4. Determination of coefficient of friction for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump / submersible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
Aim
The aim of the subject is to provide knowledge in various methods and techniques to solve the problems.

Objective
5. To study about various methods to solve eigen value problems.
6. To learn interpolation and approximation techniques.
7. To study the concepts of numerical differentiation and integration.
8. To study and analyze various methods for solving initial value problems.
9. To study and analyze various methods for solving boundary value problem.

Outcome
The students would be able to understand the various methods and techniques for solving different types of problems.

UNIT-1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS

UNIT-2. INTERPOLATION AND APPROXIMATION
Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling’s and Bessel’s).

UNIT-3. NUMERICAL DIFFERENTIATION AND INTEGRATION
Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both \(\frac{1}{3}\)th and \(\frac{3}{8}\)th) rules. Romberg's rule, two and three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

UNIT-4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

UNIT-5. BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

Tutorial: 15
Total hours: 60
TEXT BOOK

REFERENCES
Aim

The aim of the subject is to provide knowledge in various mechanisms, vibrations and balancing of masses.

Objective

10. To study about forces acting on various parts of mechanisms.
11. To learn static and dynamic balancing of masses.
12. To study the characteristics of free and forced vibrations.
13. To study and analyze various types of Governors and effect of gyroscopic forces.
14. To learn about Cam Dynamics - velocity and displacement and acceleration.

Outcome

The students would be able to understand the operations of governors, cam dynamics and vibrations.

UNIT 1 Force Analysis


UNIT –II BALANCING

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine - Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines.

UNIT -III FREE VIBRATIONS

Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration- critical speeds of simple shaft - Torsional vibration - Natural frequency of two and three rotor systems.

UNIT –IV FORCED VIBRATIONS


UNIT – V MECHANISMS FOR CONTROL


Gyroscopic Forces: Gyroscopic couple, Effect of Gyroscopic couple on vehicle; Applicatons of Gyroscopic forces. - Ships and airplanes

TUTORIAL : 15
TOTAL HOURS : 60
TEXT BOOKS

REFERENCES
Aim | The aim of the subject is to provide knowledge in cutting process of manufacturing sector.

Objective | 1. To understand the metal cutting processes.
2. To understand the types, construction and operations of lathes.
3. To gain the knowledge of different operations on special machines
4. To understand the types and operations of sawing, broaching and gear cutting machines.
5. To learn the various machining processes that uses abrasives.

Outcome | The students would be able to operate lathe machines and special machines perform operations.

UNIT – I  THEORY OF METAL CUTTING | 8

UNIT – II  CENTRE LATHE AND SPECIAL PURPOSE LATHES | 10
Centre lathe- constructional features and various operations- taper turning methods- thread cutting methods- special attachments- machining time and power estimation.
Capstan and turret lathes - automats – Swiss type–automatic screw type.

UNIT – III  SHAPER, PLANNER, MILLING AND DRILLING MACHINES | 9

UNIT – IV  SAWING - BROACHING AND GEAR CUTTING | 9

UNIT – V  ABRASIVE PROCESSES | 9
Honing- lapping- super finishing- polishing and buffing.

TOTAL HOURS  :45
TEXT BOOKS

REFERENCES
### Aim
The aim of the subject is to provide basic knowledge in materials behavior and metallurgy.

### Objective
1. To understand the classification, properties and application of various engineering materials.
2. To learn the heat treatment methodologies and mechanical treatment methodologies.
3. To understand the various deformation mechanisms, failure modes and phase diagram.
4. To understand the various forms of corrosion, protection methods.
5. To understand the basic concepts in powder metallurgy, composite materials and working of SEM.

### Outcome
The students would be able to understand the behavior of materials, their heat and mechanical treatment.

### UNIT I BEHAVIOR OF MATERIALS
9

### UNIT II MATERIAL TREATMENT
9
Heat treatment- annealing, Normalizing- hardening and Tempering, Case hardening, Hardenability - Jominy end quench test
Mechanical Treatment-strengthening mechanisms-strain hardening, solid solution hardening, grain size reduction

### UNIT III METALLIC & NON-METALLIC MATERIALS
9

### UNIT IV CORROSION
9
Introduction-forms of corrosion: pitting, intergranular, stress corrosion, corrosion fatigue, dezincification, erosion-corrosion, Crevice Corrosion, Fretting-Protection methods-PVD, CVD.

### UNIT V ADVANCED MATERIALS & CHARACTERIZATION
9
Powder metallurgy -Manufacturing-compaction-sintering-applications
Composites-MMC, PMC, CMC-properties & applications
SEM-working principle, set-up, sample preparation method-evaluation mode-EDAX

### TOTAL HOURS
45
TEXT BOOKS

REFERENCE BOOKS
2. George E.Dieter, “Mechanical Metallurgy”
<table>
<thead>
<tr>
<th>SEMESTER</th>
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<tr>
<td>IV</td>
<td>STRENGTH OF MATERIALS (Common To MECH, MECT, AERO&amp;AUTO)</td>
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**Aim**  
The aim of the subject is to provide a fundamental knowledge in strength of materials

**Objective**
1. To understand basic mechanical forces acting on rigid and deformable bodies.
2. To learn to draw shear force and bending moment diagram for various types of beams.
3. To learn the torsional effects on circular bars, shafts, helical spring.
4. To learn the deflection equations of beams and columns for different end conditions.
5. To learn the two dimensional stresses and deformation of cylinders and spherical shells.

**Outcome**
The students would understand the basic properties of materials and their testing methodologies.

**UNIT – I - STRESS- STRAIN AND DEFORMATION OF SOLIDS**  
9

**UNIT –II - BEAMS - LOADS AND STRESSES**
9
Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever-Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Shear stresses in beams.

**UNIT –III – TORSION**
9

**UNIT –IV – DEFLECTION OF BEAMS**
9

**UNIT –V – ANALYSIS OF STRESSES IN TWO DIMENSIONS**
9
Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and
stresses – Mohr’s circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion.

TUTORIAL : 15
TOTAL HOURS : 60

TEXT BOOKS

REFERENCES
**Aim**  
The aim of the subject is to provide knowledge in computer aided design and computer aided manufacturing.

**Objective**  
1. To understand the importance of CAD/CAM, basic computer graphics and modelling techniques.  
2. To learn about the basics of CNC machines  
3. To gain knowledge about CNC programming techniques.

**Outcome**  
The students would be able to understand the various concepts viz. basics of CAD/CAM, computer graphics and fundamentals of CNC machines and their programming.

**UNIT 1 INTRODUCTION TO CAD/CAM**  
9  
The design process Morphology of design, Product cycle Computer Aided Design, Benefits of CAD. Role of computers - principles of computer graphics - Current trends in manufacturing engineering - Design for Manufacturing and Assembly - Sequential and concurrent engineering - Rapid prototyping

**UNIT 2 INTERACTIVE COMPUTER GRAPHICS**  
9  
Analytic curves and surfaces, Hidden line elimination, 2D and 3D homogenous transformations - translation, rotation, reflection, scaling, shearing and combined transformation. 3D viewing transformation – panning, rotation, reflection, shearing, and zooming.

**UNIT 3 SOLID MODELING**  
9  
Graphic software: coordinate representation - graphic functions, software standards. Graphical Kernel system (GKS) - Initial graphics exchange system (IGES) - Graphic packages. Geometric Modeling - Wire frame, Surface and Solid models - Constructive Solid Geometry (CSG) and Boundary Representation (B-REP) Techniques - Features of Solid Modeling Packages.

**UNIT 4 FUNDAMENTALS OF CNC MACHINES**  
9  

**UNIT 5 PART PROGRAMMING FOR CNC MACHINES**  
9  

**TOTAL HOURS**  
45
TEXT BOOKS:

REFERENCE BOOKS
Aim
The aim of the subject is to provide a fundamental knowledge in Drawing Softwares and 3D Modelling techniques.

Objective
- To study about the various solid modeling techniques.
- To make students assemble simple machine components, measure and create assembly drawings using Computer Aided Drafting software.

Outcome
The students would be enable to learn the basic drafting procedures, allowances, 2D and 3D modeling techniques and assembly of parts.

Objective:
To learn the methodologies to use the Mechanical Design softwares to build parametric models of parts and make assembly drawings of those parts.

3D MODELING
Isometric Drawing’s of simple blocks by using solid commands- Extrusion – revolve- Modify commands- extrude, extrude cut, revolve cut, hole wizard, fillet, chamfer, mirror, rib, sweep, draft, Pattern, Shell etc- View commands – render- Wireframe- Shade- View ports- Generating Orthographic view from Isometric View.

Part modeling- Suggested Exercises
Plummer block, Cotter with Sleeve joint, Knuckle joint, – Screw jack- Lathe Tailstock –Connecting rod -Piston and crank shaft- Multi plate clutch-Machine Vice- safety Valves - Non-return valves-etc.

Introduction to SURFACE MODELLING
Creation of plane, spline, Ruled, Tabulated, Bezier, Revolved surfaces.
Editing of surfaces-converting into solid models
Suggested exercises :Models- Pipe Elbow, Tee joint-Hat-Springs-aircraft wings

DRAWINGS AND DETAILING
Preparing and printing- Drawing sheets and views, Dimensions, Annotations, Bill of materials and Tables.

Assembly of Parts
Assembly of previously Modeled components

Note:
Use of standard CAD application packages is recommended from the point of view of requirement by industries. Students may be encouraged to work with any open source software like “CollabCAD Software”, developed by: National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, NewDelhi 110003, 2003” www.collabcad.com
### Aim
The aim of the subject is to provide make the students to understand the basic mechanism in strength of materials.

### Objective
To get hands on experience to conduct testing of materials.

### Outcome
The students can performance test on various materials.

**List of Experiments:**

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
A. MANUFACTURING TECHNOLOGY LAB – I

| Aim | The aim of the subject is to provide make the students to understand the basic operations of lathe machine and drilling machine |
| Objective | To practice the various operations in lathe and drilling machine |
| Outcome | The students can perform operations in lathe and drilling machine. |

LIST OF EXPERIMENTS
1. Exercise on plain turning and facing of given cylindrical MS specimen.
2. Exercise on step turning and chamfering.
3. Exercise on taper turning of given specification on a cylindrical specimen.
4. Manufacture of external or internal threads of given specification on a cylindrical Specimen.
5. Exercise on step turning with knurling of given specification on a cylindrical specimen
6. Exercise on drilling, boring and reaming on the given MS plate.
7. Exercise on eccentric turning in lathe on a given specimen.
8. Exercise on drilling with internal thread on a given specimen.

TOTAL : 30

B. METALLURGY LAB

| Aim | The aim of the subject is to provide basic knowledge in physical metallurgy - metallography |
| Objective | 1. To get a basic understanding of microstructures of specimens of different materials  
2. To understand the process of heat treatment. |
| Outcome | The students would be able to understand the characteristics, applications of various metals and also about the heat treatment processes. |

LIST OF EXPERIMENTS
1. Introduction to Metallography
2. Preparation of Metallographic specimen
3. Identification of Ferrous specimens (minimum 4)
4. Identification of Non-Ferrous specimens (minimum 2)
5. Heat treatment – Annealing - comparison between annealed and un heat treated specimen
6. Heat treatment – Normalizing- comparison between normalized and un heat treated specimen
7. Heat treatment – Hardening- comparison between hardened and un heat treated specimen
8. Heat treatment -Tempering- comparison between hardened and un heat treated specimen  
(For heat treatment experiments low carbon steel could be used)
Aim
The aim of the subject is to provide basic knowledge in designing various machine elements.

Objective
1. To understand basic design procedures, steady and variable stresses, failure theories.
2. To study the design concepts of shafts and couplings.
3. To study the design parameters of fasteners and welded joints.
4. To learn the design parameters of different types of springs and levers.
5. To understand the design concepts of bearings and flywheel.

Outcome
The students would be able to design any machine elements with standard procedures and formulae.

UNIT 1: STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS

UNIT 2: DESIGN OF SHAFTS AND COUPLINGS
Design of solid and hollow shafts based on strength- rigidity and critical speed – Design of rigid and flexible couplings – design of knuckle joints.

UNIT 3: DESIGN OF FASTENERS AND WELDED JOINTS

UNIT 4: DESIGN OF SPRINGS AND LEVERS
Design of helical- leaf- disc and torsional springs under constant loads and varying loads – Concentric torsion springs - Belleville springs – Design of Levers.

UNIT 5: DESIGN OF BEARINGS AND FLYWHEELS
Design of bearings – sliding contact and rolling contact types– Design of journal bearings calculation of bearing dimensions – Design of flywheels involving stresses in rim and arm.

TUTORIAL :15
TOTAL HOURS :60
TEXT BOOKS

REFERENCES
Aim: To integrate the basic laws of thermodynamics into thermal systems towards applications.

Objective:
1. To provide thorough knowledge on internal combustion engines.
2. To inculcate advanced topics of internal combustion engines.
3. To understand the function and applications of air compressors and steam turbines.
4. To provide an in-depth knowledge of refrigeration systems functioning and applications.
5. To provide details of air conditioning methodologies available for domestic and industrial applications.

Outcome: The students would be able to understand the working principle of IC Engines, refrigeration systems.

UNIT –I INTERNAL COMBUSTION ENGINES

UNIT –II IC ENGINES ADVANCED TOPICS AND PERFORMANCE
Supercharging, Turbo charging of IC engines and their effects on various parameters, Stratified charge engines, Multipoint and electronic fuel injection systems, measurement of power- brake indicated, Fuel consumption, Air consumption, Heat carried away by exhaust gases. Performance test – Heat balance test and Morse test on IC Engines, standard testing procedure of IC Engines, Performance curves and effect of various parameters on the performance of the engines.

UNIT –III AIR COMPRESSORS and STEAM NOZZLES & TURBINES

UNIT –IV REFRIGERATION
Cryogenic engineering – Introduction, Application and liquefaction of gases.
UNIT –V AIR-CONDITIONING

Introduction to Psychometrics – Psychrometric chart – Psychometric process – summer and winter air-conditioning, cooling load calculations, SHF, RSHF, GSHF, EHSF components used in air conditioners – Types of air-conditioning units. Problems.

TUTORIAL HOURS : 15
TOTAL HOURS : 60

TEXT BOOKS

REFERENCES
4. GILL. SMITH and ZURYA, Fundamentals of Internal Combustion Engines – ford & IBH.
5. MANOHAR PRASAD, Refrigeration and Air-conditioning – New Age International (P) Ltd, 1995
6. RAMALINGAM, International Combustion Engines – Scitech Publications India (P) Ltd
Aim | The aim of the subject is to provide knowledge about various fluid power systems
---|---
Objective | 1. To study about basics of fluid power systems  
2. To gain knowledge about components used in hydraulic and pneumatic systems  
3. To learn various valves and actuators  
4. To learn about different hydraulic circuits  
5. To learn about different pneumatic circuits
Outcome | The students would be able to understand the applications of hydraulics and pneumatic systems.

UNIT – I  BASICS OF FLUID POWER

UNIT – II HYDRAULIC SYSTEMS

UNIT –III HYDRAULIC CIRCUITS

UNIT –IV PNEUMATIC SYSTEMS
Pneumatic Actuators: Linear cylinders – Types, end position cushioning, seals, mounting arrangements and applications

UNIT – V PNEUMATIC CIRCUITS
Design of Pneumatic circuits - Classic-Cascade-Step counter - Combination -Methods –Uses of PLC and Microprocessors - Selection criteria for Pneumatic components - Installation and Maintenance of Hydraulic and Pneumatic power packs - Faultfinding-Principles of Low Cost Automation and Applications

TOTAL HOURS  :  45
TEXT BOOKS:

REFERENCES:
Aim
The aim of the subject is to provide knowledge in computer integrated manufacturing

Objective
4. To understand the importance of CIM and business aspects
5. To gain knowledge about GT and CAPP
6. To enable student to learn about FMS and SFC
7. To understand about architecture and network concepts
8. To learn about automation protocol and database

Outcome
The students would be able to understand the various concepts viz. group technology, CAPP, FMS.

UNIT I INTRODUCTION
The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING

UNIT III SHOP FLOOR CONTROL AND INTRODUCTION OF FMS
Shop floor control-phases -factory data collection system -automatic identification methods- Bar code technology-automated data collection system. MS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout -computer control systems-application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION
CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram CIM open system architecture (CIMOSA) - manufacturing enterprise wheel-CIM architecture- Product data management-CIM implementation software. Communication fundamentals- local area networks -topology -LAN implementations - network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM

Total Hours : 45
TEXT BOOKS


REFERENCES


### Aim
The aim of this subject is study the basic concepts of Industrial Engineering.

### Objective
1. To understand the importance of work study methods and its importance in various fields.
2. To develop the skills of selection of a plant and also material handling equipment required.
3. To learn PPC and its functions.
4. To learn the skills of purchasing materials and their management.
5. To learn the awareness on various labour acts and management principles.

### Outcome
The students would be able to understand the various functions and concepts of industrial engineering.

### UNIT-I WORK STUDY
Evolution and importance of industrial engineering – Production-Classification-Productivity-Factors influencing productivity, Work study - Definition-Procedure and benefits of work study – Method study-Charting techniques-Time study-Procedure and techniques of work measurement – Stop watch time study-Motion study –SIMO chart.

### UNIT-II PLANT LAYOUT AND MATERIALS HANDLING
Plant location-Factors influencing the location-selection of site-Plant layout- Types of layout-Plant layout procedure- Material handling –Scope and Principles of Material Handling-Types of Material Handling equipment–Relationship to plant layout.

### UNIT-III: PRODUCTION PLANNING AND CONTROL
Introduction-Advantages of PPC-Functions of PPC-Demand Forecasting- Types of Forecasting-Routing-Objectives and procedure of routing-Scheduling-purpose and preparation of schedules-Scheduling techniques like CPM and PERT-Functions and types of dispatching-

### UNIT-IV: MATERIAL MANAGEMENT
Procurement of materials-codification of materials-Inventory control-Objectives of inventory control-EQQ-Inventory models-ABC analysis-Material requirements planning (MRP)-Enterprise resource planning (ERP)-supply chain Management (SCM)-Inspection and quality control-SQC-control charts-sampling procedures-Bench marking.

### UNIT-V: INDUSTRIAL LEGISLATION AND MANAGEMENT CONCEPTS
Importance and necessity of Labour acts-principles of labour legislation-various acts-Industrial Ownership and various types-Functions of management-Manpower Planning-Recruitment and Selection-Break Even Analysis-Managerial applications of breakeven point-Decisio making - Techniques of decision making.

### TOTAL HOURS
:45
TEXT BOOKS:

REFERENCES:
3. Vijay Seth-“Industrial Engineering-methods and practices”-Pernam International publishing,Mumbai-2005
Aim  The aim of the subject is to provide basic knowledge in working of CNC machines.

Objective  1. To gain knowledge about CNC programming  
2. To get the hands on training in CNC trainer machines  
3. To simulate various CNC machining and generate codes using CAM software

Outcome  The students would be able to operate CNC machine using part programming.

Introduction:

1. Study of G and M codes  
3. Machining practice on Trainer Type CNC Machines-  
4. Simulation of tool path using any CAM Software

Part programming in CNC Milling:  

1. Point to point motions  
2. Linear motions  
3. Circular interpolations  
4. Contour motions  
5. Rectangular pocketing  
6. Mirroring  
7. Circular Pocketing  
8. Fixed / canned cycles  
9. Subroutines

Part programming for CNC Turning:  

1. Turning and facing  
2. Step turning, Taper Turning  
3. Grooving  
4. Fixed/Canned Cycles:  
5. Thread cutting Cycles  
6. Peek Drilling Cycles
Aim
The aim of the subject is to provide knowledge in special machines.

Objective
To understand about operating principle of various special machines.

Outcome
The students would be able to get hands on training of the operations in shaper, grinder, milling machine, etc.

LIST OF EXPERIMENTS
1. Study of different machineries of special machines lab.
2. To shape a square rod from a round bar.
3. To manufacture a V-Groove in a given specimen.
4. To manufacture a hexagonal block from a given round stock.
5. To mill plain surfaces on the given specimen.
6. To manufacture a spur gear from the given blank in a Universal Milling Machine.
7. To manufacture a groove in a given rectangular bar stock and also do letter sink on it in a vertical milling machine.
8. To manufacture a keyway on a given specimen in a vertical slotting machine.
9. To grind a machined surface to the given specification in a universal cylindrical grinder.
10. To drill holes as per given dimensions and locations on the given specimen in a radial drilling machine and tap the hole for given thread dimension.

TOTAL HOURS : 30
Aim

The aim of the subject is to provide knowledge in performance characteristics of internal combustion engine.

Objective

i). To understand about characteristics of conventional fuels
ii). To learn about the valve timing diagram and port timing diagrams of four stroke and two stroke engines.
iii). To know about the various tests performed on the Petrol engines, Diesel engines, Air compressor and Refrigeration unit.

Outcome

The students would be able to understand the importance of fuels and their capabilities, performance characteristics of engines, air compressor and refrigeration unit.

LIST OF EXPERIMENTS:

1. Determination of Viscosity of the given specimen oil by using Red Wood Viscometer.
2. Determination of Flash Point and Fire Point of the given fuel sample.
3. Construction of actual valve timing diagram of a four stroke engine and comparison with Theoretical valve timing diagram.
4. Construction of actual port timing diagram of a two stroke engine and comparison with Theoretical port timing diagram.
5. To conduct a performance test on a four stroke single/ twin cylinder diesel engine.
6. To conduct a heat balance test on a four stroke single / twin cylinder diesel engine.
7. To determine frictional power of a four cylinder petrol engine by conducting a Morse test.
8. To conduct a retardation test and determine frictional power in a diesel engine.
9. To conduct a load test on an air compressor.
10. To determine coefficient of performance of a refrigeration test rig.
Aim: The aim of the subject is to provide an overview of a complete automobile engineering.

Scope:
1. To study construction and working of different engine components.
2. To study about the different auxiliary systems of an automobile.
3. To study about the transmission system of an automobile.
4. To understand the different types of steering, brakes and suspension systems of an automobile.
5. To study the various modern alternate technologies of automobiles.

Outcome: The students would be able to understand the various parts of automobiles and mechanisms.

UNIT I VEHICLE STRUCTURE AND ENGINES
Types of automobiles, vehicle construction and different layouts, chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms, functions and materials.

UNIT II ENGINE AUXILIARY SYSTEMS
Electronically controlled gasoline injection system for SI engines. Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system, Turbo chargers, Engine emission control by three way catalytic converter system.

UNIT III TRANSMISSION SYSTEMS
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, over drive, transfer box, fluid flywheel -torque converter, propeller shaft, slip joints, universal joints, Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock. Braking System and Traction Control.

UNIT V ALTERNATIVE TECHNOLOGIES

TOTAL HOURS: 45
TEXT BOOKS
   New Delhi, 2002

REFERENCES:
Aim
The aim of the subject is to provide knowledge in heat and mass transfer

Objective
1. To study about conduction mode of heat transfer.
2. To study about transient mode of heat transfer.
3. To study about convection mode of heat transfer.
4. To study about radiation mode of heat transfer and heat exchanger.
5. To study heat transfer with mass transfer.

Outcome
The students would be able to understand the basic concepts in heat power systems, integration of thermodynamics in heat power systems.

UNIT –I CONDUCTION - I
Fourier law of conduction, General equation in Cartesian, Cylindrical and Spherical coordinates one dimensional steady state conduction across plane wall - composite wall – Composite cylinder – Composite sphere with convection boundaries, overall heat transfer coefficients, and critical thickness of insulation, conduction with generation, thermal contact resistance, and variable conductivity.

UNIT –II CONDUCTION - II
Fins or extended surfaces- Pin fins, annular fins, longitudinal fins.
Unsteady state conduction – lumped capacity system, semi – infinite solids and multi dimensional systems, numerical solutions of two-dimensional steady and unsteady conduction.

UNIT –III CONVECTION
Boiling – Pool Boiling and regimes flow boiling through horizontal and vertical pipes. Condensation – Film and dropwise - derivation of the basic equations.

UNIT –IV RADIATION AND HEAT EXCHANGERS
Electromagnetic spectrum, black body emission, Emissive power, Laws of radiation, radiation shape factor, electrical analogy, Radiation shields, gas radiation.
Heat exchangers – types of derivation of LMTD and NTU – effectiveness equation, Fouling factor, Compact heat exchangers.

UNIT –V MASS TRANSFER AND HEAT PIPES
Fick’s law, Equimolular diffusion, Stefan’s law, mass transfer coefficient, non-dimensional number used in mass transfer, atmospheric evaporation. Problems.
Heat pipes – Introduction, Types and applications.

TUTORIAL HOURS : 15
TOTAL HOURS : 60
TEXT BOOKS

REFERENCES
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<tr>
<td>VI</td>
<td>DESIGN OF TRANSMISSION SYSTEMS</td>
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(Use of approved Design Data Book is permitted in the University examination)

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<thead>
<tr>
<th>Aim</th>
<th>The aim of the subject is to provide knowledge in various transmission system design principle.</th>
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<tr>
<td>Objective</td>
<td>1. To study the design procedure for power transmission by belt, ropes and pulleys.</td>
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<td>2. To study the design procedure for spur and helical gears.</td>
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<td>3. To study the design procedure for bevel, worm and cross helical gears.</td>
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<td>4. To study the design procedure for various types of gear box.</td>
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<td>5. To study the design procedure for clutches and brakes.</td>
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<td>Outcome</td>
<td>The students would be able to understand the design of belts, gears and gear boxes.</td>
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</table>

UNIT – I - DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS  9
Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

UNIT – II -SPUR GEARS AND PARALLEL AXIS HELICAL GEARS  9

UNIT – III -BEVEL, WORM AND CROSS HELICAL GEARS  9

UNIT – IV -DESIGN OF GEAR BOXES  9
Geometric progression - Standard step ratio - Ray diagram- kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box, simple gear box design problems.

UNIT – V -DESIGN OF CLUTCHES AND BRAKES  9
Design of plate clutches –axial clutches-cone clutches- internal and external shoe brakes-simple problems.

TUTORIAL : 15
TOTAL HOURS :60
TEXT BOOKS

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<tr>
<td>VI</td>
<td>ENGINEERING METROLOGY AND MEASUREMENTS</td>
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(Common TO MECH & MECT)

**Aim**
The aim of the subject is to provide basic knowledge in instrumentation and measurements

**Objective**
1. To understand the basic measurement system.
2. To understand the various instruments used for linear and angular measurement.
3. To understand the various instruments used for form measurement and surface finish.
4. To understand the principle, applications and advancements of laser.
5. To understand the various instruments to acquire the data and store in computer

**Outcome**
The students would be able to understand the working principle of various measuring instruments.

1. **CONCEPT OF MEASUREMENT**

2. **LINEAR AND ANGULAR MEASUREMENT**

3. **FORM MEASUREMENT**

4. **LASER AND ADVANCES IN METROLOGY**
   - Precision instruments based on laser – principles - Laser interferometer - application in linear and angular measurements and machine tool metrology

5. **DATA LOGGING AND ACQUISITION**
   - Data logging and acquisition, use of intelligent instrument for error reduction, elements of micro-Computer interfacing, intelligent instruments in use.

**TOTAL HOURS** : **45**
TEXTBOOKS:

REFERENCES:
Aim: The aim of the subject is to provide knowledge in gas dynamics and jet propulsion.

Objective:
1. To understand the basics of compressible flow and its significance.
2. To understand flow through variable areas ducts and the significance of flow through nozzles and diffusers.
3. To understand flow through constant area ducts and its significance.
4. To provide a basic understanding of normal shock behavior.
5. To provide an overview of jet propulsion technology and its basics.

Outcome: The students would be able to understand the gas dynamics and various propulsion systems.

1. **COMPRESSIBLE FLOW – FUNDAMENTALS**

2. **FLOW THROUGH VARIABLE AREA DUCTS**
   Isentropic flow through variable area ducts - T-s and h-s diagrams for nozzle and diffuser flows - Area ratio as a function of Mach number - Mass flow rate through nozzles and diffusers - Effect of friction in flow through nozzles.

3. **FLOW THROUGH CONSTANT AREA DUCTS**
   Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation - variation of flow properties - variation of Mach number with duct length.
   Isothermal flow with friction in constant area ducts. Flow in constant area ducts with heat transfer (Rayleigh flow) - Rayleigh line and Rayleigh flow equation - variation of flow properties - Maximum heat transfer.

4. **NORMAL SHOCK**
   Governing equations - Variation of flow parameters like static pressure, static temperature, static density, stagnation pressure and entropy across the normal shock - Prandtl-Meyer equation - impossibility of shock in subsonic flows - flow in convergent and divergent nozzle with shock - normal shock in Fanno and Rayleigh flows, flow with oblique shocks.

5. **PROPULSION**
   **Jet Propulsion:** Aircraft propulsion – types of jet engines – energy flow through jet engines - performance of turbo jet engines – thrust - thrust power - propulsive and overall efficiencies - thrust augmentation in turbo jet engine - ram jet and pulse jet engines
   **Space Propulsion:** Types of rocket engines - Propellants - Ignition and combustion - Theory of rocket propulsion – Terminal and characteristic velocity - Applications - Space flights.

**TOTAL HOURS**: 45
TEXTBOOKS

REFERENCES
3. RATHAKRISHNAN.E- “Gas Dynamics”- Prentice Hall of India- New Delhi- 2001
### A. DYNAMICS LAB

**Aim**  
The aim of the subject is to provide knowledge in mechanisms related to machine dynamics.

**Objective**  
To understand about governors, Gyroscopes, Speed measurement, spring mass system and compound pendulum

**Outcome**  
The students would be able to understand the working principle of vibrations, balancing of masses.

**Experiments:**

1. Determination of sensitivity & effort - Governors.
3. Determination of critical speed of shaft with concentrated loads - Whirling of shaft
4. Determination of damping co-efficient of single degree of freedom system - Spring Mass System
5. Determination of damping co-efficient of multi degree of freedom system - Bifilar & Trifilar Suspension System.
7. Study of four bar mechanism

### B. METROLOGY LAB

**Aim**  
The aim of the subject is to provide basic knowledge in working principles of various measuring instruments.

**Objective**  
To expose the students the measurement systems and its procedures.

**Outcome**  
The students would be able to understand the working principle of various equipments and their applications.

**Experiments:**

2. Measurement of angle using bevel protractor
3. Checking dimensions of a part using slip gauge.
4. Use of sine bar for measuring angles and taper.
5. Fundamental dimension of a gear using contour projector.
6. Testing squareness of a try square using slip gauge.
7. Checking straightness of a surface plate using autocollimator.
8. Study of CMM
Aim: The aim of the subject is to provide basic knowledge in heat transfer systems.

Objective: To gain knowledge in various heat transmissions systems and modes viz, conduction, convection and radiation.

Outcome: The students would be able to understand the modes of heat transfer with hands on training.

LIST OF EXPERIMENTS

1. To determine the thermal conductivity of an insulating powder.
2. To determine the thermal conductivity of a solid by the guarded hot plate method.
3. To determine the heat transfer through composite wall apparatus.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for an externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel flow conditions. Also plot the temperature distribution in both the cases along the length of heat exchanger.
10. To find overall heat transfer coefficient and effectiveness of a heat exchange under counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat exchanger.
11. To verify the Stefan-Boltzmann constant for thermal radiation.
12. Determine the COP by using LPG refrigerant test rig.
13. Study and demonstration of boiler.
Aim

The aim of the subject is to provide overall knowledge about automobile engineering.

Objective

To study about the various parts of an automobile.

Outcome

The students would be able to understand the assembly and disassembly of various automobile parts and also about other mechanisms.

List of Experiments:

The Students have to dismantle and assemble the following items:

- Multi-cylinder: Diesel and Petrol Engines.
- Engine starting system
- Cooling and Lubrication system
- Carburetors
- Synchromesh and constant mesh Gear Box
- Front and rear suspension system

The students have to study the following items:

- Power steering Systems, e.g. Rack and Pinion Power Steering System.
- Differentials and rear wheel drives
UNIT –I  INTRODUCTION

UNIT –II - TQM PRINCIPLES

UNIT –III - STATISTICAL PROCESS CONTROL (SPC)
The seven tools of quality- Statistical Fundamentals – Measures of central Tendency and Dispersion- Population and Sample- Normal Curve- Control Charts for variables and attributes- Process capability- Concept of six sigma- New seven Management tools.

UNIT –IV - TQM TOOLS

UNIT –V - QUALITY SYSTEMS

Total Hours : 45

TEXT BOOK:

REFERENCES:
Aim
The aim of the subject is to provide knowledge about mechatronics system- an integration.

Objective
1. To study about basic electronic components and to design circuits for mechanical applications.
2. To study about sensors and transducers and their significant applications in mechanical engineering applications.
3. To study about the microprocessor and microcontroller architecture and its important applications in machineries and automotives.
4. To study about programmable logic controller and to develop applications for mechanical systems.
5. To study designing of Mechatronic systems for automotive, electronic appliances etc.

Outcome
The students would be able to understand the automation principle, sensors, relays and their applications.

UNIT – I - INTRODUCTION

UNIT – II - SENSORS AND TRANSDUCERS
Transducers – Classification, selection, resistive, capacitive and inductive transducers, piezoelectric transducers, optical and digital transducers. Transducers for Measurement - displacement, temperature, level, flow, pressure, velocity, torque, speed.

UNIT – III - MICROPROCESSOR AND MICROCONTROLLERS
8051 Microcontroller – Signals, Operational features, Memory and I/O addressing, Interrupts, serial communication, and instruction set. Applications in cutting machinery and automotives.

UNIT – IV - PROGRAMMABLE LOGIC CONTROLLERS
Introduction-Basic structure-Input/Output Processing-Programming-Mnemonics-Timers- Internal relays and counters-Data handling-Analog Input/Output-Selection of a PLC. SCADA, Industrial applications of PLC in conveyor systems, product line automations etc.

UNIT – V - DESIGN OF MECHATRONICS SYSTEMS
Stages in designing mechatronic systems, traditional and mechatronic design, possible design solutions. Design of following mechatronic systems - Pick and place robot, automatic car park system, engine management system, machinery automation.

**TOTAL HOURS : 45 PERIODS**

**TEXT BOOK:**

**REFERENCES:**
The aim of the subject is to provide knowledge in finite element analysis.

1. To understand the basics of Finite element techniques and 1D element equation formulation
2. To gain knowledge about 2D problems in structural and Thermal
3. To enable student to learn about Natural coordinates and Iso-Parametric Elements
4. To understand about Elasticity concepts and Virtual work
5. To study about dynamic analysis

The students would be able to understand the basic concepts in mathematical problem analysis.

UNIT I  DFINITEELEMENT ANALYSIS  12

UNIT II  FEAOF2DPROBLEMS  12

UNIT III  SOPARAMETRIC FORMULATION  12

UNIT IV  SOLUTION TOPLANE ELASTICITYPROBLEMS  12
Introduction to Theory of Elasticity – Plane Stress – Plane Strain and Axisymmetric Formulation – Principle of virtual work – Element matrices using energy approach

UNIT V: DYNAMIC ANALYSIS  12

TUTORIAL HOURS :15
TOTAL HOURS :60
Text Books:

REFERENCE BOOKS:
Aim

The aim of the subject is to provide knowledge about different types of power plants and their functions.

Objective

1. To study about basic components and their functions of different types of conventional power plants.
2. To study about basic components and their functions of different types of non-conventional power plants.
3. To learn about the basic concepts of direct energy conversion systems.

Outcome

The students would be able to understand the functions of different power plants and their economics and functions of direct energy conversion systems.

UNIT I

**Introduction:** Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants.

**Hydro Electric Power Plants:** Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.

**Unit II**

**Steam Power Plants:** Layout and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.

**Gas Turbine and Combined Cycle Power Plants:** Constant pressure gas turbine power plants, Arrangements of combined plants (steam & gas turbine power plants), re-powering systems with gas production from coal using PFBC systems, with organic fluids, parameters affecting thermodynamic efficiency of combined cycles.

**Unit III**

**Nuclear Power Plants:** Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.

**Non-Conventional Power Generation:** Solar radiation estimation, solar energy collectors, Low, medium & high temperature power plants, OTEC, wind power plants, tidal power plants, geothermal power plants.

**Unit IV**

**Power Plant Economics:** Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-out put curves, efficiency, heat rate, economic load sharing, Problems.
Unit V
**Direct Energy Conversion Systems:** Fuel cell, MHD power generation-principle, open & Closedcycle’s systems, thermoelectric power generation, thermionic power generation.

**TOTAL HOURS** : 60

**Text Books:**


**Reference Books:**

### Aim

The aim of the subject is to provide hands on experience in finite element analysis software.

### Scope

To gain knowledge in various procedures in drafting and analysing a component using FEA software.

### Outcome

The students would be able to understand and analyse any component using software.

### LIST OF EXPERIMENTS:

1. Study of analysis and its benefits
2. Application of distributed loads
3. Nonlinear analysis of a cantilever beam
4. Buckling analysis
5. Stress analysis of cantilever beam
6. Stress analysis of axi-symmetry vessels
7. Stress analysis of two dimensional truss
8. Transient thermal conduction
9. Simple conduction
10. Plane stress bracket
11. Modal analysis of a cantilever beam
12. Harmonic analysis of a cantilever beam
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**Aim**  
The aim of the subject is to provide overall knowledge about automation sector.

**Scope**  
To train the students with hands on experience in fluid power systems and automation.

**Outcome**  
The students would be able to understand the operation of various logical sequence with software.

**LIST OF EXPERIMENTS:**

1. Design and testing of fluid power circuits to control  
   (i) Velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software
4. Design and Testing of Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
5. Conduct speed control of AC & DC drives.
6. To design a Servo controller interfacing for DC motor and test its performance.
7. To design a PID controller interfacing and test its performance.
8. Stepper motor interfacing with 8051 Micro controller  
   (i) Full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems  
   Using commercial instrumentation package
10. Computerized data logging system with control for process variables like Pressure flow and temperature.
Objectives:
1. To understand the importance of refrigeration cycle.
2. To know about various refrigerants.
3. To explain the principles of psychrometry.
4. To understand various AC systems.
5. To understand various new and unconventional refrigeration systems.

UNIT I REFRIGERATION CYCLE

UNIT II REFRIGERANTS AND SYSTEM COMPONENTS

UNIT III PSYCHROMETRY

UNIT IV AIR CONDITIONING SYSTEMS
Cooling load calculation - working principles of centralized air conditioning systems, split, ductable split, packaged air conditioning, VAV & VRV Systems. Duct Design by equal friction method, Indoor Air quality concepts.

UNIT V UNCONVENTIONAL REFRIGERATION CYCLES
Vapor Absorption system – Ejector jet, Steam jet refrigeration, and Thermo electric refrigeration - applications. Ice plant – food storage plants – milk – chilling plants.

TOTAL HOURS :45
TEXT BOOKS:

REFERENCES:
Objectives:

1. To learn the principles of fluid machinery.
2. To understand various fans and blowers.
3. To understand the concept of compressors.
4. To learn the concept of axial flow compressors.
5. To understand the concept of various turbines.

UNIT I PRINCIPLES

Energy transfer between fluid and rotor-classification of fluid machinery,-dimensionless Parameters-specific speed-applications-stage velocity triangles-work and efficiency.

UNIT II CENTRIFUGAL FANS AND BLOWERS

Types- stage and design parameters-flow analysis in impeller blades-volute and Diffusers, losses, characteristic curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR

Construction details, impeller flow losses, slip factor, diffuser analysis, losses and Performance curves.

UNIT IV AXIAL FLOW COMPRESSOR

Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and efficiency, work Done simple stage design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES

Stage velocity diagrams, reaction stages, losses and coefficients, blade design Principles, testing and performance characteristics.

TOTAL HOURS : 45
TEXT BOOK:


REFERENCES:

## Course Outline

### Subject: Industrial Robotics

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**Objectives:**
1. To learn the basics about Robotics and Robot manipulation in space.
2. To understand the controlling of Robots and devices system.
3. To learn the Sensor technology.
4. To learn the knowledge of Robot programming and Expert system.
5. To understand about Robot cell design, applications and economics.

### UNIT I  FUNDAMENTALS OF ROBOT


### UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS


### UNIT III  ROBOT SENSORS


### UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End Effectors commands and simple programs.

### UNIT V  CELL DESIGN APPLICATIONS AND ECONOMICS OF ROBOTICS


**TOTAL HOURS**: 45

**Text Books:**

Reference Books:

Objectives:
1. To learn about SI engines.
2. To learn about CI engines.
3. To learn to control various pollutants.
4. To know about various alternative fuels.
5. To know various latest trends in automobiles.

1. SPARK IGNITION ENGINES


2. COMPRESSION IGNITION ENGINES


3. POLLUTANT FORMATION CONTROL


4. ALTERNATIVE FUELS


5. RECENT TRENDS


TOTAL HOURS : 45
TEXT BOOK:

REFERENCES:
1. R.B.Mathur and R.P.Sharma- “Internal Combustion Engines ”.
2. Rowland S.Benson and N.D.Whitehouse- " Internal combustion Engines "- Vol.I and II-
Objectives:

- Linear Programming is useful in finding either maximum or minimum of an expression subject to given constraints
- To minimize the cost of transporting items from various sources to different destinations
- When number of activities are to be carried out most economical way with less time consumptions can be found
- Inventory is essential to provide flexibility in operating a system or organization.
- Decision making is an integral part of any business organization. It uses to select the best among several decisions through a proper evaluation of the parameters of each decision environment

1. Linear programming

2. Transportation model
   Transportations problem – Assignment problem – Under Assignment -Traveling salesman problem

3. Network model

4. Inventory Models
   Inventory Model – Economic Order Quantity Model – Purchasing Model (with and without shortages) – Manufacturing Model (with and without shortages) - Stochastic Inventory Model (Stock in discrete and continuous units).

5. Decision Model

TUTORIAL HOURS : 15
TOTAL HOURS : 60
TEXT BOOK

REFERENCES:
Objectives:
1. To gain knowledge about surfaces and to study the different types of friction in materials.
2. To gain knowledge in wear mechanisms, types of wear for different environment and materials.
3. To study the properties of fluid film for bearing applications.
4. To have a theoretical understanding of the film lubrication theory.
5. To learn the various ways of modifying the surface of the materials for bearing.

UNIT I SURFACES AND FRICTION


UNIT II WEAR


UNIT III LUBRICANTS AND LUBRICATION TYPES


UNIT IV FILM LUBRICATION THEORY

Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings – Reaction torque on the bearings - Virtual Co-efficient of friction - The Sommerfield diagram/.

UNIT V SURFACE ENGINEERING AND MATERIALS FOR BEARINGS


TOTALHOURS : 45

TEXT BOOK:
REFERENCES:
Objectives:
1. To know about the combustion process.
2. To explain about the thermo chemistry.
3. To explain about the kinetics of combustion.
4. To explain about various flames.
5. To know the combustion process in an engine.

UNIT I COMBUSTION OF FUELS

UNIT II THERMODYNAMICS OF COMBUSTION
Thermo-chemistry- First law analysis of reacting systems- Adiabatic combustion temperature- Second law analysis of reacting systems- criterion for chemical equilibrium- Equilibrium constant for gaseous mixtures- Evaluation of equilibrium composition- chemical availability.

UNIT III KINETICS OF COMBUSTION
Rates of reaction- Reaction order and molecularity complex reactions- chain reactions- Arrhenius rate equation- Collection theory- activated complex theory- Explosive and general oxidative characteristics of fueled.

UNIT IV FLAMES
Laminar and Turbulent flames- Premixed and Diffusion flames- Burning velocity and its determination- Factors affecting burning velocity- Quenching- Flammability and Ignition- Flame stabilization in open burners.

UNIT V ENGINE COMBUSTION
Combustion in SI and CI engines- stages of combustion in SI and CI engines- Normal combustion and abnormal combustion- Emissions from premixed combustion- Emission from Nonpremixed combustion- Control of emissions

TOTAL HOURS : 45
TEXT BOOK:

REFERENCES:
Objectives:
1. To introduce the importance of cryogenic engineering.
2. To study the low temperature refrigeration system.
3. To study the gas separation systems.
4. To know the vacuum technology.
5. To understand about cryogenic storage.

UNIT 1 CONSTRUCTION DETAILS AND HEAT TRANSFER 9

UNIT II LIQUEFACTION AND LOW TEMPERATURE REFRIGERATION 9

UNIT III SEPARATION AND PURIFICATION SYSTEMS 9
General characteristics of mixtures-composition diagrams. Gas separation-principles of rectification-flash calculations - Rectification column analysis- Flash calculations.

UNIT IV INSULATION AND VACUUM TECHNOLOGY 9
Thermal insulation and their performance at cryogenic temperatures- Super Insulations- Vacuum insulation- Powder insulation- Cryo pumping Applications.

UNIT V STORAGE AND INSTRUMENTATION 9
Cryogenic Storage vessels and Transportation- Transfer devices. Pressure flow-level and temperature measurements.

TOTAL HOURS :45
TEXT BOOK:

REFERENCES:
Objective:
1. To understand the classification of Engineering Materials and their relevant applications.
2. To understand the powder metallurgy concepts, process techniques, applications.
3. To understand the basics in composites, fabrication methods, types and applications.
4. To understand the various forms of Smart Materials, applications.
5. To understand the various types of Nano-material’s, production & applications.

UNIT 1: ENGINEERING MATERIALS CLASSIFICATION, PROPERTIES & APPLICATIONS

UNIT 2: POWDER METALLURGY

UNIT 3: COMPOSITES
Composites – Types of composites - Naturally occurring, synthetic & engineered composites - MMC – CMC – PMC - Fibre and whisker reinforced composites (continuous and discontinuous) - particulate composites layered or sheet composites, composite coating or thin fibre, inter metallic composites - properties and characteristics of composites – commercially important components and their applications

UNIT 4: SMART MATERIALS
Introduction to intelligent/smart materials, shape memory alloys-types, NiTiNol-origin, properties, martensitic transformation, Memorization process- applications-medical, satellite etc.

UNIT 5: NANO MATERIALS
TEXTBOOKS:
2. M.V.Gandhi., Thomson - Smart Materials and Structures- Chapman and Hall
3. A.K.Bandhopadyay-Nanomaterials-New Age

REFERENCES:
Objectives:

1. To understand the basic fundamentals of Nanotechnology and applications.
2. To understand the basic fundamentals of Nanoparticles and applications.
3. To understand the various properties of nanomaterials.
4. To understand the basic fundamentals of Nanopowders.
5. To understand the recent developments in Nanotechnology and latest applications.

UNIT I  INTRODUCTION AND DEFINITION OF NANOTECHNOLOGY  9


UNIT-II  NANO PARTICLES  9


UNIT-III PROPERTIES  9

Mechanical properties: Strength of Nano crystalline SiC, Preparation for strength measurements, Magnetic properties. Electrical properties: Switching glasses with nanoparticles, Electronic conduction with nanoparticles. Optical properties: Optical properties, special properties and the coloured glasses.

UNIT-IV NANO-POWDERS  9

Process of synthesis of Nano powders, Electro deposition, Important Nanomaterials.

UNIT -V LATEST DEVELOPMENTS IN NANOTECHNOLOGY & APPLICATIONS  9

TEXT BOOKS:
2. Nano Essentials- T.Pradeep, TMH
3. Springer Handbook of Nanotechnology - Bharat Bhusan
Objectives:

1. To impart about automotive components.
2. To know various ignition systems and emission.
3. To know how to use various instruments.
4. To know about the use of electronics in brakes and clutches.
5. To know about the engine management system.

UNIT – I: INTRODUCTION TO AUTOMOTIVE SYSTEMS

Introduction to Electronic – “Intensive automobile”

UNIT – II: IGNITION SYSTEMS AND EMISSION

Ignition systems: Ignition fundamental, Electronic ignition systems, Programmed ignition, Distribution less ignition, direct ignition. Spark plugs.

UNIT – III: INSTRUMENTATION SYSTEMS

Instrumentation Systems: Introduction to instrumentation systems-application of various sensors- Driver instrumentation systems – Dash board instrumentation - vehicle condition monitoring- different types of visual Display.

UNIT – IV: ELECTRONIC BRAKING CLUTCHES AND STEERING

Traction and stability control – Adoptive cruise control - Electronic control of Automatic Transmission:
Introduction and description Control of gear shift and torque converter lockup-Break power assistance and lockup control – Breaking and stability control in Electric vehicle – suspension control – power steering assist.

UNIT V. VEHICLE MANAGEMENT SYSEM


TOTAL HOURS: 45
TEXT BOOKS:
1. Human factors in the design of automotive electronics systems, Lane departure warning and keeping parallel packing assistance.

REFERENCES:
2. TOM DENTON, Automobile Electrical and Electronic Systems, Edward Arnold PB. 1995.
Objectives:
1. To understand the basics of governing equations and boundary conditions
2. To gain knowledge about finite difference method
3. To enable student to learn about FVM – Diffusion.
4. To inherit knowledge about FVM-Convection diffusion.
5. To elaborate about FVM flow field calculation

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  9

UNIT II  FINITE DIFFERENCE METHOD  9

UNIT III  FINITE VOLUME METHOD (FVM) FOR DIFFUSION  9
Finite volume formulation for steady state One, Two and Three -dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank – Nicolson and fully implicit schemes.

UNIT IV  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  9
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes- properties of discretization schemes – Conservativeness, Boundedness, Trasnpportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT V  CALCULATION FLOW FIELD BY FVM  9
Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, simple algorithm and its variants. Turbulence models, mixing length model, two equation (k-€) models – High and low Reynolds number models

TOTAL  :45
TEXT BOOKS:

REFERENCES:
5. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.
Objectives:
1. To gain knowledge and understanding of basic concepts of unconventional machining processes
2. To impart the knowledge and understanding of various mechanical methods
3. To impart the knowledge and understanding of electrical energy based processes
4. To impart the knowledge and understanding of chemical and hybrid processes
5. To impart the knowledge and understanding of thermal energy based processes

UNIT I INTRODUCTION 6

UNIT II MECHANICAL ENERGY BASED PROCESSES 9

UNIT III ELECTRICAL ENERGY BASED PROCESSES 10

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 10
Chemical machining and Electro-Chemical Machining- Electro Chemical Grinding and Electro chemical Honing-working principle and applications-Process Parameters -Surface finish and MRR - Etchants–Maskants.

UNIT V THERMAL ENERGY BASED PROCESSES 10
Laser Beam Machining and drilling, Plasma Arc Machining and Electron Beam Machining Working principles & Applications – Equipment –Types - Beam control techniques. Micromachining and Nanofabrication Techniques

TOTAL HOURS :45
TEXT BOOKS:

REFERENCES:
Objectives:

1. To gain the knowledge and understanding of basic concepts of lean manufacturing process
2. To understand the various quality improvement methods in lean manufacturing.
3. To gain the knowledge and understanding of basic concepts of scheduling systems.
4. To gain the knowledge and understanding of basic concepts of JIDOKA
5. To gain the knowledge and understanding of basic concepts of employee involvement and systematic planning

UNIT I   INTRODUCTION

The mass production system – Origin of lean production system – Necessity – Lean revolution in Toyota – Systems and systems thinking – Basic image of lean production – Customer focus – Muda (waste).

UNIT II   STABILITY OF LEAN SYSTEM


UNIT III   JUST IN TIME


UNIT IV   JIDOKA (AUTOMATION WITH A HUMAN TOUCH)


UNIT V   WORKER INVOLVEMENT AND SYSTEMATIC PLANNING METHODOLOGY

Involvement – Activities to support involvement – Quality circle activity – Kaizen training - Suggestion Programmes – Hoshin Planning System (systematic planning methodology) – Phases of Hoshin Planning – Lean culture.

TOTAL HOURS : 45
TEXTBOOKS:
1. Pascal Dennis, Lean Production Simplified: A Plain-Language Guide to the
2. World's Most Powerful Production System, (Second edition), Productivity Press,
3. Mike Rother and John Shook, Learning to See: Value Stream Mapping to Add

REFERENCES:
1. Jeffrey Liker, the Toyota Way: Fourteen Management Principles from the
2. Michael L. George, Lean Six SIGMA: Combining Six SIGMA Qualities with Lean
3. Taiichi Ohno, Toyota Production System: Beyond Large-Scale Production, Taylor
Objectives:
1. To study the air pollution from automobiles, industries and their measuring systems
2. To study water pollution and alternative treatments
3. To study the soil pollution and controlling systems
4. To have knowledge on the hazardous solid waste and controlling measures
5. To know the industrial disasters, pollutions and remedial measures

UNIT- I Structure of the atmosphere, Sources and Classification of Air Pollutants
Transport and Diffusion of Pollutants. Plume behavior and stack dispersion. Reactions of hydroxyl radical with O₂, N₂, CO₂ and Oxides of Nitrogen, Sulphur and Carbon. Sinks of Air pollutants – Acid rain: Ozone depletion – Montreal protocol; Global warming – Kyoto protocol; Gaseous pollution control measures; photo chemical smog; Automobile pollution in India; Zero emission standards; Noise pollution – Sensing, Measurement, Abatement measures.

UNIT – II Properties of water
Characteristics of water bodies; Heavy metals, Speciation and Complexation, water quality. DO, BOD, COD, acidity, alkalinity, salinity, hardness; drinking Water quality standards; Water pollution; Classification of water pollutants, Ground water Pollution, Sources and sinks, Eutrophication. Purification of water by adsorption, flocculation, ion exchange and reverse osmosis methods. Alternatives of end of pipe treatments, Radioactive Pollution and control measures.

UNIT – III Soil pollution;
Sources, sinks and broad classification, movement and sorption mechanisms of Organic and inorganic contaminants and their impacts on physio-chemical and biological Properties of soil and plants, Sediment Pollution – Black carbon – formation and fate, Black Carbons as adsorbents for organics, Soil pollution control measures – Physical-chemical and Biological methods.

UNIT – IV Hazardous Solid Wastes
Hospital Wastes, Radioactive Wastes - Sources, Transport, Disposal. Municipal solid wastes - hazards, disposal and energy production- Case studies; Light pollution And control measures; and Thermal pollution and control measures.

UNIT V Industrial Disasters and Pollution

Total Hours : 45
TEXT BOOK:

REFERENCES:
SUBJECT | L | T | P | C
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ENTREPRENEURIAL SKILLS DEVELOPMENT FOR ENGINEERS | 3 | 0 | 0 | 3

Objectives:
1. To understand the importance of entrepreneurship for engineering students.
2. To inculcate entrepreneurship skills for engineering students.
3. To create awareness of business and train in preparing the project report and create awareness for engineering students.
4. To understand the importance of finance and its transactions.
5. To develop the skills of consequences of business sickness and take corrective measures.

UNIT 1 ENTREPRENEURSHIP

UNIT 2 MOTIVATION

UNIT 3 BUSINESS AND ENTERPRISE MANAGEMENT

UNIT 4 FINANCIAL MANAGEMENT
Need and objectives of financial management for engineers-Sources of Finance- Term Loans-Capital structure- Financial Institutions- Management of working capital- Costing - Break Even Analysis- Managerial uses of Breakeven analysis-Network analysis Techniques –Problems on PERT &CPM – Taxation

UNIT 5 BUSINESS SICKNESS AND GROWTH STRATEGIES

TOTAL HOURS :45
TEXT BOOKS:

REFERENCES:
1. EDII - “A manual for Entrepreneurs”- Entrepreneurship Development Institute of India, Ahmedabad- Tata McGrawHill-2006...
Objectives:
1. To learn marketing skills for engineering students.
2. To understand the behavioural pattern of customers.
3. To learn marketing research and develop skills of sales forecasting.
4. To learn the skills of developing a market plan and formulation of strategies.
5. To understand various promotion mix details.

UNIT I MARKETING ENGINEERING APPROACH


UNIT II BUYING BEHAVIOUR & MARKET SEGMENTATION

Customer value assessment and valuing customers- Understanding customer needs and wants- Customer Buying behavior- Motives- types- Buying decisions- segmentation factors- Demographic-Psychographic & Geographic Segmentation- Buying Patterns-Social and Ethical considerations.

UNIT III MARKETING RESEARCH & SALES FORECASTING


UNIT IV MARKETING PLANNING & STRATEGY FORMULATION


UNIT V POSITIONING AND PROMOTION MIX


TOTAL HOURS :45
TEXT BOOKS:

REFERENCES:
Objectives:

1. To understand the importance of solar energy.
2. To learn the importance of wind energy.
3. To know the importance of bio energy.
4. To know various renewable energy power plants.
5. To learn the necessity of latest and modern energy sources.

UNIT I SOLAR ENERGY


UNIT II WIND ENERGY


UNIT III BIO – ENERGY


UNIT IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY


UNIT V NEW ENERGY SOURCES

Hydrogen generation, storage, transport and utilization, Applications - power generation- transport – Fuel cells – technologies, types – economics and the power generation

TOTAL HOURS : 45
TEXT BOOKS:

REFERENCES:
Objectives:

1. To understand Rapid prototyping history and its development.
2. To gain knowledge about liquid and powder based RP process
3. To enable student to learn about solid based RP process
4. To inherit knowledge about Rapid Tooling
5. To elaborate about principles of reverse engineering

UNIT I  INTRODUCTION 9


UNIT II  LIQUID AND POWDER BASED RP PROCESSES 9

Liquid based process: Principles of STL and typical processes such as the SLA process, solid ground curing and others - Powder based process: Principles and typical processes such as selective laser sintering and some 3D printing processes.

UNIT III  SOLID BASED RP PROCESSES 9

Principles and typical processes such as fused deposition modeling laminated object modeling and others.

UNIT IV  RAPID TOOLING 9

Principles and typical processes for quick batch production of plastic and metal parts though quick tooling.

UNIT V  REVERSE ENGINEERING 9

3D scanning, 3D digitizing and Data fitting, high speed machining - Hardware and software - Applications: Evaluation, bench marking and various case studies.

TOTAL HOURS: 45
Text Books:

REFERENCES:
At the end of this elective, student shall be able to:
1. Get an exposure to the Aerospace Industry.
2. Understand the Basics of Aircraft Systems and Aircraft Structures.

Chapter-1 –Aircraft industry overview, Duration- 3 hours

Evolution and History of Flight, Types Of Aerospace Industry, Key Players in Aerospace Industry, Aerospace Manufacturing, Industry Supply Chain, Prime contractors, Tier 1 Suppliers, Key challenges in Industry Supply Chain, OEM Supply Chain Strategies, Mergers and Acquisitions, Aerospace Industry Trends, Advances in Engineering/CAD/CAM/CAE Tools and Materials technology, Global and Indian Aircraft Scenario

Chapter-2 –Introduction to Aircrafts, Duration- 5 hrs

Basic components of an Aircraft, Structural members, Aircraft Axis System, Aircraft Motions, Control surfaces and High lift Devices. Types of Aircrafts - Lighter than Air/Heavier than Air Aircrafts Conventional Design Configurations based on Power Plant Location, Wing vertical location, intake location, Tail Unit Arrangements, Landing Gear Arrangements. Unconventional Configurations-Biplane, Variable Sweep, Canard Layout, Twin Boom Layouts, Span loaders, Blended Body Wing Layout, STOL and STOVL Aircraft, Stealth Aircraft. Advantages and disadvantages of these Configurations.

Chapter-3-Introduction to Aircraft Systems, Duration- 16 hrs


Chapter-4-Basic Principles of Flight, Duration- 10 hrs

Significance of speed of Sound, Air speed and Ground Speed, Properties of Atmosphere, Bernoulli’s Equation, Forces on the airplane, Airflow over wing section, Pressure Distribution over a wing section, Generation of Lift, Drag, Pitching moments, Types of Drag, Lift curve, Drag Curve, Lift/Drag Ratio Curve, Factors affecting Lift and Drag, Center of Pressure and its effects, Aerofoil Nomenclature, Types of Aerofoil, Wing Section- Aerodynamic Center, Aspect Ratio, Effects of lift, Drag, speed, Air density on drag.

Chapter-5-Basics of Flight Mechanics , Duration 6 hrs
Mach Waves, Mach Angles, Sonic and Supersonic Flight and its effects

**Stability and Control**
Degree of Stability- Lateral, Longitudinal and Directional Stability and controls of Aircraft. Effects of Flaps and Slats on Lift Coefficients, Control Tabs, Stalling, Landing, Gliding Turning, Speed of Sound, Mach Numbers, Shock Waves

**Aircraft Performance and Maneuvers**
Power Curves, Maximum and minimum speeds of horizontal flight, Effects of Changes of Engine Power, Effects of Altitude on Power Curves, Forces acting on aAeroplane during a Turn, Loads during a Turn, Correct and incorrect Angles of Bank, Aerobatics, Inverted Maneuvers, Maneuverability

Reference Books:
4. Introduction to Flight by Dave Anderson
5. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration by Ian moir, Allan Seabridge
6. An Introduction to Aircraft Certification; A Guide to Understanding Jaa, Easa and FAA by Filippo De Florio, Butterworth-Heinemann
### SUBJECT

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At the end of this elective, student shall be able to:
1. Industry Practices on Design of Aircraft Structures.
2. Understand the applicability of Design aspects in Aircraft Design.
3. Relate the theoretical knowledge with the design of Aircraft Structures.

**Chapter-1-Overview of the Aircraft Design Process, Duration- 2hrs**


**Chapter 2-Fundamentals of Structural Analysis, Duration 2 hrs**

Review of Hooke’s Law, Principal stresses, Equilibrium and Compatibility, Determinate Structures, St Venant’s Principle, Conservation of Energy, Stress Transformation, Stress Strain Relations

**Chapter 3-Introduction to Aircraft Structures, Duration 3 hrs**

Types of Structural members of Fuselage and wing section Ribs, Spars, Frames, Stringers, Longeron, Splices, Sectional Properties of structural members and their loads, Types of structural joints, Type of Loads on structural joints

**Chapter-4 Aircraft Loads, Duration- 4 hrs**

Aerodynamic Loads, Inertial Loads, Loads due to engine, Actuator Loads, Maneuver Loads, VN diagrams, Gust Loads, Ground Loads, Ground conditions, Miscellaneous Loads

**Chapter-5-Aircraft Materials and Manufacturing processes Duration- 4 hrs**

Chapter-6-Structural Analysis of Aircraft Structures Duration-20

Theory of Plates- Analysis of plates for bending, stresses due to bending, Plate deflection under different end conditions, Strain energy due to bending of circular, rectangular plates, Plate buckling, Compression buckling, shear buckling, Buckling due to in plane bending moments, Analysis of stiffened panels in buckling, Rectangular plate buckling, Analysis of Stiffened panels in Post buckling, Post buckling under shear. Sample Exercises.

Theory of Shells-Analysis of Shell Panels for Buckling, Compression loading, Shear Loading / Shell Shear Factor, Circumferential Buckling Stress, sample exercises

Theory of Beams-Symmetric Beams in Pure Bending, Deflection of beams, Unsymmetrical Beams in Bending, Plastic Bending of beams,Shear Stresses due to Bending in Thin Walled Beams, Bending of Open Section Beams, Bending of Closed Section Beams, Shear Stresses due to Torsion in Thin Walled Beams. Sample Exercises.

Theory of Torsion - Shafts of Non-Circular Sections, Torsion in Closed Section Beams, Torsion in Open Section Beams, Multi Cell Sections, Sample Exercises.

Chapter-7 Airworthiness and Aircraft Certification, Duration- 4 hrs

Definition, Airworthiness Regulations, Regulatory Bodies, Type certification, General Requirements, Requirements Related to Aircraft Design Covers, Performance and Flight Requirements, Airframe Requirements, Landing Requirements, Fatigue and Failsafe requirements, Emergency Provisions, Emergency Landing requirements

Chapter-8 Aircraft Structural Repair, Duration- 3 hrs

Types of Structural damage, Nonconformance, Rework, Repair, Allowable damage Limit, Repairable Damage Limit, Overview of ADL Analysis, Types of Repair, Repair Considerations and best practices

Reference Books:
Objectives:

1. To understand the basics of pipes and their material’s selection.
2. To understand the various pipeline accessories and fittings.
3. To know about various valves and their selection.
4. To know about various special piping elements.
5. To understand about various flows of fluids and frictional losses through pipes due to the flow.

UNIT 1: FUNDAMENTALS OF PIPING

Introduction and Scope of Piping – Definition and Application of Pipes – Pipe networks - Selection of Materials - Codes and Standards.

UNIT 2: ACCESSORIES AND FITTINGS


UNIT 3: VALVES

Definition – Types – Functions – Operators - Valves Layout Considerations – Valve Data Sheet - Valve Selection

UNIT 4: PIPING SPECIAL ELEMENTS


UNIT 5: FLOW THROUGH PIPES


TOTAL HOURS: 45
BOOKS:

REFERENCES:
Objectives:

1. To make the students to understand the importance of ceramics in various advanced fields.
2. The application of ceramic in bio and medical field will help the students to gain knowledge in those fields.
3. To familiarize the ceramics applications in electronic industries.
4. To understand the application of ceramics in special and precious items
5. To enable students to understand about the Nano technology in ceramic field.

UNIT 1: CERAMICS USED IN ADVANCED APPLICATIONS: 9


UNIT 2: CERAMICS FOR MEDICAL AND SCIENTIFIC PRODUCTS: 9


UNIT 3: CERAMICS FOR OPTICAL APPLICATIONS: 9

CRT and TV picture tubes - Telecommunication and related uses - Information display - Laser – Fibre optics - Electromagnetic windows.

UNIT 4: MAGNETIC CERAMICS: 9

Spinel Ferrites - Hexagonal Ferrites - Garnet - Processing -Single crystal ferrite -Applications.

UNIT 5: CERAMIC SUPERCONDUCTORS AND NANOCERAMICS: 9


Total Hours : 45
BOOKS:-


REFERENCES:

2. The ceramic society of Japan-“Advanced ceramic technologies & Products”-Springer.
Objectives:

1. To understand the various types of vibration and analyses.
2. To understand the basics of Noise and the relevant parameters.
3. To understand the noise sources relevant to automotives.
4. To understand the various vibration control techniques.
5. To understand the various noise control techniques.

UNIT I BASIC OF VIBRATION

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and nonlinear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies - Vibration Analyses.

UNIT II BASIC OF NOISE

Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES


UNIT IV CONTROL TECHNIQUES

Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL

Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers.

Total Hours : 45
TEXT BOOKS:

REFERENCES: