Programme Educational Objectives

1. The graduates acquire ability to create model, design, synthesize and analyze essential production operational skills, mechanism and automation system.
2. The graduates use their talent, self-confidence, knowledge and engineering practice which facilitate them to presume position of scientific and/or managerial leadership in their career paths.
3. The graduates apply their consciousness of moral, professional responsibilities and motivation to practice life-long learning in a team work environment.

Programme Outcomes

a. Graduate will demonstrate strong basics in mathematics, science and engineering which serve as the foundation for the Programme.
b. Graduate will demonstrate the ability to design and conduct experiments, as well as to analyse and interpret data in the spheres of fundamental engineering.
c. Graduate will demonstrate the ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
d. Graduate will become familiar with modern engineering tools and analyse the problems within the domains of Production Technology as the members of multidisciplinary teams.
e. Graduate will acquire the capability to identify, formulate and solve engineering problems related to production engineering.
f. Graduate will demonstrate an understanding of professional and ethical responsibility with reference to their career in the field of production engineering.
g. Graduate will be able to communicate effectively both in verbal and non verbal forms.
h. Graduate will be trained towards developing and understanding the impact of development of Production Technology on global, economic, environmental and societal context.
i. Graduate will be capable of understanding the value for life-long learning.
j. Graduate will demonstrate knowledge of contemporary issues pertaining to the health and well being of desirable living forms inhabiting the environment.
k. Graduate will demonstrate the ability to use the techniques, skills and modern engineering tools necessary for engineering practice in the field of Production Engineering.
l. Graduate will be able to design and develop innovative/ manufacturable / marketable / environmental friendly products useful to the nation and the society.
m. Graduate will be able to manage any organisation well and will be able to emerge as a successful entrepreneur.

Mapping PEO with POs:

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# MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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**Attended**

S. Sabarinath

DIRECTOR

Centre for Academic Courses
Anna University, Chennai-600 025.
4. Finite Element Analysis in Manufacturing
   | | | | | | | | | |
5. Professional Elective- III
6. Professional Elective-IV

**PRACTICAL**
7. Modelling and Analysis Laboratory
   | | | | | | | | | |
8. Creative and Innovative Project
   | | | | |

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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF  12
Listening – Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage– Scanning for specific information; Writing - Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS  12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing – Process description( non-technical)- Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion (root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL  12
Listening- Listening to lectures/ talks and completing a task; Speaking – Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative); Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary – Compound words – Word formation – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING  12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking Informal and formal conversation; Reading –Critical reading (prediction & inference); Writing– Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS  12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading –Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ;Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary –Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.
EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face 2 Face (Pre-intermediate Student’s Book & Workbook) Cambridge University Press, New Delhi: 2005

MA7151 MATHEMATICS – I
(Common to all branches of B.E./B.Tech. Programmes in I Semester)

OBJECTIVES:
- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES
UNIT III INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS  12

UNIT V DIFFERENTIAL EQUATIONS  12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER

UNIT II  ACOUSTICS AND ULTRASONICS

UNIT III  THERMAL AND MODERN PHYSICS

UNIT IV  APPLIED OPTICS

UNIT V  CRYSTAL PHYSICS
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:

CY7151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

OBJECTIVE
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermostetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
UNIT IV CHEMICAL THERMODYNAMICS
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCEMISTRY

TOTAL: 45 PERIODS

OUTCOME
- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXTBOOKS

REFERENCES

GE7152 ENGINEERING GRAPHICS

OBJECTIVES
- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

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.
UNIT I     PLANE CURVES AND FREE HANDSKETCHING  14
Basic Geometrical constructions, Curves used in engineering practices-Conics –
Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of
cycloid – construction of involutes of square and circle – Drawing of tangents and normal to
the above curves. Visualization concepts and Free Hand sketching: Visualization principles –
Representation of Three Dimensional objects – Layout of views- Free hand sketching of
multiple views from pictorial views of objects

UNIT II    PROJECTION OF POINTS, LINES AND PLANE SURFACES  14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points.
Projection of straight lines (only First angle projections) inclined to both the principal planes-
Determination of true lengths and true inclinations by rotating line method and trapezoidal
method and traces Projection of planes (polygonal and circular surfaces) inclined to both the
principal planes by rotating object method.

UNIT III   PROJECTION OF SOLIDS  14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when
the axis is inclined to both the principal planes by rotating object method and auxiliary plane
method.

UNIT IV    PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF  14
SURFACES
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of
the principal planes and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders
and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V     ISOMETRIC AND PERSPECTIVE PROJECTIONS  15
Principles of isometric projection – isometric scale –Isometric projections of simple solids and
truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in
simple vertical positions and miscellaneous problems.
Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method
and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)  3
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
- Perform free hand sketching of basic geometrical shapes and multiple views of
  objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

REFERENCES:
1.  K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) Subhas Stores,
    Bangalore, 2007
    an introduction to Interactive Computer Graphics for Design and Production”, Eastern
    Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

BS7161 BASIC SCIENCES LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
    b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow
OUTCOME:

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:
(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS

GE7162 ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes) L T P C 0 0 4 2

OBJECTIVES
To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES

PLUMBING
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.
2. ELECTRICAL ENGINEERING PRACTICES
• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Stair case light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
• Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS) 15

3. MECHANICAL ENGINEERING PRACTICES
WELDING
• Arc welding of Butt Joints, Lap Joints, and Tee Joints
• Gas welding Practice.
• Basic Machining - Simple turning, drilling and tapping operations..
• Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.
DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES
• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

HS7251 TECHNICAL ENGLISH L T P C 4 0 0 4

OBJECTIVES
• To enable students acquire proficiency in technical communication.
• To enhance their reading and writing skills in a technical context.
• To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING 12
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement–structuring paragraphs.

UNIT II SUMMARISING 12
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.
UNIT III DESCRIBING VISUAL MATERIAL

Listening - Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing - data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION

Listening - Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice (mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing - job application – cover letter – Résumé preparation.

UNIT V REPORT WRITING

Listening - Viewing a model group discussion; Speaking –Participating in a discussion - Presentation; Reading – Case study - analyse -evaluate – arrive at a solution; Writing – Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format. - writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

OUTCOMES
- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

REFERENCES:
MA7251 MATHEMATICS - II
(Common to all branches of B.E. / B.Tech. Programmes in II Semester)

OBJECTIVES:
- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES
- Eigenvalues and Eigenvectors of a real matrix
- Characteristic equation
- Properties of eigenvalues and eigenvectors
- Cayley-Hamilton theorem
- Diagonalization of matrices
- Reduction of a quadratic form to canonical form by orthogonal transformation
- Nature of quadratic forms.

UNIT II VECTOR CALCULUS
- Gradient and directional derivative
- Divergence and Curl
- Irrotational and Solenoidal vector fields
- Line integral over a plane curve
- Surface integral
- Area of a curved surface
- Volume integral
- Green’s, Gauss divergence and Stoke’s theorems
- Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION
- Analytic functions
- Necessary and sufficient conditions for analyticity
- Harmonic conjugates
- Construction of analytic function
- Conformal mapping
- Mapping by functions $w = z + c$, $az$, $\frac{1}{z}$, $z^2$
- Bilinear transformation.

UNIT IV COMPLEX INTEGRATION
- Line integral
- Cauchy’s integral theorem
- Cauchy’s integral formula
- Taylor’s and Laurent’s series
- Singularities
- Residues
- Residue theorem
- Application of residue theorem for evaluation of real integrals
- Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS
- Existence conditions
- Transforms of elementary functions
- Transform of unit step function and unit impulse function
- Basic properties
- Shifting theorems
- Transforms of derivatives and integrals
- Initial and final value theorems
- Inverse transforms
- Convolution theorem
- Transform of periodic functions
- Application to solution of linear ordinary differential equations with constant coefficients.

OUTCOMES:
- Upon successful completion of the course, students should be able to:
  - Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
  - Appreciate how complex methods can be used to prove some important theoretical results.
  - Evaluate line, surface and volume integrals in simple coordinate systems
  - Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
  - Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
TEXTBOOKS:

REFERENCES:

PH7251 MATERIALS SCIENCE L T P C
(Common to Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering) 3 0 0 3

OBJECTIVE:
- To impart knowledge on the basics of binary phase diagrams and their applications
- To learn the phase diagram, effect of alloying elements and various transformations in the Fe-C system, and also the heat treatment of steels.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement
- To instill the types, properties and applications of magnetic, dielectric and superconducting materials.
- To introduce the preparation, properties and applications of various new materials.

UNIT I PHASE DIAGRAMS 9
Solid solutions - Hume Rothery's rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS AND HEAT TREATMENT 9
UNIT III MECHANICAL PROPERTIES 9

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS 9

UNIT V NEW MATERIALS 9
Ceramics - types and applications - Composites: classification, role of matrix and reinforcement - processing of fiber reinforced plastics - Metallic glasses - types , glass forming ability of alloys - Inoue criteria - melt spinning process - applications - Shape memory alloys - phases, shape memory effect, pseudoeelastic effect - NiTi alloy - applications- Nanomaterials - preparation: ball milling and chemical vapour deposition - properties and applications - carbon nanotubes - Biomaterials

OUTCOME:
Upon completion of this course, the students will
• gain knowledge on the basics of binary phase diagrams and the use of lever rule
• learn about the Fe-C phase diagram, effect of alloying elements, TTT in the Fe-C system, and also the heat treatment of steels.
• understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
• acquire knowledge on the types, properties and applications of magnetic, dielectric and superconducting materials.
• get adequate understanding on the preparation, properties and applications of ceramics, composites, metallic glasses, shape-memory alloys and nanomaterials.

TEXTBOOKS:

REFERENCES:

GE7153 ENGINEERING MECHANICS L T P C
4 0 0 4
OBJECTIVE:
• The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.
UNIT I  STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  DISTRIBUTED FORCES  16
Centroids of lines and areas — symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION  8

UNIT V  DYNAMICS OF PARTICLES  12
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles.

L – 45 + T – 15 TOTAL: 60 PERIODS

OUTCOMES:
• Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES
OBJECTIVES:
- To impart the knowledge on basic concepts of various machining Processes and Machine tools.
- Classes to be supported by demonstration in the workshop and screening of video film of the various operations of the machines.

UNIT I LATHE

UNIT II SHAPER, PLANER & SLOTTER

UNIT III DRILLING

UNIT IV MILLING

UNIT V GRINDING

TOTAL: 45 PERIODS
OUTCOMES:
- In a position to select and use the machine suitably
- Obtain the total knowledge about the machines
- Helps to improve (or) modify the design by combining the various operations.

TEXT BOOKS:

REFERENCES:

GE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVE
- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL : 45 PERIODS
OUTCOME
At the end of the course, the student should be able to:
- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXTBOOKS:

REFERENCES:

PR7211 DRAFTING AND MACHINING LAB

OBJECTIVES
- To get hands on experience in drafting of engineering components
- To get hands on experience in the conventional machines.
- To prepare the process planning sheets for all the operations and then follow the sequences during the machining processes.

LIST OF EXPERIMENTS
Machining Exercises
1. Preparation of part drawing to machine a raw material in a lathe – (involving facing, turning, stepped turning, knurling, taper turning, thread cutting and parting)
2. Preparation of part drawing to machine a blank material in a shaper – (involving horizontal, vertical surface machining, V-shape, dove-tail end)
3. Preparation of part drawing to machine the given part in drilling machine – (involving single hole, multi hole, equidistant, equi-pitch, reaming, boring, counter boring, counter sinking).
4. Preparation of part drawing to mill the groove part in a milling machine – (involving key way, slot, spur gear, patched milling, spline, gang milling).
5. Preparation of part drawing to grind the part in a grinding machine-(involving flat surface, cylindrical surface).

Drafting Exercises
Any CAD software with 2D modeling to used by students for drafting exercises
1. Practice on Drafting Software using Measuring commands; Basic Draw Commands; Display Commands GRID, SNAP, CIRCLE, LINE, ARC LIMITS, ZOOM, PAN.
2. Practice on using Editing commands; Creating layers: CHANGE, ERASE, EXTEND, TRIM, GRIPS. Construction Commands; ARRAY, COPY.
MIRROR, MOVE, OFFSET, FILLET, CHAMFER, OSNAP.

3. Placing lettering on a drawing; Crosshatching a drawing TEXT BHATCH.
4. 2D drafting of automobile components like engine crank shaft, connecting rod etc.,
5. 2D drafting of machine components.
6. 2D drafting of machine shop drawing.
7. 2D drafting of pin joints, cotter joints and bearings.
   The drafting exercise include process planning sheet where student shall fill up the data for producing the product as per drawing. As per the process planning sheet the machining operations are to be conducted.
   2. Eccentric turning in a Lathe
   4. Machining to make a cube/ V-Block using shaper.
   5. Counter sinking, Counter Boring and Tapping operation in a drilling machine.
   7. Polygonal shape milling in a horizontal milling machine.
   8. Flat surface grinding and cylindrical grinding operations.

TOTAL: 60 PERIODS

OUTCOMES
- Enable to interpret drawing of component, process sheet, etc.
- Trained to draft part drawing with use of CAD software and operate basic machining tools.
- Impart practical knowledge on the selection of machines and processes to manufacture components.

GE7161 COMPUTER PRACTICES LABORATORY L T P C
0 0 4 2

OBJECTIVES
- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

OUTCOMES
At the end of the course, the student should be able to:
- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.
OBJECTIVE:

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation laws to flow through pipes and hydraulics machines are studied.

UNIT I INTRODUCTION
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III DIMENSIONAL ANALYSIS
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV TURBINES

UNIT V PUMPS

TOTAL: 45 PERIODS

OUTCOME:

- On completion of the course, students will be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to simple problems.

TEXT BOOKS:

REFERENCES:
### OBJECTIVES

- The objective of this course is to make the students to understand the concepts of stress and strain and their relationships by analysis of solids and structures, to analyze determinate and indeterminate axial members, torsional members, and beams, in order to determine axial forces, torque, shear forces, bending moments, stresses and deflections.

### UNIT I - STRESS-STRAIN – AXIAL LOADING

- Definition of stress and strain
- Stress-Strain relation
- Relation between material constants
- Bar under axial loading
- Statically determinate and indeterminate cases
- Thermal stress
- Impact loading

### UNIT II - STRESSES IN BEAMS

- Types of beams and loadings
- Relation between shear force and bending moment
- Shear force and bending moment diagrams
- Euler beam theory
- Bending stress in beams
- Shear stress in beam
- Composite beam

### UNIT III - DEFLECTION OF BEAM

- Various methods for statically determinate beams
- Double integration method
- Macaulay’s method
- Moment area method
- Conjugate Beam method
- Method of superposition

### UNIT IV - TORSION AND SPRINGS

- Shear stress and twist relation for circular section
- Comparison of hollow shaft and solid shaft
- Compound shaft
- Power transmission by circular shafts
- Springs
- Deflection expression for close coiled helical spring
- Stress in springs

### UNIT V - BIAXIAL STRESS

- Thin walled cylinder under internal pressure
- Principal stresses for general biaxial stress field
- Mohr’s circle
- Stresses in combined loading

### OUTCOMES

At the end of the course, the students are expected to

1. Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
2. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems.
3. Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments.
4. Have physical insight into distribution of stresses and strains in structural members.

### TEXT BOOKS:


### REFERENCES:

The objective of this course is to introduce the basic principles of thermodynamics and
termal engineering via real world engineering examples, to show students how
termodynamics is applied in engineering practice.

UNIT I BASIC THERMODYNAMICS
Systems, closed, open and isolated. Property, state, path and process, quasi-static process,
 Zeroth low, First law. Steady flow energy equation. Heat and work transfer in flow and non-flow
 processes. Second law, Kelvin-Planck statement – Clausius statement - Concept of Entropy,
 Clausius inequality, Entropy change in non-flow processes.

UNIT II AIR STANDARD CYCLES AND COMPRESSORS
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective
pressure. Compressors, Classifications of compressors, Single stage and multi stage, Effect of
intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the
compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION
Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart –
Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles -
Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING
Principles of refrigeration, Vapour compression – Vapour absorption types, comparison - Co-
efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and
Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER
Modes of heat transfer, Heat conduction in parallel, radial and composite wall – Basics of
Convective heat transfer. Fundamentals of Radiative heat transfer – Flow through heat
exchangers, Logarithmic Mean Temperature Difference (LMTD) for parallel flow and Arithmetic
Mean Temperature Difference (AMTD) counter flow heat exchangers.

TOTAL : 45 PERIODS
(Use of standard Steam tables with Mollier chart and Refrigerant tables are permitted)

OUTCOMES:
- Students will demonstrate a basic understanding of the nature of the thermodynamic
  processes for pure substances of ideal gases
- Student will demonstrate a basic understanding of the First law Thermodynamics and its
  application to systems and control volumes
- To analyze any problem in an engineering approach based on basic concepts and logic
  sequences.
- To understand the basics and modes of heat transfer, Refrigeration and Air-conditioners.
TEXT BOOKS:

REFERENCES:

EI7307 ELECTRICAL, ELECTRONICS AND CONTROL SYSTEMS

OBJECTIVES:
- Gain knowledge on construction and working principle of AC and DC machines.
- Get exposed to basic electronic devices and their applications.
- Gain knowledge on logic gates and their applications in digital electronics.
- Will be in a position to analyze open and closed loop control systems.
- Exposed to various types of measurement Systems.

UNIT I ELECTRICAL MACHINES

UNIT II BASIC ELECTRONIC DEVICES
Semiconductor devices: Diodes, BJT, FET, UJT, SCR Principle of Operation and their characteristics and applications -Rectifier and power supply circuits.

UNIT III DIGITAL ELECTRONICS
Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - Combinational circuits- Design of adder, subtractor, encoders, decoders, multiplexers and demultiplexers-Flip flops.

UNIT IV BASICS OF CONTROL SYSTEM
Introduction to control systems – open loop and closed loop- Block diagram and signal flow graph representation-realization of transfer functions-Time and Frequency response of dynamic systems-Stability analysis.

UNIT V MEASURING SYSTEMS

TOTAL: 45 PERIODS

OUTCOMES:
- Will be in a position to suggest suitable AC/DC machines for a given application.
- Able to analyze the characteristics of electronic devices such as diodes Thyristors family.
- Able to understand the fundamental concepts and solve problems applied to digital system.
- Able to analyze and solve problems for open loop and closed loop control systems.
- Will be in a position to suggest suitable measuring device for a given application.

TEXT BOOKS:

REFERENCES:

MA7354  NUMERICAL METHODS L T P C 4 0 0 4

OBJECTIVE:
- To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

UNIT II  INTERPOLATION AND APPROXIMATION 12
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION 12
UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS


UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

OUTCOMES:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods

TEXT BOOKS:


REFERENCES:


PR7301 METALLURGY AND MATERIALS TESTING

L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on the structure, properties and applications of ferrous and non-ferrous metals so as to identify and select suitable materials for various engineering applications.
- To familiarize property evaluation by various testing methods and fundamentals of characterization techniques to understand structure property correlation.

UNIT I MICROSTRUCTURAL DEVELOPMENT AND METALLOGRAPHY

HSLA steels – TRIP steel- maraging steels – Gray, white, malleable, spheroidal / graphite, alloy cast irons

UNIT II HEAT TREATMENT AND KINETICS

UNIT III NON FERROUS METALS

UNIT IV DEFORMATION AND FAILURE OF METALS

UNIT V TESTING OF MATERIALS

TOTAL: 45 PERIODS

OUTCOMES:
• Student shall have knowledge in understanding constitution of ferrous and non ferrous alloys, their properties and application.
• Student understand the mechanical behaviour of materials under different condition and evaluation by various testing methods and characterization tools.

TEXT BOOKS:

REFERENCES:
EI7313 ELECTRICAL, ELECTRONICS AND CONTROL SYSTEMS LABORATORY

OBJECTIVES:
- Exposed to important characteristics of electrical machines.
- Will be in a position to design oscillators, signal generators using operational amplifiers.
- Able to handle measuring instruments for measuring electrical parameters.

LIST OF EXPERIMENTS
1. Load test on single phase transformer.
2. Load test on D.C Shunt motor.
3. Load test on generator.
4. Load test on three phase Induction motor.
5. Speed control of DC Shunt motor.
10. Realization of logic gates circuits.
11. Measurement of various electrical parameters using C.R.O.
12. Experiments with virtual instruments.

OUTCOMES:
- Able to obtain and analyze the characteristics of electrical machines
- Ability to design and analyze electronic circuits using operational amplifiers
- Able to understand the basic of logic gates.
- Will be in a position to select proper measuring instruments for basic electrical and electronics applications.

TOTAL: 60 PERIODS

PR7311 METALLURGY AND MATERIALS TESTING LABORATORY

OBJECTIVES:
- To study the testing methods and quantifying techniques for the mechanical properties of engineering materials.
- To gain practical knowledge in Microstructural analysis of various steels, Cast iron, Non ferrous Materials and Heat Treated steels.

LIST OF EXPERIMENTS
1. Cooling curve- Pure metal and alloy (Pb-Sn).
2. Specimen preparation for macro – examination.
7. Tension test of mild steel.
8. Torsion test of mild steel.
11. Compression test for Helical spring.
12. Fatigue test

43
13. Creep test.

OUTCOMES:
- Awareness of procedure and methods of testing materials for evaluation of mechanical properties.
- Experience in metallographic techniques and familiarization of microstructure of typical ferrous and non ferrous alloys.

GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an 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 – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION
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– soil waste management: causes, effects and control measures of municipal solid 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 / Agricultural.

UNIT III NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of 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

TOTAL: 60 PERIODS

S: (Total 01 supervisor)

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3 0 0 3
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 IV SOCIAL ISSUES AND THE ENVIRONMENT  7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT  6

TOTAL : 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the principle, procedure and applications of Foundry and Welding.

UNIT I  CASTING PROCESSES  9

UNIT II  SPECIAL CASTING PROCESSES  9

UNIT III  METAL JOINING PROCESSES  9

UNIT IV  SPECIAL WELDING PROCESSES  9

UNIT V  TESTING OF CASTINGS AND WELDMENTS  9

TOTAL:45 PERIODS

OUTCOME:
- Students shall gain knowledge on foundry and welding techniques.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the theory of metal cutting.
- To understand the concepts of gear manufacture.
- To understand the constructional and operational features of CNC machines and programming.

UNIT I TOOL MATERIAL, TOOL WEAR AND TOOL LIFE 9

UNIT II MECHANICS OF METAL CUTTING 9

UNIT III GEAR MANUFACTURING 9

UNIT IV CNC MACHINES 9

UNIT V CNC PROGRAMMING 9

OUTCOME:
- The students will gain and apply the knowledge on the concepts of metal cutting and to programme CNC machines.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the principle, procedure and application of Bulk Metal Forming and Sheet Metal Forming.

UNIT I  FUNDAMENTALS OF METAL FORMING  9

UNIT II  FORGING AND ROLLING  9

UNIT III  EXTRUSION AND DRAWING PROCESSES  9

UNIT IV  SHEET METAL FORMING PROCESSES  9

UNIT V  POWDER FORGING AND RECENT ADVANCES  9

OUTCOME:
- The course shall enable student to understand forming of bulk metal, sheet and powder and tools and design for manufacturing

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

- To understand the basic concepts of mechanisms and machinery.

UNIT I  MECHANISMS  12

UNIT II  FRICTION  12
Types of friction – friction in screw and nut – screw jack – pivot, collar and thrust bearings – plate and cone clutch – belt (Flat and V) and rope drives – creep in belts – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.

UNIT III  GEARS AND CAMS  12

UNIT IV  VIBRATION  12

UNIT V  BALANCING  12
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines – Governors and Gyroscopic effects.

OUTCOME:

- The student shall be able to apply the kinematics and dynamics of machinery in design and analysis of engineering problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the various quantitative techniques and optimization techniques and to make the students apply these techniques for modeling and solving many engineering situations in general and manufacturing situations in particular.

UNIT I LINEAR PROGRAMMING

UNIT II REPLACEMENT MODELS AND GAME THEORY

UNIT III QUEUING MODELS AND SIMULATION

UNIT IV FORECASTING, SEQUENCING AND LINE BALANCING

UNIT V PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

TOTAL: 60 PERIODS

OUTCOME:
- The students shall able to select and apply techniques for typical engineering and industrial situations.

TEXT BOOKS:

REFERENCES:
PR7411  METAL CUTTING AND CNC LABORATORY

OBJECTIVES:
- To familiarize metal cutting principles.
- To train the students to write, simulate and carry out various operations in CNC machines.

LIST OF EXPERIMENTS:
1. Tool life study on a single point turning tool.
3. Acceptance test on RAM type milling machine as per ISI test chart and Measurement of tool angles.
4. Temperature measurement in machining.
5. Spur Gear generation using gear shaper.
6. Programming and machining of step turning and taper turning operation in CNC Lathe.
7. Programming and machining of thread cutting and grooving operation in CNC Lathe.
8. Programming and simulation for canned cycle in CNC lathe.
   (i) Stock removing in facing cycle.
   (ii) Stock removing in turning cycle.
   (iii) Grooving cycle.
   (iv) Thread cutting cycle.
12. Programming and Simulation in CNC Router.

TOTAL: 60 PERIODS

COURSE OUTCOME:
- The students will be able to use dynamometers to measure the cutting forces, cut gears and they will be able to programme in CNC machines.

PR7412  METAL FORMING, FOUNDRY AND WELDING LABORATORY

OBJECTIVE:
- To familiarize the students with test procedures followed in forming and in foundry and also to practice various types of welding processes.

LIST OF EXPERIMENTS:
METAL FORMING LABORATORY
2. Erichsen cupping Test.
5. Water hammer forming.
6. Determination of Power consumption in sheet rolling process and wire drawing process.
7. Determination of strain rate sensitivity index of given specimen.
8. Superplastic forming studies on Pb-Sn alloys.
10. Forward Extrusion process.
12. Simulation studies on metal forming.
WELDING
1. Welding of basic joints using gas and arc welding.
2. Welding of pipes in different positions.
3. GTAW / GMAW of ferrous and non-ferrous metals.

FOUNDRY
1. Green and Dry Strength of Moulding sand.
2. Permeability testing.
3. Determining the clay content.
4. Sieve analysis of dry silica sand.
5. Determining the moisture content.

TOTAL: 60 PERIODS

COURSE OUTCOME:
- The students would gain practical knowledge on Metal forming, Welding and Foundry.

PR7501 ENGINEERING METROLOGY

OBJECTIVES:
- To understand the concept of Engineering metrology.
- To learn about metrology instruments and application for various measurements.
- To introduce the concepts of computer applications in metrology.

UNIT I  FUNDAMENTALS OF MEASUREMENT

UNIT II  LINEAR AND ANGULAR MEASURING SYSTEMS
Linear and Angular measuring systems. Slip gauges, micrometers, verniers, dial gauges and surface plates – Concept of comparators mechanical, electrical, optical and pneumatic comparators – Angular measuring systems – angle gauges – Sine bar – Precision spirit level, Auto collimators – Angle dekkor – Clinometers – Straightness and flatness measurement using precision level and auto collimators.

UNIT III  MEASUREMENT OF SURFACE TEXTURE AND MEASURING INSTRUMENTS

UNIT IV  METROLOGY OF SCREW THREADS AND GEARS
Metrology of screw threads and gears Internal and external screw threads – terminology - measurement of various elements of screw threads – thread micrometer two wire and three wire methods, gear terminology measurement of various elements of gears pitch circle method, constant chord method, base tangent method – plug method – Rolling gear tester.
UNIT V  LASER METROLOGY AND COMPUTER AIDED METROLOGY  9

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to understand the principles of measuring equipments.
- Students will be able to identify appropriate metrology equipments.

TEXT BOOKS:

REFERENCES:

PR7502  FLUID POWER SYSTEMS  L T P C  3 0 0 3

OBJECTIVES:
- To understand the working principle of hydraulic and pneumatic components and its selection.
- To design hydraulic and pneumatic circuits for different applications.

UNIT I  BASICS OF FLUID POWER  9

UNIT II  FLUID POWER SOURCES  9
Fluid Power drives – Pumps – working principle and construction details of Gear, vane and piston pumps, Hydraulic motors, Hydrostatic transmission drives and characteristics, Hydraulic supply components Pneumatic power supply – compressors, air distribution, air motors.

UNIT III  FLUID POWER ACTUATORS AND ELEMENTS  9
Control valves – pressure, flow, direction - working principle and construction – Special type - valves – Cartridge, modular, proportional, and servo – Selection and actuation methods.
Actuators – Selection and specification, cylinders, mounting, cushioning, pipe fittings – Fluid conditioning elements – Accumulators- Intensifier.

UNIT IV  HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN  9
Regenerative, speed control, synchronizing circuits -Design of Hydraulic and pneumatic circuits for automation, selection and specification of circuit components, sequencing circuits, cascade, and Karnaugh – Veitch map method – Circuits for industrial application - grinding, milling, shaping, press, material handling, etc

UNIT V  ELECTRO PNEUMATICS AND PLC CIRCUITS  9
Moving part logic circuits - Use of electrical timers, switches, solenoid, relays, proximity sensors etc. electro pneumatics sequencing Ladder diagram – PLC – elements, functions and selection – PLC programming– Ladder and different programming methods - Sequencing circuits.

TOTAL: 45 PERIODS
OUTCOMES:
- Students will acquire knowledge on working principle of pump, actuators, control elements etc of fluid power system
- Students will be capable to design circuit for typical applications like material handling, press, shaping, milling, grinding, etc.

TEXT BOOKS:

REFERENCES:

PR7503 MACHINE COMPONENTS DESIGN

OBJECTIVE:
- To introduce the students the design and theory of common machine elements and to give experience in solving design problems.

UNIT I INTRODUCTION

UNIT II JOINTS
Design of Bolts under Static Load, Design of Bolt with tightening / Initial Stress, Design of Bolts subjected to Fatigue – Keys -Types, Selection of Square and Flat Keys-Design of Riveted Joints and Welded Joints.

UNIT III SHAFTS, COUPLINGS AND BRAKES
Design of Shaft –Static and Varying Loads, Strength and Rigidity- Design of Coupling-Types, Flange, Muff and Flexible Rubber Bushed Coupling-Design of Brakes-Block and Band Brakes.

UNIT IV GEARS AND BELT DRIVES
Design of Spur, Helical, Bevel and Worm Gear drives- Design of Belt drives- Flat and V Belts.

UNIT V SPRINGS AND BEARINGS

TOTAL:60 PERIODS

OUTCOME:
- Enable student to design and validate typical components of machines
TEXT BOOKS:

REFERENCES:

PR7551 STATISTICAL QUALITY CONTROL AND RELIABILITY ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To impart the knowledge of the quality control, control charts and application and construction of various quality control charts and the selection.
- To study the significance of design of experiments and its application.
- To train the students in the field of reliability and its estimation.

UNIT I STATISTICAL PROCESS CONTROL
Quality control – Definition – Quality Assurance Variation in process – Factors – control charts – variables X\(_R\) and X\(_\sigma\) - Attributes P, C and U-Chart Establishing and interpreting control charts process capability – Quality rating – Short run SPC.

UNIT II ACCEPTANCE SAMPLING
Lot by lot sampling types – probability of acceptance in single, double, multiple sampling plans – OC curves – Producer’s risk and consumer’s risk. AQL, LTPD, AOQ, AOQL, Concepts Design of sampling plan – single, double, multiple- standard sampling plans for AQL and LTPD – Use of standard sampling plans – Sequential sampling plan.

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD

UNIT IV RELIABILITY AND ITS PREDICTION

UNIT V FAILURE DATA ANALYSIS
Real time distribution, exponential,normal, log normal, gamma and weibull – reliability data requirements – Graphical evaluation.

TOTAL: 45 PERIODS
OUTCOME:
- Enable student to apply tools of statistics in analysis of experiments and data of industrial management interest.

TEXT BOOKS:

REFERENCES:

PR7511 FLUID POWER SYSTEMS LABORATORY

OBJECTIVES:
- To study the functional aspects of different pneumatic and hydraulic Components and its use in circuits.
- To train the student in designing different pneumatic and hydraulic circuits for different applications.

LIST OF EXPERIMENTS
1. Study and use of pneumatic and hydraulic elements.
2. Simulation of speed control circuits in a hydraulic trainer.
3. Simulation of hydraulic circuits in a hydraulic trainer.
4. Simulation of single and double acting cylinder circuits using different directional control valves.
5. One shot and regenerative pneumatic circuits.
7. Simulation of Electro-pneumatic circuits.
8. Simulation of Logic pneumatic circuits.
9. Simulation of electro pneumatic sequencing circuits.
10. Simulation of PLC based electro pneumatic sequencing circuits.
11. Simulation of pneumatic circuits using PLC.
12. Design and simulate the circuits for the given applications.
13. Simulation of ladder diagram for electrical and PLC control for the given sequence.
14. Simulation of circuit for the given sequence using software.

OUTCOMES:
- Hands on experience in handling various components of fluid power systems
- Ability to design circuit for desired sequence of practical application by pneumatics, electropneumatics and PLC.

TOTAL: 60 PERIODS
OBJECTIVE:
- To practice various measurement methods and to introduce quality control tools.

LIST OF EXPERIMENTS
3. Measurement of internal taper angle
6. Inspection of screw thread parameters using three wire method.
7. Measurement of gear tooth thickness
10. Straightness measurement using Autocollimator
12. Study on CMM.
13. Determination of process capability from given components and plotting variable control chart/attribute chart.
14. Analyzing the fault in given batch of specimens by using quality control tools.
15. Usage of MINITAB software with respect to quality control.
16. Case studies related to quality control.

TOTAL :60 PERIODS

OUTCOME:
- The students will be able to carry out various types of measurements using different instruments and familiarization of software tools for quality control.

PR7601 COMPUTER AIDED PRODUCT DESIGN

OBJECTIVES:
- To introduce the concepts and applications of CAD.
- To introduce the various concepts and techniques used for product design and to develop product design skills.

UNIT I INTRODUCTION TO COMPUTER AIDED DESIGN
Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware and Peripherals – software packages for design and drafting.

UNIT II COMPUTER GRAPHICS FUNDAMENTALS

UNIT III GEOMETRIC MODELING
UNIT IV  PRODUCT DESIGN CONCEPTS  9

UNIT V  PRODUCT DATA MANAGEMENT  9

OUTCOME:
- Enable students to understand the features of modern design tools and data handling product development.

TEXT BOOKS:

REFERENCES:

PR7602  COMPUTER INTEGRATED MANUFACTURING SYSTEMS  L T P C  3 0 0 3

OBJECTIVES:
- To understand the various automated manufacturing activities.
- To study the application of computer Technology in the manufacturing activities.
- To know the smooth transition from conventional manufacturing to automated production and computer integrated manufacturing.

UNIT I  INTRODUCTION TO AUTOMATED PRODUCTION SYSTEMS  9

UNIT II  MATERIAL HANDLING AND STORAGE SYSTEM  9
UNIT III  
CELLULAR MANUFACTURING  

UNIT IV  
FLEXIBLE MANUFACTURING SYSTEM  

UNIT V  
AUTOMATED ASSEMBLY AND SHOP FLOOR CONTROL  

OUTCOME:
- The students will gain and apply the knowledge using computers for various manufacturing activities

TEXT BOOKS:

REFERENCES:

TOTAL: 45 PERIODS

PR7603  
FINITE ELEMENT ANALYSIS IN MANUFACTURING  
3 0 0 3

OBJECTIVE:
- To introduce the concept of FEA and to apply in the field of Manufacturing.

UNIT I  
INTRODUCTION  

UNIT II  
GENERAL PROCEDURE OF FEA  
Discretization of Domain selection of interpolation polynomials-Convergence requirements-Formulation of element characteristics matrices and load vectors – Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.
UNIT III  
**FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS**  
9  
One dimensional finite element analysis-Linear bar element-Quadratic bar element-Beam element-Frame elements-One dimensional heat transfer-Two dimensional finite element analysis approximation of geometry and field variables-Three nodded triangular element-Four nodded rectangular element-Six nodded triangular element-Natural coordinates and coordinate transformation – Numerical integration-Incorporation of boundary conditions

UNIT IV  
**VIBRATIONAL ANALYSIS**  
9  

UNIT V  
**APPLICATION OF FINITE ELEMENT ANALYSIS**  
9  

OUTCOME:  
- Students shall develop in depth knowledge on techniques of FEA and tools for analysis of typical manufacturing processes.

TEXT BOOKS:  

REFERENCES:  

PR7651  
**PRODUCTION OF AUTOMOTIVE COMPONENTS**  
L T P C  
3 0 0 3

OBJECTIVES:  
- To impart knowledge in various manufacturing methods in developing automotive components.  
- To study the principle of automobile engineering.

UNIT I  
**ENGINE**  
9  
Working principle of two strokes, four stroke and wankel engines – wet and dry liners – Piston and Piston rings – types – classification. Production of Cylinder block, Cylinder head, liners, oil pan, piston and piston rings and testing.

UNIT II  
**ENGINE PARTS**  
9  
Working principle of crank shaft – Cam shaft – valve operating mechanisms – carburetors - spark plug Production of Connecting rod, Crankshaft, push rod and rocker arm, valves, tappets, carburetors and spark plugs.
UNIT III  FUEL AND TRANSMISSION SYSTEM  9

UNIT IV  CHASSIS AND SUSPENSION SYSTEM  9
Working principle of – Suspension system – leaf spring and shock absorbers – wheel housing – design concepts of chassis (aerodynamics and cross worthiness) - Production of Brake shoes, leaf spring, wheel disc, wheel rim –usage of non metallic materials for chassis components.

UNIT V  RECENT ADVANCES  9

TOTAL: 45 PERIODS

OUTCOME:
• The students shall have knowledge of production of various automotive components.

TEXT BOOKS:

REFERENCES:

PR7611  CREATIVE AND INNOVATIVE PROJECT  L T P C
0 0 4 2

The main objective of this course is to help the students to identify innovative projects which promotes and enhances creativity to explore the variables. The goal is to improve the creative and innovative aspects in the design, fabrication and implementation of real time problems related to social/industrial and campus based.
This course will help the students to learn concepts, models, frameworks, tools, etc., in a world where creativity and innovation is fast becoming a precondition for competitive advantages.
The students will be grouped into 3 or 4 (max) students as a batch and work under a faculty member as project supervisor. The progress of project work will be continuously evaluated by a committee constituted by the Head of the Department. The project report is to be submitted by the group.
The final end semester exam will be conducted by an external member in a Viva Voce mode.

Student has to take a project involving minimum of TWO areas as given below:
1. Design and fabrication of jigs/ fixtures/ press tool (involving total design, cost estimation and prototype)
2. Automation using fluid power and electrical (design and fabrication of a proto type model)
iii. Design for manufacturability (To study an assembly based tolerance and fits, preparation of machine and assembly drawing)
iv. Software development (To computerize the activity with proper algorithm as a application software for problems faced in Production Engg. as office automation or e-governance)
v. Virtual Reality (To develop software based on any one production process explaining the concept and working principles)
vi. Automation of manual related task (To design, fabricate and to complement the model for the task selected).

TOTAL: 60 PERIODS

PR7612 MODELLING AND ANALYSIS LABORATORY

OBJECTIVE:

• To train the students to make use of software for simulation and analysis for various applications in the field of manufacturing engineering.

LIST OF EXPERIMENTS

1. One Dimensional FEA Problem.
   a. Truss structure analysis.
   b. Cantilever beam analysis.
   c. Temperature distribution problem.
2. Two Dimensional FEA Problems.
   a. Plane stress analysis.
   b. Axisymmetric analysis.
   c. Vibration Analysis.
3. Three Dimensional FEA Problems.
   a. 3D Shell Analysis.
   b. 3D Contact Analysis.
4. FEA Application in metal forming, Metal cutting, Casting process etc.

TOTAL: 60 PERIODS

OUTCOMES:

• The student are trained in finite element modelling and analysis package.
• The students are enabled to do finite element modeling analysis for solid mechanics, heat transfer problems, vibration problems, shell and contact problems in 2D and 3D simulation.

PR7701 INDUSTRIAL ENGINEERING AND MANAGEMENT

OBJECTIVE:

• To introduce various concepts of Engineering Management.

UNIT I PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT

UNIT II INVENTORY MANAGEMENT
Purpose of Inventory – Cost related to inventory – Basic EOQ model – variations in EOQ model – Finite Production, quantity discounts – ABC Analysis – MRP.

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UNIT III OPERATIONS MANAGEMENT


UNIT IV FINANCIAL MANAGEMENT


UNIT V MARKETING MANAGEMENT


TOTAL 45 PERIODS

TEXT BOOKS:

REFERENCES:

PR7702 MECHATRONICS FOR AUTOMATION L T P C
3 0 0 3

OBJECTIVE
- To enhance the knowledge to develop the mechatronics system through the understanding of sensors, signals, controls, actuators and microcontrollers.

UNIT I MECHATRONICS SYSTEMS AND SENSORS

Introduction to mechatronics systems, key elements, ways of integration – hardware and software. sensors – characteristics – static and dynamic, types - linear, rotational, velocity acceleration, force, torque, flow, temperature, proximity, optical, Micro and Nano sensors, selection of sensors.

UNIT II SIGNAL CONDITIONING AND CONTROL SYSTEM

Analog and Digital Signals - Signal condition module – Amplifiers - inverting amplifier, non-inverting amplifier, instrumentation amplifier, Filters, A/D and D/A converter. Open loop and closed loop control systems. P, PD, PI, PID controllers and its use for stable system design.

UNIT III ACTUATORS


UNIT IV MICROCONTROLLERS

8051 Microcontrollers – Architecture, Address modes, Instruction sets, programming exercises - Memories – different types – Different I/O devices, Stepper and servo motor interface. Overview of advanced microcontrollers and its typical applications.
UNIT V  MECHATRONICS SYSTEM
Stages in Designing Mechatronics Systems – Traditional and Mechatronic Design – Case studies of mechatronics system in CNC machine, Engine management system, Car production and its assembly line automation.

OUTCOME:
- It gives the frame work of knowledge that allows the production engineers to automate the production field.

TEXT BOOKS:

REFERENCES:

PR 7703 ROBOTIC TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE:
- To study the kinematics, drive systems and programming of robots.

UNIT I  FUNDAMENTALS OF ROBOT

UNIT II  ROBOT KINEMATICS
Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices Denavit and Hartenberg transformation.

UNIT III  ROBOT DRIVE SYSTEMS AND END EFFECTORS

UNIT IV  SENSORS IN ROBOTICS
Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.
UNIT V  PROGRAMMING AND APPLICATIONS OF ROBOT

Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.

OUTCOME:

• The students will be able of interpret the features of robots and technology involved in the control.

TEXT BOOKS:


REFERENCES:


PR7711  MECHATRONICS AND ROBOTICS LABORATORY

OBJECTIVES:

• To understand the various concepts of sensors, transducers, and actuators.
• To impart practical knowledge in mechatronics, Robotic system, Simulation softwares and microcontroller programming.

LIST OF EXPERIMENTS:

1. Study of characteristics of optical sensors.
2. Study of characteristics of temperature transducers.
3. Experiments on LVDT and ultrasonic transducer.
4. 8 bit and 16 bit Arithmetic operation in 8051 microcontroller.
5. I/O port programming of 8051 microcontroller.
6. PC parallel port and microcontroller interfacing of a unipolar stepper motor.
7. Modeling and Simulation of mechanisms using simulation software.
10. Robot control with stepper motor interfacing.
11. Experimental verification of Freudenstein equation for 1 DOF robot.
14. Study of AC and DC power control.

OUTCOME:

• Students will get practical experience with sensors, actuators, microcontroller programming, modelling and simulation software to get familiar with mechatronics systems and robotics.

TOTAL: 45 PERIODS

TOTAL: 60 PERIODS
The main objective of the industrial training / internship is to experience and understand the real life situations in any industrial organization and their related environmental aspects. The students are advocated to take a small project during the training / internship.

The students have to undergo practical training for FOUR weeks (during 5th or 6th semester holidays) in recognized industrial establishments. The student has to submit a report about the training / internship with the following information.

1. Industry profile.
2. Organization structure.
5. Labor welfare schemes.
6. Training schedule.
7. Project work carried out.
8. Learning points.

The assessment will be based equally on the report in the prescribed format and Viva Voce examination by a committee nominated by the Head of the Department.

TOTAL:60 PERIODS

A project area must be selected by the students in consultation with the faculty members who act as a guide. The objective of the project work is to deepen comprehension of principles by applying them to a problem which may be; design and fabrication of a device / a research project with a focus on the application needed by the industry; a software oriented project involving design and analysis; a management project to apply the latest technique for an industrial problem; material characterization (or) any inter-disciplinary topic of due weightage / continued work of internship in a company etc.,

The progress of this project is evaluated based on a minimum of two reviews. The review committee will be constituted by the Head of the Department. A project report is to be submitted at the end of the project. The final end semester exam will be evaluated jointly by external and internal examiners based on oral presentation and the demonstration of the project work.

TOTAL: 300 PERIODS

OBJECTIVES:

- Basic concepts, types and industrial application of shape memory alloys
- To emphasize the importance of cutting fluids and its effect in the manufacturing process
- To understand the efficiency of electrochemical energy systems for industrial application
- To familiarize the stages, measurement and control of wear
- To know about battery technology and disseminate the student about clean and green alternate energy sources

UNIT I SHAPE MEMORY ALLOYS
Shape Memory Alloys – Introduction, one way memory effect, two way memory effect – Types (copper-aluminium-nickel, and nickel-titanium (Ni-Ti) alloys), manufacturing methods, properties, crystal structures, applications and limitations.
UNIT II  CUTTING FLUIDS  9
Cutting Fluids – definition, types - oil, water, emulsion fluid as coolant and lubricant, selection parameters for cutting fluids, functions of cutting fluid- shear – strength reduction mechanism, applications, preparation of demineralized water (ion exchange method and permanganate method).

UNIT III  ELECTROCHEMICAL ENERGY SYSTEMS  9

UNIT IV  WEAR MECHANISM  9
Wear – definition, stages of wear (primary, secondary, tertiary), types – adhesive, abrasive, surface fatigue, fretting, erosion wear, measurement – Tribometry (Pin/ball on disc method), control of wear – Lubrication – theory, mechanism, types of lubricants (liquid, semi-solid, solid and gaseous), selection of lubricants.

UNIT V  BATTERY TECHNOLOGY AND ENERGY SOURCES  9

TOTAL: 45 PERIODS

OUTCOME:
• The students are familiarized with the use chemicals in the field manufacturing

TEXT BOOKS:

REFERENCES

CY7002  SURFACE MODIFICATIONS AND ANALYTICAL TECHNIQUES  L T P C
3 0 0 3

OBJECTIVE
• To acquire knowledge in the fields of corrosion and its control, abrasives and refractories, metallic coatings, chemical conversion and organic coatings and surface characterization.
UNIT I  CORROSION AND ITS CONTROL  

UNIT II  ABRASIVES AND REFRACTORIES  
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of refractories – general method; acidic refractories – fire clay, silica; basic refractories – magnesite, dolomite; neutral refractories – silicon carbide, zircon.

UNIT III  METALLIC COATINGS  
Definition – methods of metallic coating, hot dipping - galvanizing, tinning, metal cladding, electroplating, electroless plating. Various other metallic coatings – displacement plating- Kanigen process – metal spraying or metallised coating – cementation or diffusion coatings.

UNIT IV  CHEMICAL CONVERSION AND ORGANIC COATINGS  
Chemical Conversion coatings- Types- phosphate, chromate, chemical oxide and anodized (Aluminium) coatings -Organic coatings- paint, vehicle or drying oil, thinners, driers- Formulation of paints, failure of paint film-Varnishes, Enamels, Lacquers, Epicoating, Emulsion Paints-types, advantages and disadvantages – Special paint.

UNIT V  SURFACE CHARACTERIZATION  

TOTAL: 45 PERIODS

OUTCOME
• To have thorough understanding in the fields of shape memory alloys corrosion and its control, abrasives and refractories, metallic coatings, chemical conversion and organic coatings and surface characterization.

TEXT BOOKS

REFERENCE
OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
disaster response in areas where they live, with due sensitivity

UNIT I               INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II                APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

UNIT III               INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT IV               DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V               DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies; Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXTBOOKS:
REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

GE7074 HUMAN RIGHTS L T P C 3 0 0 3

OBJECTIVE:
• To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
• Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
OBJECTIVES

- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I  HUMAN VALUES  3

UNIT II  ENGINEERING ETHICS  9

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime - the challenger case study.

UNIT IV  ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY  12

UNIT V  GLOBAL ISSUES  12
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES

- Students will have the ability to perform with professionalism , understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXTBOOKS

REFERENCES
OBJECTIVES

- To describe the basic processes of materials that are used to fabricate semiconductor and MEMS devices.
- To learn the thermal considerations of electronic materials.

UNIT I INTRODUCTION
Overview of semiconductors and other basic materials - Plastics, Elastomers, and Composites - tables with material properties, terms and definitions, trade names, and material structure correlation, basic electronic components and its metallurgical structure. Carrier generation and recombination; junctions; photovoltaic materials and devices.

UNIT II ORGANIC MATERIALS AND PROCESSES
Types and properties of organic materials, manufacturing technique – Vacuum Metallization, Vapour phase deposition, Thermal Imaging, Digital Lithography, Application areas.

UNIT III MEMS MATERIALS AND PROCESS
MEMS design process- Methods, Selection of materials for process, Optimization techniques in design, Over view of additive process of Semiconductors, Dielectric materials, Metals, and Polymer Materials, Piezoelectric materials, Shape memory alloys, Micromachining techniques, packaging methods.

UNIT IV MATERIALS SYSTEMS

UNIT V THERMAL MANAGEMENT OF MATERIALS AND SYSTEMS
Temperature effects on circuit operation and physical construction. Laws of heat transfer mechanism and their considerations in the manufacturing process. Thermal management in packaging of electronic materials

OUTCOME:

- Students will be familiar about the electronics material characteristics, and preparation and production process.

TEXT BOOKS:

REFERENCES:
PR7001  ADVANCES IN OPERATIONS RESEARCH  

OBJECTIVE:  
• To introduce the advanced OR models and to apply them for Engineering problems.

UNIT I  INTRODUCTION  

UNIT II  CLASSIC OPTIMIZATION TECHNIQUES  

UNIT III  NON-LINEAR PROGRAMMING  
Introduction – Lagrangian Method – Kuhn-Tucker conditions – Quadratic programming – Separable programming – Stochastic programming

UNIT IV  INTEGER PROGRAMMING  

UNIT V  DYNAMIC PROGRAMMING  
Formulation – Application to capital budgeting, reliability improvement, shortest path, solution of LP using DP.

OUTCOME:  
• The students are equipped with basic and advanced techniques of operations research.

TEXT BOOKS:  

REFERENCES:  

PR7002  APPLIED HEAT TRANSFER  

OBJECTIVES:  
• To introduce the basic concepts and the science behind heat transfer.
• A provide a brief description about heat exchangers and their functioning

UNIT I  MODES OF HEAT TRANSFER  
Modes of heat transfer - effect of temperature on thermal conductivity of different solids, liquids and gases- derivation of generalized equation in Cartesian ,cylindrical and spherical coordinates and its reduction to specific cases- General laws
UNIT II  CONDUCTION
Fourier’s law- One dimensional steady state conduction- heat conduction through plane and composite walls, cylinders and spheres-electrical analogy-critical radius of insulation for cylinder and sphere, overall heat transfer coefficient- Transient heat conduction- lumped heat capacity analysis, time constant, transient heat conduction in solids with finite conduction and convective resistances -Heat transfer from extended surface-Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip-efficiency and effectiveness of fin-Biot number-Estimation of error in temperature measurement in a thermometer well.

UNIT III  CONVECTION
Newton’s law of cooling-Dimensional analysis applied to forced and free convection- dimensionless numbers and their physical significance-empirical correlations for free and forced convection - Continuity, momentum and energy equations-thermal and hydrodynamic boundary layer-Blasius solution for laminar boundary layer- General solution of Von-Karman integral momentum equation

UNIT IV  RADIATION
Absorptivity, reflectivity and transmissivity- black, white and grey body- emissive power and emissivity-laws of radiation – Planck, Stefan-Boltzmann, Wein’s displacement, Kirchhoff’s law, intensity of radiation and solid angle- Lambert’s cosine law
Radiation heat exchange between black bodies, shape factor, heat exchange between non-black bodies- infinite parallel planes and infinite long concentric cylinders- radiation shield- heat exchange between two grey surfaces- electrical analogy

UNIT V  HEAT EXCHANGER
Classification- heat exchanger analysis- LMTD for parallel and counter flow exchanger- condenser and evaporator- overall heat transfer coefficient- fouling factor- correction factors for multi pass arrangement- effectiveness and number of transfer unit for parallel and counter flow heat exchanger- introduction of heat pipe and compact heat exchanger

OUTCOMES:
- Understand basic concept of heat transfer
- Able to do basic calculations involving heat transfer as is typical for a mechanical engineer. This includes conduction, convection and radiation heat transfer as well as heat exchanger design.
- Apply scientific and engineering principles to analyze and design aspects of engineering systems that relate to conduction, convection and radiation heat transfer.

TEXT BOOKS:

REFERENCES:
OBJECTIVE

- To train the students so that students will be able to design experimental designs and use these concepts for research design.

UNIT I PROBABILITY THEORY
Random variables – probability density and distribution functions - moment generating and characteristic functions – Binomial, Poisson, Normal distributions and their applications.

UNIT II SAMPLING THEORY
Sampling distributions – Standard error – t, F, Chi square distributions – applications.

UNIT III ESTIMATION THEORY
Interval estimation for population mean, standard deviation, difference in means, difference in proportions, ratio of standard deviations – point estimation.

UNIT IV TESTING OF HYPOTHESIS
Hypothesis testing – Small samples – Tests concerning proportion, means, standard deviations – Tests based on chi square.

UNIT V ANOVA
One, two factor models – Design of experiments, MANOVA.

TOTAL: 45 PERIODS

OUTCOME:

- The students are taught the basic concepts of probability and statistics and their application in industrial problems.

TEXT BOOKS:

REFERENCES:

OBJECTIVES

- To analyze manufacturing processes with intent to point out areas of adverse environmental impact and how this impact could be minimized or prevented.
- To incorporating the environmentally based improvements such as recycling, substitution of environmentally favorable materials and redesign of processes.
- To design the rules and processes to meet the current market need and the green manufacturing requirements by selecting and evaluating suitable technical and supply chain management schemes.

UNIT I ENVIRONMENTAL SUSTAINABILITY AND IMPACT ASSESSMENT
Environmental impact assessment objectives – Legislative development – European community directive – Hungarian directive. Strategic environmental assessment and sustainability appraisal. Regional spatial planning and environmental policy.
UNIT II LEAN MANUFACTURING AND GREEN ENERGY SYSTEM 9


UNIT III ENERGY SAVING MACHINERY AND COMPONENTS 9


UNIT IV HAZARDOUS AND SOLID WASTE MANAGEMENT 9


UNIT V SUSTAINABILITY PRACTICE 9


TOTAL: 45 PERIODS

OUTCOMES

- The students will be able to analyze manufacturing processes towards minimization or prevention of environmental impacts.
- The students will be in a position to apply suitable schemes towards design of green manufacturing requirements.
- As a whole, students will be in a position adopt recycle, reduce and reuse techniques.

TEXT BOOKS:


REFERENCES:


PR7005 DESIGN OF CASTING AND WELDMENTS L T P C 3 0 0 3

OBJECTIVE:

- To impart knowledge to the students about the design principles of casting and welding.
UNIT I MELTING AND POURING  

UNIT II CASTING DESIGN  
Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner, gate and risers-problems in design and manufacture of thin and unequal sections - design for directional solidification, minimum distortion and for overall economy - design problems of L,T,V,X and Y junctions.

UNIT III WELD DESIGN  
Design of welded components-symbolic representation of welds on drawings- residual stresses in welds-weld distortions-design consideration-strength consideration of welded joints-analysis of statistically loaded welded joints-welded structures subjected to fatigue loads

UNIT IV PHYSICAL METALLURGY OF WELDING  
Welding of ferrous materials: Formation of different micro structural zones in welding of carbon steels. Welding of C-Mn and low-alloy steels, phase transformations in weld and heat - affected zones, cold cracking, role of hydrogen and carbon equivalent, formation of acicular ferrite and effect on weld metal toughness.

UNIT V AUTOMATION  
Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry — Computer aided design of casting and Automation in welding – robot welding – safety norms.

TOTAL: 45 PERIODS

OUTCOME:
• The students will become capable to employ the design principles of castings and weldments in the industries.

TEXT BOOKS:

REFERENCES:

PR 7006 DESIGN OF JIGS, FIXTURES AND DIES L T P C
3 0 0 3

OBJECTIVES:
• To introduce the concepts of various types of jigs, fixtures and dies.
• To design jig / fixture/ die for a given component.

UNIT I LOCATION AND CLAMPING DEVICES IN JIGS AND FIXUTRES  
UNIT II  DESIGN OF JIGS AND FIXTURES  9
Design concepts of Template Jig, Plate Jig, Sandwich Jig, Vice Jaw Jig, Latch Jig, Turnover Jig, Box Jig – Design of Jigs, Fixtures for Milling, Grinding, Turning, Welding, and Assembly – Modular fixtures.

UNIT III  CONCEPTS OF DIES AND ITS ELEMENTS  9

UNIT IV  DESIGN OF DIES  9
Design of Blanking, Piercing, lancing, notching and bending dies, Design features of dies for drawing, extrusion, wire drawing and forging, Design of Progressive die – compound die – combination die-die- Bending and drawing dies

UNIT V  CASE STUDIES IN JIGS, FIXTURES AND DIES  9
Drill Jigs – Milling fixtures- Progressive die – compound die –combination die- Bending and drawing dies

OUTCOMES:
- Elements of various work holding devices and dies are learnt by the students.
- Process for designing dies, jigs and fixtures are taught.

TEXT BOOKS:

REFERENCES:

PR7007  GREEN ELECTRONICS MANUFACTURING  L T P C
3 0 0 3

OBJECTIVE:
- This course aims to provide students with knowledge on the theories, eco-design concepts, methods, and relevant hands-on experience for designing a range of sustainable green electronic products. It is expected that students will develop their ability to address relevant issues on environmental impact; product design, operating life, and the 3R concept (reduce, reuse, and recycle).

UNIT I  INTRODUCTION TO GREEN ELECTRONICS  9
Environmental concerns of the modern society- Overview of electronics industry and their relevant regulations in China, European Union and other key countries- global and regional strategy and policy on green electronics industry. Restriction of Hazardous substances (RoHS) - Waste Electrical and electronic equipment (WEEE - Energy using Product (EuP) and Registration - Evaluation, Authorization and Restriction of Chemical substances (REACH).
UNIT II  GREEN ELECTRONICS MATERIALS AND PRODUCTS
Introduction to green electronic materials and products - Lead (Pb) free solder pastes, conductive adhesives, halogen-free substrates and components. Substitution of non-recyclable thermosetting polymer based composites with recyclable materials X-Ray Fluorescence (XRF) for identifying hazardous substances in electronic products.

UNIT III  GREEN ELECTRONICS ASSEMBLY AND RECYCLING
Various processes in assembling electronics components - the life-cycle environmental impacts of the materials used in the processes - substrate interconnects . Components and process equipments used. Technology and management on e-waste recycle system construction, global collaboration, and product disassembles technology.

UNIT IV  PRODUCT DESIGN AND SUSTAINABLE ECO-DESIGN
Stages of product development process in green design: Materials - Manufacturing - Packaging and use - End of Life and disposal - Design for recycling - Life Cycle Assessment (LCA), and Eco-design tools - Environmental management systems, and International standards - Eco-design in electronics industry.

UNIT V  CASE STUDIES

OUTCOME:
- An outline of the regulations on electronics in key countries is provided.
- A detailed study of electronic materials, their assembly and recycling is taught.

TEXT BOOKS:

REFERENCES:

PR7008  LEAN MANUFACTURING
OBJECTIVES:
- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.

UNIT I  INTRODUCTION TO LEAN MANUFACTURING
UNIT II    CELLULAR MANUFACTURING, JIT and TPM
Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT III    SET UP TIME REDUCTION, TQM, 5S and VSM
Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles, EOQ, EPQ.

UNIT IV    SIX SIGMA
Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation

UNIT V    CASE STUDIES
Various case studies of implementation of lean manufacturing at industries.

OUTCOMES:
- The various aspects of lean manufacturing are taught.
- Six sigma and some case studies are taught to the students.

TEXT BOOKS:

REFERENCES:

PR7009    MICRO ELECTRO MECHANICAL SYSTEMS AND NANO TECHNOLOGY
L T P C
3 0 0 3

OBJECTIVE:
- To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be aware of micro actuators.

UNIT I    MATERIALS FOR MEMS AND MINIATURISATION

UNIT II    FABRICATION PROCESSES
UNIT III  MICROSYSTEM – WORKING PRINCIPLE AND PACKAGING

UNIT IV  MICROSYSTEMS DESIGN

UNIT V  NANO TECHNOLOGY
Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process – nano positioning systems.

TOTAL: 45 PERIODS

OUTCOMES:
- Advantages of miniaturization, top-down micro-manufacturing techniques like lithography are taught.
- Design of micro-electromechanical systems is learnt by the students.

TEXT BOOKS:

REFERENCES:
 and smart systems”, Wiley India Pvt. Ltd., New Delhi, 2010
 Structure”, Theory, Modeling and Simulations, Prentice-Hall of India (P) Ltd., New
 Delhi, 2007.
OBJECTIVE:
- To introduce the various types of micromachining processes and their applications.

UNIT I  INTRODUCTION
Introduction to micromachining process – Classification of micromachining and nanomachining processes – Molecular dynamics (MD), principle of molecular dynamics simulation potential energy function – Boundary condition – MD simulation procedure.

UNIT II  MICROFABRICATION METHODS
Methods of microfabrication — Electro deposition, Chemical vapour deposition, Physical vapour deposition – Electro Chemical spark deposition – LIGA (Lithographie, Galvanof ormung, Abformung) process.

UNIT III  MECHANICAL MICROMACHINING
Ultrasonic machining – Abrasive jet machining – Abrasive water jet machining, water jet machining – Beam energy micromachining – Electron beam machining, electro discharge machining, ion beam machining, focused ion beam machining.

UNIT IV  MICROMACHINING AND NANO FUNCTIONING WITH ABRASIVE FLOW

UNIT V  HYBRID MICRO MACHINING
Chemical Mechanical polishing – Electro chemical spark micro machining – Electro discharge grinding – Electrolytic in process dressing – Application.

TOTAL: 45 PERIODS

OUTCOME:
- Various modern micromachining and fabrication methods are learnt by the students.

TEXT BOOKS:

REFERENCES:

OBJECTIVE:
- The objective of this course is to familiarize the students about the contemporary manufacturing techniques being employed widely in industries.
UNIT I  LEAN MANUFACTURING

UNIT II  AGILE MANUFACTURING
The Agile Production Paradigm – Agile Manufacturing Vs Mass Manufacturing - Agile practices for product development - Manufacturing agile practices - Implementing new technology - A checklist, technology applications that enhance agility - agile technology make or buy decisions. - Costing for Agile Manufacturing practices - Creating the learning factory: Imperative for success, factory becoming a learning factory, building a road map for becoming a learning factory

UNIT III  GREEN MANUFACTURING

UNIT IV  ADDITIVE MANUFACTURING

UNIT V  INTELLIGENT MANUFACTURING

OUTCOME:
- The students are taught the five modern manufacturing techniques that will equip them in understanding process of manufacturing in day today industries.

TEXT BOOKS

REFERENCES
PR7012  MODERN PRODUCTION TECHNIQUES  L T P C  3 0 0 3

OBJECTIVE:

- To introduce the modern production techniques and their applications.

UNIT I  RAPID PROTOTYPING AND RAPID TOOLING  9
Introduction-need Development of Rapid Prototyping (RP) systems-RP process chain –
Stereolithography -Fused Deposition Modeling- Laminated Object Manufacturing – 3 D Printing –
Tooling – Classification – Fabrication processes –Applications.

UNIT II  ADVANCED CASTING AND WELDING PROCESSES  9
Stir Casting – Squeeze casting –process parameters -advantages-disadvantages – applications -
Application of Ultrasonic Cavitations in Stir casting and Squeeze casting to produce metal matrix
nanocomposites - Friction stir welding – Under water welding – Explosive welding – Metallizing –
Hard facing – Spray welding - process parameters-advantages-disadvantages-applications.

UNIT III  POWDER METALLURGY  9
Conventional methods and modern methods of metal powder manufacture - Blending techniques -
Powder characterization -Powder compaction - Mechanical, thermal and thermo-mechanical
compacting processes - Sintering mechanisms - Types of sintering furnaces -Manufacturing and
application of powder metallurgy components - Bearings, Metallic filters, Magnets and Friction
materials.

UNIT IV  MANUFACTURING SUPPORT SYSTEMS  9
Advanced Manufacturing Planning -Aggregate Production Planning and the Master Production
Schedule – Material Requirements Planning I - Material Requirements Planning II - Enterprise
Resource Planning - Capacity Planning - Inventory Control.

UNIT V  QUALITY MANAGEMENT  9
Software Quality Management – Metrics used for Software Quality Management – Capability
Maturity Model Integration (CMII) – Case studies - Six Sigma – Concepts and Implementation –
Case studies –Service Quality Management – Case studies.

TOTAL:45 PERIODS

OUTCOMES:

- The students are familiarized with the recent advances in production techniques.
- The students acquire the ability to apply the modern production techniques in industries.

TEXTBOOKS:


REFERENCES:

PR 7013 NON DESTRUCTIVE TESTING METHODS L T P C 3 0 0 3

OBJECTIVES:
- To understand principle behind various NDT techniques.
- To learn working procedures of various NDT techniques.

UNIT I NON-DESTRUCTIVE TESTING: AN INTRODUCTION 9
Introduction to various non-destructive methods – Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.

UNIT II LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING 9
Physical principles, procedure for penetrant testing, Pentrant testing materials, Penetrant testing methods – Applications Principle of MPT, Magnetising technical and procedure used for testing a component, Equipment used for MPT, Applications

UNIT III EDDY CURRENT TESTING AND ACOUSTIC EMISSION TESTING 9

UNIT IV ULTRASONIC TESTING 9
Principle, Ultrasonic transducers, Inspection Methods – Normal incident pulse-echo Inspection, through – transmission testing, angle Beam Pulse-echo testing, Techniques A-Scan, B-Scan , C-Scan – Applications.

UNIT V RADIOGRAPHY, COMPARISON AND SELECTION OF NDT METHODS 9
Basic principle, Effect of radiation of Film, Radiographic Imaging – Inspection Techniques – Single wall single image, Double wall Penetration and Multiwall Penetration technique – Comparison and selection of various NDT techniques.

TOTAL: 45 PERIODS

OUTCOME:
- NDT techniques widely used in industries are learnt by the students.

TEXT BOOKS:

REFERENCES:

PR7014 PROCESSING OF PLASTICS AND POLYMERS L T P C 3 0 0 3

OBJECTIVE
- To expose the students to the basics of plastics and polymers processing

UNIT I INTRODUCTION TO PLASTICS 9
UNIT II INTRODUCTION TO POLYMERS
Chemistry and Classification of Polymers – Glass transition temperature, thermal expansion and its effects, molecular weight, stress strain behaviour. Types of polymers - plastics and rubbers. Applications of various types of polymers.

UNIT III PROCESSING OF PLASTICS AND POLYMERS

UNIT IV POLYMER MIXING AND BLENDING

UNIT V POLYMER TESTING
Mechanical-static and dynamic: tensile, flexural, compressive, abrasion, endurance, fatigue, hardness, tear, resilience, impact, toughness. Conductivity-thermal and electrical, dielectric constant, dissipation factor, power factor, electric resistance, Surface resistivity, volume resistivity, swelling, ageing resistance, environmental stress, Cracking resistance.

TOTAL: 45 PERIODS

OUTCOME:
- Knowledge of uses and techniques of plastics and polymer processing are well known to the students.

TEXT BOOKS:

REFERENCES:

PR7015 PRODUCTION OF COMPOSITES L T P C
3 0 0 3

OBJECTIVE
- To enlighten the students about the various composite production methods

UNIT I INTRODUCTION TO COMPOSITES
UNIT II  INTRODUCTION TO FIBRES AND COMPOSITE MATERIALS

UNIT III  POLYMER MATRIX COMPOSITES
Open mould process, bag moulding, Hand layup and spray up techniques filament winding, compression and transfer moulding, BMC and SMC – pultrusion – centrifugal casting – injection moulding – structure, properties and application of PMC's – Carbon Matrix Composites – Interfaces – Properties – recycling of PMC.

UNIT IV  METAL MATRIX COMPOSITES

UNIT V  CERAMIC MATRIX COMPOSITES

OUTCOME:
• Knowledge about various composites Processing Techniques are well known to the students.

TEXT BOOKS:

REFERENCES:

PR7016  PURCHASING AND MATERIALS MANAGEMENT
OBJECTIVE:
• To introduce the various aspects of Purchasing And Materials Management and other practice.
UNIT I     FUNCTIONS OF MATERIALS MANAGEMENT  9
Introduction to materials management – objectives – organization – Functions operating cycle – value analysis – make or buy decisions.

UNIT II    PURCHASING MANAGEMENT  9

UNIT III  STORES MANAGEMENT  9

UNIT IV  INVENTORY MANAGEMENT  9

UNIT V    QUANTITATIVE TECHNIQUES IN MATERIAL MANAGEMENT  9

TOTAL: 45 PERIODS

OUTCOME:
- Students are taught various aspects of materials purchasing and management

TEXT BOOKS:

REFERENCES:

PR7017  SELECTION OF MATERIALS  L T P C
3  0  0  3

OBJECTIVE:
- By considering various constraints like material chart, process attributes, Material cost, recyclability, materials are selected for the engineering components.

UNIT I  MATERIALS AND PROPERTIES  9

UNIT II  FACTORS IN SELECTION PROCESS  9
Design process - types of design, design requirements, function, Material attributes. Shape and Manufacturing processes - Materials processing and design processes and their influence on design, Process attributes, Systematic process selection, Process selection diagrams, Process cost, Energy consumption for production, Material costs, availability and recyclability, Environmental consideration.
UNIT III  MATERIALS SELECTION PROCESS  9
Materials selection methods: Screening, Ranking - weighted ranking, Performance indices - Materials selection charts, Deriving property limits and material indices, Structural indices. Shape factors, Efficiency of standard sections, Material limits for shape factors, Material indices which include shape-microscopic or micro structural shape factor, Co-selecting material and shape.

UNIT IV  ALTERNATE MATERIALS  9
Environmental design, Economics and environmental impact of materials, Hybrid materials: composites, sandwich structure, lattices and segmented structure, applications of hybrid materials, polymer foams.

UNIT V  CASE STUDIES  9
Automobile materials (Body and Crank shaft), Marine structural materials (Hull and Propeller), Aircraft structural materials (Wings and landing gears), Materials for space (Gas turbines and Nose), Materials for power generation machinery (Boilers and Pressure vessels), Materials for medical applications (Surgical knives and Bone replacements), Chemical and petrochemical industries (Acid storage tanks and Fuel carrying pipes).

TOTAL: 45 PERIODS

OUTCOME:
- The students will get familiarized with basic materials science and how to select engineering materials for various applications.

TEXT BOOKS:

REFERENCES:

PR7018  SUPPLY CHAIN MANAGEMENT  L T P C
3 0 0 3

OBJECTIVE:
- To teach the basic principles of supply chains and associated logistics management

UNIT I  INTRODUCTION  9

UNIT II  SUPPLY CHAIN NETWORK DESIGN  9
UNIT III LOGISTICS IN SUPPLY CHAIN
Role of transportation in supply chain – factors affecting transportation decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation.

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY
The role IT in supply chain – The supply chain IT framework Customer Relationship Management – Internal supply chain management – Supplier relationship management – Future of IT in supply chain – E-Business in supply chain.

TOTAL:45 PERIODS

OUTCOME:
- The student would understand the framework and scope of supply chain networks and functions.

TEXT BOOKS:

REFERENCES:

PR7019 TOTAL QUALITY MANAGEMENT: PRINCIPLES AND APPLICATIONS

OBJECTIVES
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I
UNIT IV            TQM TOOLS & TECHNIQUES II

UNIT V            QUALITY SYSTEMS

TOTAL : 45 PERIODS

OUTCOME:
• The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

REFERENCES:

PR7020        UNCONVENTIONAL MACHINING PROCESSES L T P C
3 0 0 3

OBJECTIVE:
• To impart knowledge to the students about various non-traditional machining processes.

UNIT I        MECHANICAL ENERGY BASED PROCESSES

UNIT II        CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES

UNIT III        ELECTRICAL ENERGY BASED PROCESSES
UNIT IV  THERMAL ENERGY BASED PROCESSES
Laser Beam machining (LBM) - Plasma Arc machining (PAM) - Electron Beam Machining (EBM) - Ion Beam Machining (IBM) - Principle – Parameters – Equipment – Types– MRR -Applications.

UNIT V  HYBRID MACHINING
Abrasive based hybrid machining processes - Thermal based hybrid machining processes - Electro based hybrid machining processes – Vibration assisted EDM - Vibration assisted ECM.

OUTCOME:
- The students will be in a position to select and employ an appropriate unconventional machining process for a specific application in industries.

TEXT BOOKS:

REFERENCES:

PR7022  MINI PROJECT
OBJECTIVES
- The students are encouraged to put forth their design ideas in their respective fields.
1. The students in batches (not exceeding three in a batch) have to take up a project in the area of Production engineering.
2. Each batch is guided by a faculty member. The students have to select a suitable problem/design, prepare the drawings, produce the components, assemble and commission the project/develop a software with analysis.
3. The students have to prepare and present a detailed project report at the end of the VIII Semester.
4. The evaluation will be made for the continuous internal assessment for the Project by a committee nominated by the Head of the Department.

OUTCOME:
- The students have articulated their designs for industrial applications.
OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT

UNIT II  REQUIREMENTS AND SYSTEM DESIGN

UNIT III  DESIGN AND TESTING

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:

GE7072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
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