VISION OF THE DEPARTMENT
To develop disciplined, socially committed and technically competent Production Engineers with Creativity, Comprehension and Managerial skills to design and manufacture innovative cost effective quality products for the benefit of mankind.

MISSION OF THE DEPARTMENT

1. Train the students who will be able to design and manufacture Innovative, Environment Friendly, Ergonomic and Cost Effective Quality Products and Services.
2. Improve the technical quality of the students to meet the challenges, competitions and opportunities in production engineering.
3. Prepare the students who will be able to solve socially relevant engineering problems and other complex problems by means of inculcating Managerial Skills.
4. Enhance the department industry / research centre interaction by means of training, internship and student projects to solve industrial problems.

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

1. Graduate will demonstrate strong basics in mathematics, science and engineering which serve as the foundation for the Programme.
2. Graduate will demonstrate the ability to design and conduct experiments, as well as to analyse and interpret data in the spheres of fundamental engineering.
3. 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.
4. Graduate will become familiar with modern engineering tools and analyse the problems within the domains of Production Technology as the members of multidisciplinary teams.
5. Graduate will acquire the capability to identify, formulate and solve engineering problems related to production engineering.
6. Graduate will demonstrate an understanding of professional and ethical responsibility with reference to their career in the field of production engineering.
7. Graduate will be able to communicate effectively both in verbal and non verbal forms.
8. Graduate will be trained towards developing and understanding the impact of development of Production Technology on global, economic, environmental and societal context.
9. Graduate will be capable of understanding the value for life-long learning.
10. Graduate will demonstrate knowledge of contemporary issues pertaining to the health and well being of desirable living forms inhabiting the environment.
11. Graduate will demonstrate the ability to use the techniques, skills and modern engineering tools necessary for engineering practice in the field of Production Engineering.
12. Graduate will be able to design and develop innovative/ manufacture/ marketable/ environmental friendly products useful to the nation and the society.
**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

By completion of Production Engineering, the graduates will have following Program specific outcomes:

1. Knowledge on Production system: Familiarization of basic and advanced systems and practices.
2. Knowledge on design, analysis and development of Production processes, automation and quality systems.
3. Foundation of continuous improvement: Knowledge on application of appropriated materials, production processes and production system and development of an optimal solution to achieve continuous improvement to cater the needs of industry and society.

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### MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

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# ANNA UNIVERSITY, CHENNAI
# UNIVERSITY DEPARTMENTS
# B.E. PRODUCTION ENGINEERING
# REGULATION-2019
# CHOICE BASED CREDIT SYSTEM
# CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS

## SEMESTER I

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* the students will undergo industrial training / Internship during previous vacation
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**TOTAL CREDITS : 167**
### Humanities and Social Sciences Including Management Courses (HSMC)

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AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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PROFESSIONAL ELECTIVE COURSES

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### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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### UG : Production Engineering

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OBJECTIVES:
The first semester English course entitled ‘Technical English’ aims to,
- Familiarise first year students of engineering and technology with the fundamental aspects of technical English.
- Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.
- Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I  INTRODUCING ONESELF  12
Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – Speaking: Introducing oneself – introducing friend/ family - Reading: Descriptive passages (from newspapers / magazines)- Writing: Writing a paragraph (native place, school life)- Grammar: Simple present, present continuous – Vocabulary Development: One word substitution

UNIT II  DIALOGUE WRITING  12
Listening: Listening to conversations (asking for and giving directions) – Speaking: making conversation using (asking for directions, making an enquiry), Role plays-dialogues- Reading: Reading a print interview and answering comprehension questions-Writing: Writing a checklist, Dialogue writing- Grammar: Simple past – question formation (Wh- questions, Yes or No questions, Tag questions)- Vocabulary Development: Stress shift, lexical items related to the theme of the given unit.

UNIT III  FORMAL LETTER WRITING  12
Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)- Speaking: Giving short talks on a given topic- Reading: Reading motivational essays on famous engineers and technologists (answering open-ended and closed questions)- Writing: Writing formal letters/ emails (Complaint letters)- Grammar: Future Tense forms of verbs, subject and verb agreement-Vocabulary Development: Collocations – Fixed expressions

UNIT IV  WRITING COMPLAINT LETTERS  12

UNIT V  WRITING DEFINITIONS AND PRODUCT DESCRIPTION  12
Listening: Listening to a product description (labeling and gap filling) exercises- Speaking: Describing a product and comparing and contrasting it with other products- Reading: Reading graphical material for comparison (advertisements)- Writing: Writing Definitions (short and long) – compare and contrast paragraphs- Grammar: Adjectives – Degrees of comparison - compound nouns- Vocabulary Development: Use of discourse markers – suffixes (adjectival endings).

LEARNING OUTCOMES
At the end of the course the students will have gained,
- Exposure to basic aspects of technical English.
- The confidence to communicate effectively in various academic situations.
- Learnt the use of basic features of Technical English.
TEXT BOOK:

ASSESSMENT PATTERN

- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5158    ENGINEERING MATHEMATICS – I
(Effective to all branches of B.E. / B.Tech. Programmes in I Semester)

COURSE OBJECTIVES:
- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I     MATRICES

UNIT II    DIFFERENTIAL CALCULUS

UNIT III   FUNCTIONS OF SEVERAL VARIABLES

UNIT IV    INTEGRAL CALCULUS
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 V     MULTIPLE INTEGRALS

TOTAL : 60 PERIODS
COURSE OUTCOMES:
At the end of the course the students will be able to
- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:

REFERENCES:

PH5151 ENGINEERING PHYSICS
(2023-24) (Common to all branches of B.E / B.Tech programmes)

COURSE OBJECTIVES:
- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS
9

UNIT II ELECTROMAGNETIC WAVES
9
Gauss’s law – Faraday’s law - Ampere’s law - The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.
UNIT III OSCILLATIONS, OPTICS AND LASERS


UNIT IV BASIC QUANTUM MECHANICS

- Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS

- The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch’s theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

COURSE OUTCOMES:
After completion of this course, the students should able to
- Understanding the importance of mechanics.
- Express the knowledge of electromagnetic waves.
- Know the basics of oscillations, optics and lasers.
- Understanding the importance of quantum physics.
- Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

REFERENCES

CY5151 ENGINEERING CHEMISTRY L T P C 3 0 0 3
(COMMON TO ALL BRANCHES)

COURSE OBJECTIVES:
- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photo processes and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.
UNIT I  POLYMER CHEMISTRY

UNIT II  NANO CHEMISTRY

UNIT III  PHOTO CHEMISTRY AND SPECTROSCOPY

UNIT IV  ENERGY CONVERSIONS AND STORAGE
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H2-O2 and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V  WATER TECHNOLOGY

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
- To demonstrate the knowledge of water and their quality in using at different industries.
TEXT BOOKS:

REFERENCES:

GE5151 ENGINEERING GRAPHICS L T P C 1 0 4 3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

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 different methods – 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 15
Orthographic projection- principles-Principle 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 15
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 SURFACES 15
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

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)

Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60)=75 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:
1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

REFERENCES:

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.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

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PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:
- 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 and band gap determination.

LIST OF EXPERIMENTS:
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. Photoelectric effect
14. Michelson Interferometer.
16. Melde’s string experiment

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students will be able
- 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)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:
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. Phase change in a solid.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques.
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques.
- To design and analyse the kinetics of reactions and corrosion of metals.

TEXT BOOKS:

GE5162 WORKSHOP PRACTICES LABORATORY
(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 4 2

COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.
WOOD WORK:
  a) Sawing,
  b) Planing and
  c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
  a) Studying joints in door panels and wooden furniture
  b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

WIRING WORK:
  a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
  b) Wiring Stair case light.
  c) Wiring tube – light.
  d) Preparing wiring diagrams for a given situation.

Wiring Study:
  a) Studying an Iron-Box wiring.
  b) Studying a Fan Regulator wiring.
  c) Studying an Emergency Lamp wiring.

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:
  a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
  b) Practicing gas welding.

BASIC MACHINING WORK:
  a) (simple)Turning.
  b) (simple)Drilling.
  c) (simple)Tapping.

ASSEMBLY WORK:
  a) Assembling a centrifugal pump.
  b) Assembling a household mixer.
  c) Assembling an air conditioner.

SHEET METAL WORK:
  a) Making of a square tray

FOUNDRY WORK:
  a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:
  a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
  a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
  a) Studying a FM radio.
  b) Studying an electronic telephone.

TOTAL (P: 60) = 60 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

1. Draw pipeline plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

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HS5251 PROFESSIONAL COMMUNICATION

COURSE OBJECTIVES
The course entitles ‘Professional Communication’ aims to,

- Improve the relevant language skills necessary for professional communication.
- Develop linguistic and strategic competence in workplace context.
- Enhance language proficiency and thereby the employability of budding engineers and technologists.

UNIT I TECHNICAL COMMUNICATION
Listening: Listening to telephone conversations (intent of the speaker and note taking exercises)- Speaking: Role play exercises based on workplace contexts, introducing oneself- Reading: Reading the interview of an achiever and completing exercises (skimming, scanning and predicting)- Writing: Writing a short biography of an achiever based on given hints- Grammar: Asking and answering questions, punctuation in writing, prepositional phrases- Vocabulary Development: use of adjectives.

UNIT II SUMMARY WRITING
Listening: Listening to talks/lectures both general and technical and summarizing the main points- Speaking: Participating in debates- Reading: Reading technical essays/articles and answering comprehension questions- Writing: Summary writing- Grammar: Participle forms, relative clauses- Vocabulary Development: Use of compound words, abbreviations and acronyms.

UNIT III PROCESS DESCRIPTION
Listening: Listening to a process description and drawing a flowchart- Speaking: Participating in Group Discussions, giving instructions- Reading: Reading instruction manuals- Writing: Writing process descriptions- Writing instructions- Grammar: Use of imperatives, active and passive voice, sequence words- Vocabulary Development: Technical jargon
UNIT IV REPORT WRITING
Listening: Listening to a presentation and completing gap-filling exercises - Speaking: Making formal presentations - Reading: Reading and interpreting charts/tables and diagrams - Writing: Interpreting charts/tables and diagrams, writing a report - Grammar: Direct into indirect speech, use of phrases - Vocabulary Development: reporting words

UNIT V WRITING JOB APPLICATIONS
Listening: Listening to a job interview and completing gap-filling exercises - Speaking: Mock interview, telephone interviews - Reading: Reading a job interview, SOP, company profile and completing comprehension exercises - Writing: job applications and resumes and SOPs - Grammar: Present perfect and continuous tenses - Vocabulary Development: Technical vocabulary.

TOTAL : 45 PERIODS

LEARNING OUTCOMES
At the end of the second semester the learners should be able to,

- Read and comprehend technical texts effortlessly.
- Write reports of a technical kind.
- Speak with confidence in interviews and thereby gain employability

TEXT BOOK

ASSESSMENT PATTERN
- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5252 ENGINEERING MATHEMATICS – II
(Common to all branches of B.E. / B.Tech. Programmes in II Semester)

COURSE OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students 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 VECTOR CALCULUS

UNIT II ANALYTIC FUNCTION
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation \( w = c + z, \quad az, \quad 1/z, \quad z^2 \).
UNIT III  COMPLEX INTEGRATION  12

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

UNIT V  LAPLACE TRANSFORMS  12

TOTAL : 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:
- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
- Construct analytic functions and use their conformal mapping property in application problems.
- Evaluate real and complex integrals using the Cauchy’s integral formula and residue theorem.
- Apply various methods of solving differential equation which arise in many application problems.
- Apply Laplace transform methods for solving linear differential equations.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING


SUGGESTED ACTIVITIES:

- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

SUGGESTED EVALUATION METHODS:

- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS


SUGGESTED ACTIVITIES:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Group discussion on external learning.

UNIT III SIMPLE DATA STRUCTURES IN PYTHON

SUGGESTED ACTIVITIES:
- Implementing python program using lists, tuples, sets for the following scenario:
  Simple sorting techniques
  Student Examination Report
  Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV STRINGS, DICTIONARIES, MODULES 10

SUGGESTED ACTIVITIES:
- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student’s choice) and importing into the application.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.

UNIT V FILE HANDLING AND EXCEPTION HANDLING 7
Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

SUGGESTED ACTIVITIES:
- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.
TEXT BOOKS:

REFERENCES:

EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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COURSE OBJECTIVES:
- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS

UNIT III ELECTRICAL MACHINES

UNIT IV BASICS OF ELECTRONICS
Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES
Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
CO1 To be able to understand the concepts related with electrical circuits and wiring.
CO2 To be able to study the different three phase connections and the concepts of magnetic circuits.
CO3 Capable of understanding the operating principle of AC and DC machines.
CO4 To be able to understand the working principle of electronic devices such as diode and zener diode.
CO5 To be able to understand the characteristics and working of current controlled and voltage controlled devices.

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TEXT BOOKS:

REFERENCES:

GE5152 ENGINEERING MECHANICS

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES (9+3)
UNIT II  EQUILIBRIUM OF RIGID BODIES  

UNIT III  DISTRIBUTED FORCES  
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre 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  

UNIT V  DYNAMICS OF PARTICLES  

TOTAL  (L: 45  +  T: 15)=60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

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PH5251 MATERIALS SCIENCE
(Common to Mechanical, Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering & Rubber and Plastics Technology)

COURSE OBJECTIVES:
- To make the students to understand the basics of crystallography and crystal imperfections.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement.
- To impart knowledge on the basics of phase diagrams and their applications.
- To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

UNIT I CRYSTALLOGRAPHY

UNIT II MECHANICAL PROPERTIES

UNIT III PHASE DIAGRAMS
Basic concepts - Gibbs phase rule – Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) – determination of phase composition and phase amounts – tie line and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) – eutectoid and peritectic reactions - other invariant reactions – micro structural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT IV FERROUS AND NONFERROUS ALLOYS

COURSE OUTCOMES:
Upon completion of this course, the students will
- Understand the basics of crystallography and its importance in materials properties
- Understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
- Gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
- Understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
- Get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

REFERENCES

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

COURSE OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To articulate where computing strategies support in providing Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:
1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 45 PERIODS

TOTAL: 60 PERIODS
COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

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EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

COURSE OBJECTIVES
1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

LIST OF EXPERIMENTS
1. Verification of Kirchhoff's Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

COURSE OUTCOMES:
- To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
- Ability to perform speed characteristic of different electrical machines
- Ability to use logic gates and Flip flops
COURSE OBJECTIVES:

- To familiarize students about the concepts of inventory management.
- To introduce the students about Production Management Techniques such as work study, Plant location, Layout, Materials handling.
- To illustrate to the students about importance of financial management.
- To introduce Profit Planning and management as a concept to plan for profit.
- To familiarize the students, HR ad Marketing concepts and techniques.

UNIT I INVENTORY MANAGEMENT 11

UNIT II PRODUCTION MANAGEMENT 10

UNIT III FINANCIAL MANAGEMENT 10

UNIT IV PROFIT MANAGEMENT 6
Break Even Analysis – Profit planning – Angle of incidence – Margin of safety – Multi product break even analysis – Effect of variation in selling price, Fixed cost and Variable cost on break even quantity, angle of incidence and margin of safety.

UNIT V HUMAN RESOURCE MANAGEMENT AND MARKETING MANAGEMENT 8

COURSE OUTCOMES:
At the end of the course, students will be able to:
- CO1: Design a suitable inventory system for a given situation.
- CO2: Understand work study and develop Layout and materials handling system.
- CO3: Prepare financial statement such as balance sheet, income statement.
- CO4: Apply concepts of Break Even Analysis for profit planning.
- CO5: Develop marketing and HR skills.

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TEXT BOOKS:
REFERENCES:

MA5353 NUMERICAL METHODS

COURSE OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving Eigen value problems and linear system of equations.
- To apply the techniques of interpolation for equal and unequal intervals for the given data.
- To understand and to apply the techniques of numerical integration and differentiation for solving and ODE in applying day today life.
- To familiar in solving initial value problems and ODE for given initial and boundary conditions.
- To demonstrate the utility of Numerical techniques for solving Partial Differential Equations in Heat and Fluid problems.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS


UNIT II INTERPOLATION AND APPROXIMATION

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


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
Upon completion of this course, the students will be able to:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to the algebraic and transcendental equations.
- Apply numerical methods to obtain approximate solutions to mathematical problems using interpolation.
- 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 in solving ODE of First and Second order equations.
- Understand various numerical techniques for solving PDE, for given conditions in Heat flow and Wave problems.

TEXT BOOKS:

COURSE OBJECTIVES:
The objective of this course is

i. To know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
ii. To apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force- deformation, and stress-strain relationships to the solid and structural mechanics problems
iii. To analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
iv. To have physical insight into distribution of stresses and strains in structural members
v. To identify the biaxial stresses in acting in a body or an element.

UNIT I STRESS - STRAIN, AXIAL LOADING
Stress and strain, elastic limit, Hooke's law, factor of safety, shear stress, shear strain, relationship between elastic constants. Stresses in stepped bars, uniformly varying sections, composite bars due to axial force. Lateral strain, Poisson's ratio, volumetric strain, changes in dimensions and volume. Thermal stresses and impact loading.

UNIT II STRESSES IN BEAMS
Beam – Definition, types of end supports, types of beam, types of loading. Shear force diagram and bending moment diagram for cantilever, simply supported and overhanging beams under point load, UDL, UVL and moments. Euler beam theory - Bending equation, section modulus, Bending stress in beams – Shear stress in beams.

UNIT III DEFLECTION OF BEAMS AND COLUMNS

UNIT IV TORSION AND SPRINGS
Theory of torsion and assumptions - torsion equation, polar modulus, stresses in solid and hollow circular shafts, power transmitted by a shaft, shafts in series and parallel, deflection in shafts fixed at the both ends. Springs – types, Deflection expression for closed coiled helical spring – Stress in springs - design of springs.
UNIT V  BIAXIAL STRESS

Principal stresses, normal and tangential stresses, maximum shear stress - analytical and graphical method. Stresses in combined loading. Thin walled cylinder under internal pressure – changes in dimensions – volume. Spherical shells subjected to internal pressure – deformation in spherical shells – Lame’s theory.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students are expected to
i. Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
ii. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems
iii. Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
iv. Have physical insight into distribution of stresses and strains in structural members
v. Identify the biaxial stresses in acting in a body or an element.

TEXT BOOKS:

REFERENCES:

AU5351  THERMODYNAMICS AND THERMAL ENGINEERING  L T P C

COURSE OBJECTIVES:
i. To impart knowledge of basic principles of thermodynamics via real world engineering examples
ii. To analyse and evaluate cardinal air standard cycles
iii. To analyse and evaluate cardinal Steam power cycles
iv. Summarize the governing concepts of Refrigeration and Air conditioning
v. To introduce various modes of heat transfer, related to real time scenarios of thermodynamics applied in engineering practice

UNIT I  BASIC THERMODYNAMICS
UNIT II AIR STANDARD CYCLES AND COMPRESSORS
Cycle, Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Comparison of cycles, Efficiency versus compression ratio, For the same compression ratio and the same heat input 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
Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface 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 – Types of VCR system with respect to condition of vapour, Problems, 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

TOTAL: 45 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

COURSE OUTCOMES:

i. Will demonstrate understanding of the nature of the thermodynamic processes for pure substances of ideal gases
ii. Will interpret First Law of Thermodynamics and its application to systems and control volumes
iii. Will solve any flow specific problem in an engineering approach based on basic concepts and logic sequences.
iv. Will compare and contrast between various types of refrigeration cycles
v. Will get exposed to the basics and modes of heat transfer

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES: Of this course are
- To learn about the basic properties of fluids.
- To introduce the concept of incompressible and viscous flows.
- To have a thorough knowledge on dimensional analysis and model studies.
- To study the applications of conservation laws to flow through pipes and hydraulic machines.
- To learn the basics of water turbines, their classification and working principles.

UNIT I BASIC EQUATIONS
Definition of fluid, Newton’s law of viscosity, Units and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow, Bernoulli’s equation and its applications.

UNIT II INCOMPRESSIBLE VISCOUS FLOW
Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness – Darcy Weisbach equation, friction factor, Moody’s diagram.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES

UNIT IV PUMPS
Euler’s equation – Theory of Roto dynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps- Reciprocating pump–working principle.

UNIT V TURBINES
Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working principles – draft tube Specific speed, unit quantities, performance curves for turbines – governing of turbines.

TOTAL: 45 PERIODS

OUTCOMES: Upon completion of the course, Students will be able to
CO1: Exhibit the basic understanding on fluid properties and fluid statics.
CO2: Demonstrate the understanding in fluid kinematics and governing equations.
CO3: Use the governing equations for fluid flow problems and understand the elementary plane flows.
CO4: Analyse laminar and turbulent flow problems.
CO5: Acquire knowledge on the various types of fluid machines.

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TEXT BOOKS:
1. Ojha C.S.P, Berndtsson R and Chadramouli P. N., Oxford University Press, 2010
REFERENCES:

PR5311 COMPUTER AIDED DRAFTING AND MACHINING LABORATORY L T P C 0 0 4 2

COURSE 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
1. Any CAD software with 2D modeling to used by students for drafting exercises
2. Practice on Drafting Software using Measuring commands; Basic Draw Commands; Display Commands GRID, SNAP, CIRCLE, LINE, ARC LIMITS, ZOOM, PAN.
3. Practice on using Editing commands; Creating layers: CHANGE, ERASE, EXTEND, TRIM, GRIPS. Construction Commands; ARRAY, COPY, MIRROR, MOVE, OFFSET, FILLET, CHAMFER, OSNAP.
4. Placing lettering on a drawing; Crosshatching a drawing TEXT BHATCH.
5. 2D drafting of automobile components like engine crank shaft, connecting rod etc.,
6. 2D drafting of machine components.
7. 2D drafting of machine shop drawing.
8. 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

COURSE 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.

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PR5312 MATERIAL TESTING AND THERMAL ENGINEERING LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:
- To study the mechanical properties of materials when subjected to different types of loading.
- To study the performance characteristics of various engines
- To understand the working principle of IC engines
- To understand the modes of heat transfer
- To enable the students to apply the heat transfer knowledge to real applications.

MATERIAL TESTING
1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal beam (Rockwell, Vicker’s and Brinell Hardness Tests)
4. Compression test on helical spring
5. Deflection test on carriage spring
6. Impact test (Izod and Charpy)

THERMAL ENGINERRING LAB
1. Valve timing diagram
2. Port timing diagram
3. Performance test on four stroke diesel engine
4. Performance test on air compressor
5. Composite wall apparatus
6. Determination of convective heat transfer coefficient
7. Determination of thermal conductivity for pipe application.
8. Emissivity apparatus
9. Stefan Boltzmann apparatus
10. Pin fin apparatus

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to

CO1: Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
CO2: Understand the performance parameters of IC engines and their significance
CO3: Understand the importance of valve timing, and overlap on performance
CO4: Analyze the performance characteristics of the given engine.
CO5: Distinguish different modes of heat transfer.
HM5402 QUANTITATIVE TECHNIQUES IN MANAGEMENT  L T P C 3 0 0 3

COURSE OBJECTIVES:

- To familiarize the students with concepts of Linear Programming so that they can be used in industry.
- To introduce the replacement models to students so that optimal replacement policy on machine can be made.
- To enable the students to utilize the queuing models for application to waiting line problems.
- To stress on importance on forecasting and sequencing models and their use in industry.
- To familiarize project network and decision tree problems to students so that they can use them in project management.

UNIT I LINEAR PROGRAMMING 9

UNIT II REPLACEMENT MODELS AND GAME THEORY 9

UNIT III QUEUING MODELS AND SIMULATION 9

UNIT IV FORECASTING, SEQUENCING AND LINE BALANCING 9

UNIT V PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS 9
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:
To students will be able to
CO1: Use the simplex method to solve problems in industry
CO2: Identify a suitable replacement model so that replacement of equipments can be done optimally
CO3: Utilize the knowledge on queuing models for banking industry
CO4: Identify forecasting model for a specific industry
CO5: Identify a suitable project network technique for project management
TEXT BOOKS:

REFERENCES:

GE5251                      ENVIRONMENTAL SCIENCES                      L T P C
                                    3 0 0 3

COURSE OBJECTIVES:
• To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
• To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
• To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
• To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
• To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I                      ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY                      14
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 – bio geographical 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 renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 47 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


UNIT V  HUMAN POPULATION AND THE ENVIRONMENT


TOTAL: 45 PERIODS

COURSE OUTCOMES:

• To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

• To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.

• To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

• To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.

• To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.
TEXT BOOKS:

REFERENCES:

PR5401 FOUNDRY AND WELDING TECHNOLOGY

COURSE OBJECTIVES:
- To impart knowledge about principles/methods of casting with detail design of gating/riser system needed for casting, defects in cast objects and requirements for achieving better casting.
- To understand the basic principle, procedure and applications of various Foundry and Welding methods.
- To inculcate the principle, thermal and metallurgical aspects during solidification of metal and alloys.
- To study SMAW, GMAW, GTAW, Oxy-acetylene welding and resistance spot welding processes.
- To have a broad knowledge to design a casting and welding process and metallurgical and weld-ability aspects of different common engineering materials.

UNIT I CASTING PROCESSES

UNIT II SPECIAL CASTING PROCESSES

UNIT III METAL JOINING PROCESSES
UNIT IV  SPECIAL WELDING PROCESSES
Submerged arc welding – Flux Cored Arc Welding – Electro slag welding – friction welding –
welding of dissimilar materials – Friction stir welding – High frequency induction welding.

UNIT V  TESTING OF CASTINGS AND WELDMENTS
Causes and remedies for casting defects – welding defects – Destructive testing – Non Destructive
Testing (NDT) methods– Testing: Dye penetrant – magnetic particle – X-ray - Radiography -
ultrasonic - Case studies in testing of welded joints and castings.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the process of Pattern making, Moulding and core making
CO2: Analyze the thermal, metallurgical aspects during solidification in casting and welding and
their role on quality of cast or weld objects
CO3: Analyze the welding process behavior for common and newer welding techniques
CO4: Have generalized knowledge on various welding technology used in manufacturing.
CO5: Design the gating and riser system needed for casting and requirements to achieve defect
free casting.

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2002.
(2003).

PR5402  ENGINEERING MATERIALS
COURSE OBJECTIVES:
- To impart knowledge on the various microstructural features of metallic materials.
- To illustrate the role of heat treatment on microstructure and properties.
- To desire the various non ferrous alloys and their applications.
- To introduce the concepts of mechanical behaviour of the materials.
- To describe the properties and applications of polymers and ceramics.

UNIT I  MICROSTRUCTURAL DEVELOPMENT AND METALLOGRAPHY
Basics of Metallographic microscopy -sample preparation – resolution – contrast – Metallographic
microscope - quantitative techniques - Homogenous and Heterogeneous nucleation - grain growth-
directional solidification- cast and weld microstructure- ingot and continuous casting -
microstructures of Steels and Cast irons - spinodal decomposition - Pearlitic, bainitic and martensitic
transformations - Effect of alloying elements on steel ( Mn, Si, Cr, Ni, Mo, V, Ti and W) –
Specification and Standards, Properties and application -stainless and tool steels – 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  NON METALLIC MATERIALS

Polymers- Thermo, Thermoset Polymers, Co and mixed Polymers- Commodity Polymers, PE, PS,PVS PMMA, PC, PET, ABS- Engineering Polymers, PA, PPS, PI, PFE- Natural and Synthetic rubbers, Elastomers- Adhesives- Ceramics- Natural and Synthetic Ceramic- Feldspar, Corrundum, Garnet- WC, TC,Tic, Si3N4,Al2O3, CBN, PCD, Uses of abrasives and cutting tools.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to:

CO1: identify the microstructural features of ferrous materials.
CO2: relate the heat treatment, microstructure and properties.
CO3: understand the properties and uses of non ferrous alloys.
CO4: correlate the mechanical behaviour with the mechanisms of strengthening.
CO5: suggest suitable polymer and ceramic for a given application.

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COURSE OBJECTIVES:
- To provide students with fundamental knowledge and principles in material removal processes.
- To understand the fundamentals aspects of metal cutting principles by studying various machining processes.
- To study the constructional features and various operations related to milling, drilling and grinding.
- To know the factors influencing the processes and their applications.
- To recommend appropriate manufacturing process when provided a set of functional requirements and constraints.

UNIT I  LATHE

UNIT II  SHAPER, PLANER and SLOTTER

UNIT III  DRILLING

UNIT IV  MILLING

UNIT V  GRINDING

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Explain the features and applications of lathe, milling, drilling and grinding machines
CO2: Discuss the features and applications of reciprocating machine tools and like shaper, planer and slotting machine.
CO3: Explain the machine tool structures and machining economics.
CO4: Explain the working principles of various machines used in manufacturing.
CO5: Identify the appropriate production process and machines.

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REFERENCES:

PR5451 KINEMATICS AND DYNAMICS OF MACHINES L T P C
3 1 0 4

COURSE OBJECTIVES:
- To impart knowledge on various types of mechanisms and synthesis.
- To impart skills and analyze the position, velocity and acceleration of mechanisms.
- To understand the effects of friction in motion in transmission and machine components.
- To familiarize higher pairs like cams and gears.
- To study the undesirable effects of unbalances resulting from prescribed motions in mechanisms.

UNIT I MECHANISMS 9+3

UNIT II FRICTION 9+3
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  GEAR S AND CAMS  9+3

UNIT IV  VIBRATION  9+3

UNIT V  BALANCING  9+3
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.

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Apply the kinematics and dynamics of machinery in design and analysis of engineering problems.
CO2: Demonstrate the ability to synthesize and analysis mechanisms
CO3: Design and analyze cam and their motion.
CO4: Select the gears and gear trains for their applications.
CO5: Examine the concept of free, forced and damped vibrations.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To impart students with the knowledge of various machine tools and its operations
- To familiarize with the selection of suitable production process for the desired component.
- To train students into machining operations to enrich their practical skills.
- To inculcate team qualities and expose students to shop floor activities.
- To educate students about ethical, environmental and safety standards.

LIST OF EXPERIMENTS
1. Taper Turning and Eccentric Turning using lathe
2. External and Internal Thread cutting using lathe
3. Knurling
4. Shaping – Square and Hexagonal Heads
5. Drilling and Reaming
6. Contour milling - vertical milling machine
7. Spur and helical gear cutting using milling machine
8. Gear generation using gear hobber
9. Gear generation using gear shaper
10. Grinding – Cylindrical, Surface and Centerless grinding
11. Tool angle grinding with tool and Cutter Grinder
12. Spline Broaching
13. Measurement of cutting forces in Milling /Turning Process
14. CNC Part Programming

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Explain the working principles of various machines used in manufacturing.
CO2: Select cutting tools materials and tool geometries for different materials.
CO3: Select appropriate machining processes and conditions for different metals.
CO4: Write programs for CNC turning and machining centre.
CO5: To produce different part features to the desired quality.

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COURSE OBJECTIVES:
- To train the students in the area of non-ferrous metal casting with the simple shapes.
- To study the basic requirements of given moulding sand by standard tests.
- To train the students to make the simple joints by various welding techniques.
- To study the solidification of metals and alloys also find the various micro structure of given specimens.
- To train the students for various heat treatment processes.

LIST OF EXPERIMENTS:

**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.

**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.

**METALLURGY**
1. Cooling curve- Pure metal and alloy (Pb-Sn).
2. Specimen preparation for macro – examination.

**TOTAL: 60 PERIODS**

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the casting procedure of different methods.
CO2: Find the quality of moulding sand.
CO3: Make simple joints by welding.
CO4: Understand the concept of phase diagrams and metallographic techniques.
CO5: Understand the concept of various heat treatment process and their applications.

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COURSE OBJECTIVES:
- To train the students so that students will be able to design experimental designs and use these concepts for research design.
- To introduce the concept of probability so that they can be used for industrial applications.
- To stress upon the importance of the sampling theory and its usefulness in industrial quality control.
- To make students familiarize with the concepts of estimation theory and its applications.
- To help students familiarize with the concepts of estimation theory and its applications in industry and research.

UNIT I  PROBABILITY THEORY  12
Random variables – Discrete and continuous random variable- Probability mass and density functions- Joint density and mass functions-Moment about mean and origin- Moment generating and characteristic functions – Binomial, Poisson, Normal distributions and their applications- to manufacturing problems.

UNIT II  SAMPLING THEORY  12
Sampling with and without replacement- Random sample- Sampling distributions of means, proportions, difference of means and proportions-Student ‘t’ distribution- Chi square distribution-Fisher’s distribution and their applications to production problems.

UNIT III  ESTIMATION THEORY  6
Point and Interval estimation- Confidence limits for mean, proportions, difference of means, proportions- Confidence limits using student ‘t’ distribution, Chi square and F distribution-applications.

UNIT IV  TESTING OF HYPOTHESIS  10
Procedure for testing hypothesis and significance- Level of Significance of large samples for means, proportions, difference of means and difference of proportions- Tests based on student t distribution, chi square distribution and F distribution – Applications to manufacturing.

UNIT V  ANOVA  5
One factor experiments – Mathematical model for one factor experiments- Two factor experiments- Mathematical model for two factor experiments- Applications to production problems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
- CO1: Design of experiments for research and industry.
- CO2: Apply the concept of probability so that they can be used for industrial applications.
- CO3: Use sampling theory and its usefulness in industrial quality control.
- CO4: Apply the concepts of estimation theory to industrial problems.
- CO5: Apply the test of significance and its applications to industry and research.

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TEXT BOOKS:
PR5501 ENGINEERING METROLOGY L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand the concept of Engineering metrology.
- To familiarize the metrology instruments used for linear and angular measurements.
- To learn about the surface texture and measuring instruments.
- To learn about the metrology of screw threads and gears.
- To introduce the concepts of Laser and computer applications in metrology.

UNIT I  FUNDAMENTALS OF MEASUREMENT
Fundamentals of Engineering metrology – Line, end and wave length standards of measurement – Accuracy, Precision and Calibration of instruments - Errors in measurements – Limits, fits, tolerance and gauge design – Inter changeability and selective assembly – Uncertainties in measurements.

UNIT II  LINEAR AND ANGULAR MEASURING SYSTEMS

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

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the principles of Engineering Metrology.
CO2: Identify appropriate metrology equipment for measuring linear and angular measurements.
CO3: Apply the suitable equipment to measure the surface textures.
CO4: Identify appropriate methodology to measure the parameters of screw threads and gears.
CO5: Employ the advanced metrology equipment.
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**TEXT BOOKS:**

**REFERENCES:**

**PR5502 FLUID POWER SYSTEMS**

**COURSE OBJECTIVES:**
- To understand the basic principles of fluid power.
- Know the different properties of hydraulic fluids and their effects
- Explain the working principles of various pumps
- 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**

**UNIT II FLUID POWER SOURCES**
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**

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students will be able to
- CO1: Acquire the knowledge on principles and applications of fluid power.
- CO2: Acquire knowledge on working principle of pump, actuators, control elements of fluid power system
- CO3: Understand the principles of accumulators and circuits
- CO4: Design circuit for typical applications like material handling, press, shaping, milling, grinding.
- CO5: Design electro pneumatics and PLC Circuits.

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TEXT BOOKS:

REFERENCES:
UNIT II JOINTS 9+3
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 AND COUPLINGS 9+3
Design of Shaft –Static and Varying Loads, Strength and Rigidity- Design of Coupling-Types, Flange, Muff and Flexible Rubber Bushed Coupling

UNIT IV GEAR AND BELT DRIVES 9+3
Design of Spur, Helical, Bevel and Worm Gear drives- Design of Belt drives- Flat , V Belts and Timer Belts

UNIT V SPRINGS AND BEARINGS 9+3

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the fundamentals of Engineering design, Failure theories and solve the basic machine problems.
CO2: Implement their ideas onto design bolts & joints and exposes them to selection of keys.
CO3: Acquire knowledge on design of shafts, various types of couplings and brakes.
CO4: Develop in-depth knowledge on design of different types of gears and belt drives.
CO5: Gain knowledge on design of various springs and bearings.

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TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES:

• To study the functional aspects of different pneumatic Components and its use in circuits.
• To study the functional aspects of different hydraulic components and its use in circuits.
• To train the student in designing different pneumatics for different applications.
• To train the student in designing different hydraulics for different applications.
• To train the student in designing of PLC circuits using hydraulic circuit applications.

LIST OF EXPERIMENTS

1. Study and use of pneumatic and hydraulic elements.
2. Basic hydraulic and Basic Electro hydraulic circuits.
3. Single and double acting cylinder circuits using different directional control valves.
5. Logic pneumatic circuits.
6. Speed control circuits in a pneumatic trainer kit.
7. Pneumatic sequencing circuits.
8. Electro pneumatic sequencing circuits.
9. PLC based electro hydraulic sequencing circuits.
10. PLC based electro pneumatic sequencing circuits.
11. Simulation of pneumatic, Electro pneumatic and electro hydraulic sequencing circuits using software.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to
CO1: Get Hands on experience in handling various components of pneumatic systems.
CO2: Get Hands on experience in handling various components of hydraulic systems.
CO3: Design circuit for desired sequence of practical application in pneumatics.
CO4: Acquire to design electro pneumatics for desired sequence of practical application in pneumatics.
CO5: Design circuit for desired sequence of practical application in PLC.

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PR5512 ENGINEERING METROLOGY LABORATORY

COURSE OBJECTIVES:

• To practice various measurement methods.
• To get acquainted with the instruments used for linear and angular measurements.
• To learn about the form measurements.
• To familiarize with surface texture measurements.
• To get acquainted with the advanced instruments such as machine vision system and CMM.
LIST OF EXPERIMENTS
3. Measurement of internal taper angle
5. Calibration of a Dial gauge.
7. Inspection of screw thread parameters using three wire method.
8. Measurement of gear tooth thickness
10. Measurements using profile projector.
11. Measurements using Autocollimator
13. Measurements using CMM.
14. Contact and Non-contact surface roughness measurements.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to

CO1: Carry out various types of measurements using different instruments.
CO2: Use the most appropriate equipment for the given application.
CO3: Choose the best method to accomplish various types of form measurements.
CO4: Carry out the measurements related to screw thread and gears.
CO5: Use the advanced equipment’s such as machine vision system and CMM.

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PR5601 METAL FORMING

COURSE OBJECTIVES:
- Students will gain knowledge on the mechanism involved in plastic deformation and parameter representation.
- Students will read and understand various bulk forming process and its recent technology.
- Student will have a knowledge on various sheet metal forming process
- Students will study the powder metallurgy techniques and Special metal forming processes.
- Student will understand the significance of heat treatment based on the application.

UNIT I FUNDAMENTALS OF METAL FORMING
UNIT II FORGING AND ROLLING

UNIT III EXTRUSION AND DRAWING PROCESSES

UNIT IV SHEET METAL FORMING PROCESSES

UNIT V POWDER FORGING AND RECENT ADVANCES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Represent the state of stress in metal forming process.
CO2: Identify the appropriate bulk forming process based on the application.
CO3: Understand the conventional sheet metal forming process and grasp the significance of various high energy rate forming techniques.
CO4: Really understand the powder metallurgy technique.
CO5: Select appropriate surface heat treatment technique based on the application.

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TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
- To understand the applications and advantages of CNC machines and technology.
- To understand the various CNC control and calculate technological data for CNC machining.
- To understand modern CNC systems and its importance in manufacturing.
- To impart the knowledge in CNC programming.
- To understand the concepts of CNC machine and its construction.

UNIT I  INTRODUCTION

UNIT II  STRUCTURE OF CNC MACHINE

UNIT III  CNC MACHINING

UNIT IV  CNC PROGRAMMING
Coordinate Systems and Reference Points -The Ten Steps of CNC Programming - Structure Of A Part Program, G Codes and M Codes, Tool Length Compensation, Cutter Radius And Tool Nose Radius Compensation, Do Loops, Subroutines, Canned Cycles, Mirror Image, Parametric Programming, Machining Cycles, Programming For Machining Centre And Turning Centre For Well Known Controllers, Generation of CNC Codes From CAM Packages.

UNIT V  TOOLING AND WORK HOLDING DEVICES
Introduction To Cutting Tool Materials – Carbides, Ceramics, CBN, PCD– Inserts Classification-PMK, NSH, Qualified, Semi Qualified And Preset Tooling, Tooling System For Machining Centre And Turning Centre, Work Holding Devices For Rotating And Fixed Work Parts.

COURSE OUTCOMES:
At the end of the course, students will be able to
- CO1: Understand Evolution and Principle of CNC Machine Tools
- CO3: Write the CNC program for given components.
- CO4: Understand the working principle of CNC machine and its construction.
- CO5: Select the required tooling and work holding devices.

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TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

PR5603 COMPUTER AIDED DESIGN AND ANALYSIS

COURSE 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
- To analyse a given problem using finite element techniques.
- To impart knowledge about various factors, pre-processing and post-processing steps with implementation of computer in FEA.
- To introduce the concepts of FEA and to apply in the field of manufacturing.

UNIT I COMPUTER GRAPHICS AND GEOMETRIC MODELING

UNIT II PRODUCT DESIGN CONCEPTS

UNIT III ELEMENTS OF FINITE ELEMENT ANALYSIS
General field problems in engineering-Discrete and continuous models-Characteristics-the relevance and place of finite element method- The method of weighted residuals-Rayleigh-Ritz and Galerkin methods - Solution of large system of equations- Gaussian elimination procedures - 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 IV FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS
One dimensional finite element analysis - Beam element - Frame elements - One dimensional heat transfer - Two dimensional finite element analysis approximation of geometry and field variables - triangular and rectangular element- - Natural coordinates and coordinate transformation – Numerical integration - Incorporation of boundary conditions. Dynamic analysis - Equations of motion using
Lagrange’s approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems- Solution of Eigen value problems - Transient vibration analysis-Thermal transients- Isoparametric elements.

UNIT V APPLICATION OF FINITE ELEMENT ANALYSIS


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to

CO1: Understand the features of modern design tools and data handling product development.

CO2: Develop depth knowledge on techniques of FEA and tools for analysis of typical manufacturing processes.

CO3: Get idea of implementation of computer on solving FEA based problems.

CO4: Discretize and solve one-dimensional solid mechanics and heat transfer problems in FEA.

CO5: Analyze a production process through FEA and control its parameters.

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TEXT BOOKS:

REFERENCES:

PR5611 CNC AND METAL FORMING LABORATORY

COURSE OBJECTIVES:
- To familiarize metal cutting principles.
- To study the characteristic features of CNC lathe.
- To impart knowledge in 3D profile cutting.
- To impart knowledge in mechanical behavior of metals in various metal forming operations.
- To train the students to write, simulate and carry out various operations in CNC machines.

LIST OF EXPERIMENTS

CNC LAB
1. Programming and machining of step turning and taper turning operation in CNC Lathe.
2. Programming and machining of thread cutting and grooving operation in CNC Lathe.
3. 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.
5. Programming for mirroring / scaling function / Pocket milling and drilling cycle in a CNC milling.
7. Programming and Simulation of profile cutting in CNC Router.
8. Programming for cross drilling in a four axis CNC machining center.
9. 3D Profile cutting in CNC machining center.

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.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand various metal cutting operations on CNC machine.
CO2: Have hands on experience with various operations on CNC machine Centre.
CO3: Write NC program for various operations and perform machining in CNC machine
CO4: Understand the mechanical behavior of metals in various metal forming operations.
CO5: Perform various metal forming operations and calculate the required parameters associated with it.

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PR5612 MODELING AND ANALYSIS LABORATORY

COURSE OBJECTIVES:
- The course is intended to provide a basic understanding of Modeling and Analysis techniques.
- To acquire a basic understanding of Modeling and Analysis software.
- To train the students to various approaches involved in assembly modeling.
- To understand the different kinds of analysis and apply the basic principles to find out the stress and other related parameters of bars, beams loaded with loading conditions.
- To learn to apply the basic principles to carry out dynamic analysis to know the natural frequency of different kind of beams.
LIST OF EXPERIMENTS

MODELLING EXPERIMENTS
1. 3-D Assembly of Bolt and Nut
2. 3-D Assembly if Protected Type Flange Coupling
3. 3-D Assembly of Universal Coupling
4. 3-D Assembly of Plummer Block
5. 3-D Assembly if Swivel Bearing

ANALYSIS 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

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Perform finite element modeling in manufacturing applications and analysis package.
CO2: Work on various analysis packages available.
CO3: Enable the student to perform finite element modeling analysis for solid mechanics, heat transfer problems, vibration problems, shell and contact problems in 2D and 3D simulation
CO4: Carry out dynamic analysis and finding natural frequencies for various boundary conditions and also analyze with forcing function.
CO5: Use the modern tools to formulate the problem, and able to create geometry, discretize, apply boundary condition to solve problems of bars, truss, beams, plate to find stress with different loading conditions.

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PR5701  MECHATRONICS FOR AUTOMATION  L T P C  3 0 2 4

COURSE OBJECTIVES:
- To acquire overview of multi-domain engineering integration and make the students get acquainted with the sensors and transducers and its interfacing.
- To understand and apply the various types of actuators and its drives for interfacing.
- To apply modeling of basic mechanical system elements and cognize the need of control systems.
- To impart knowledge about the fundamentals of microcontroller to realize the interfacing and control.
- To render exposure in the design and development of mechatronics systems.
UNIT I MECHATRONICS SYSTEMS AND SENSORS


UNIT II ACTUATORS


UNIT III SYSTEM MODELING AND CONTROL


UNIT IV MICROCONTROLLERS


UNIT V MECHATRONICS SYSTEM DESIGN AND APPLICATIONS


TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Identify suitable sensors to develop mechatronics systems.  
CO2: Select the appropriate actuators and its drives for integration.  
CO3: Develop the mathematical model of the mechanical systems elements for control.  
CO4: Use the microcontroller for input and output interfacing.  
CO5: Demonstrate the steps involved mechatronic system integration for automation for various applications.

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REFERENCES:

MECHATRONICS FOR AUTOMATION LABORATORY

COURSE OBJECTIVES:
- To assess the functioning of various sensors, transducers, and actuators.
- To acquire the hands-on experience in simulation software, microcontroller programming and I/O interfacing.

LIST OF EXPERIMENTS:
1. Experimentation on Characterization and Application of Optical Sensors.
2. Experimentation on Characterization of Temperature Transducers.
4. Experiments on Resistive Transducers for Force and Torque Measurements
5. 8 bit and 16 bit Arithmetic Operation in 8051 Microcontroller.
7. Modeling and Simulation of Mechanisms using Simulation Software.
10. Robot Control with Stepper Motor Interfacing.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Select and use suitable sensors and actuators more confidently.
CO2: Able to simulate the various mechanism for system development.
CO3: Practice the use microcontroller for automation in various applications.

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PR5702 COMPUTER INTEGRATED MANUFACTURING SYSTEMS

COURSE OBJECTIVES:
- To understand the various automated manufacturing activities and to study the application of computer Technology in the manufacturing activities
- To familiarize the various material handling equipments
- To learn about the concepts of cellular manufacturing.
- To introduce the concepts of Flexible Manufacturing System
- To study about the principles of automated assembly system

UNIT I INTRODUCTION TO AUTOMATED PRODUCTION SYSTEMS
UNIT II MATERIAL HANDLING AND STORAGE SYSTEM

UNIT III CELLULAR MANUFACTURING

UNIT IV FLEXIBLE MANUFACTURING SYSTEM

UNIT V AUTOMATED ASSEMBLY AND AUTOMATED DATA COLLECTION

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Gain and apply the knowledge using computers for various manufacturing activities
CO2: Employ the most suitable material handling equipment to accomplish the given task
CO3: Employ the principles of cellular manufacturing
CO4: Gain and apply the knowledge using flexible manufacturing system
CO5: Identify the appropriate ADC technology

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REFERENCES:
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 minimum of **FOUR weeks** (during 4\textsuperscript{th} or 5\textsuperscript{th} semester holidays) in recognized industrial establishments. The student has to submit a report at the end of 6\textsuperscript{th} semester about the training / internship with the following information.

**CERTIFICATE COURSES MUST BE STATED**

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.

**PR5712  PROJECT I  L T P C  0 0 6 3**

**COURSE OBJECTIVES:**

- A project topic may be selected based on the literature survey and the creative ideas of the students themselves in consultation with their project supervisor.
- The topic should be so chosen that it will improve and develop the skills to design, fabricate, analyse, test and research. Literature survey and a part of the project work be carried out in phase I.
- The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.
- A project report for phase I is to be submitted at the end.

**EVALUATION:**

- A project topic may be selected based on the literature survey and the creative ideas of the students themselves in consultation with their project supervisor.

**COURSE OUTCOMES:**

The students would be able to:

- **CO1:** Apply the knowledge gained from theoretical and practical courses in solving problems
- **CO2:** Give confidence to the students to be
- **CO3:** Be creative, well planned
- **CO4:** Organized
- **CO5:** Coordinated
COURSE OBJECTIVES:

- To continue the work from Project Work I and complete the Project Work II in order to meet the stated objectives of the topic chosen.
- The progress of the project is evaluated based on a minimum of three reviews.
- The review committee may be constituted by the Head of the Department.
- A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.
- To improve the research and development activities of the students.

EVALUATION:

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 three 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.

COURSE OUTCOMES:

The students would be able to:

CO1: Apply the knowledge gained from theoretical and practical courses in solving problems
CO2: Give confidence to the students to be
CO3: Be creative, well planned
CO4: Organized
CO5: Coordinated
COURSE OBJECTIVES:
- To educate on mechanism of machining in micro and nano level based on molecular dynamics.
- To introduce to various methods of microfabrication based on material addition.
- To introduce to various methods of micromachining with aid of high rate energy input.
- To introduce to micromachining processes based on abrasive flow and enhanced rheology.
- To introduce the concepts of hybrid machining for high material removal and surface finish.

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, Galvanoformung, Abformung) process- Stereolithography- MicroMoulding.

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
Surface Integrity of Machined surface-Chemical Mechanical polishing – Electro chemical spark micro machining – Electro discharge grinding – Electrolytic in process dressing – Laser and Ultrasonic aided Machining – High/Low temperature aided Machining -Application.

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand on the molecular dynamics mechanism in micro-nano machining
CO2: Familiarize on various methods of microfabrication based on material addition.
CO3: Get the Overview of various methods of micromachining with aid of high rate energy input.
CO4: Acquire Knowledge on micromachining processes based on rheology of abrasive medium.
CO5: Realize hybrid machining for better material removal and surface finish.

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REFERENCES:

PR5002 MODERN CONCEPTS IN MANUFACTURING L T P C 3 0 0 3

COURSE OBJECTIVES:
- The objective of this course is to teach the lean tools to attain optimum level in quality.
- Students will get knowledge on how to meet the needs of customers while maintaining high standards of quality and controlling the overall costs involved in the production of a particular product.
- Aims to develop the students to conserve energy and natural resources, and to ensure that they have minimal impact on the environment and society.
- To introduce students the basics of additive manufacturing/rapid prototyping and its applications in various fields, reverse engineering techniques.
- To give students an introduction to an advanced information process techniques.

UNIT I LEAN MANUFACTURING 9

UNIT II AGILE MANUFACTURING 9
The Agile Production Paradigm – Agile Manufacturing Vs Mass Manufacturing - Agile Practices - Agile practice 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 9

UNIT IV ADDITIVE MANUFACTURING 9
UNIT V INTELLIGENT MANUFACTURING

Goals of AI in manufacturing: Methods for production equipment selection and layout, Heuristic scheduling of multiple resources, Fuzzy multiple attribute decision making methods- Application of neural networks and fuzzy sets to machining and metal forming.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping technologies
CO2: Apply the concepts of JIT, Lean Manufacturing, and Agile Manufacturing methodologies
CO3: Assess the product life cycle, impact on environment and development of green manufacturing processes.
CO4: Implement variety of Additive Manufacturing (AM) technologies, their potential to support design and manufacturing
CO5: Apply artificial intelligence (AI) and data mining (DM) techniques to improve the efficiency of manufacturing systems

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COURSE OBJECTIVES:
- To introduce the development of Additive Manufacturing (AM), various business opportunities and applications
- To familiarize various software tools, processes and techniques to create physical objects that satisfy product development / prototyping requirements, using AM.
- To be acquainted with vat polymerization and material extrusion processes.
- To be familiar with powder bed fusion and direct energy deposition.
- To gain knowledge on applications of binder jetting, material jetting and laminated object manufacturing processes.

TEXT BOOKS:


REFERENCES:

UNIT I  INTRODUCTION

UNIT II  DESIGN FOR ADDITIVE MANUFACTURING (DFAM)

UNIT III  VAT POLYMERIZATION AND MATERIAL EXTRUSION

UNIT IV  POWDER BED FUSION AND DIRECT ENERGY DEPOSITION

UNIT V  OTHER ADDITIVE MANUFACTURING PROCESSES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course students shall be able to:
CO1: Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.
CO2: Acquire knowledge on process of transforming a concept into the final product in AM technology.
CO3: Elaborate the vat polymerization and material extrusion processes and its applications.
CO4: Acquire knowledge on process and applications of powder bed fusion and direct energy deposition.
CO5: Evaluate the advantages, limitations, applications of binder jetting, material jetting and laminated object manufacturing processes.

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PR5003 TOOL DESIGN L T P C
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COURSE OBJECTIVES:
• To introduce the concepts of various types of jigs, fixtures and dies.
• To design jig / fixture/ die for a given component.
• To learn the designing of jigs, fixtures for various machining processes widely used in industries.
• To understand the elements of various work holding devices.
• To impart knowledge in tool design concepts.

UNIT I TOOL DESIGN

UNIT II DESIGN OF JIGS AND FIXTURES
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

UNIT IV DESIGN OF DIES
Die design – fourteen steps to design a die - 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- Bending and drawing dies

UNIT V CASE STUDIES IN JIGS, FIXTURES AND DIES
Design of jigs, fixtures and dies for industrial components.

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the elements of various work holding devices.
CO2: Understand the design concepts of jigs and fixtures.
CO3: Understand the different types of dies and its design concepts.
CO4: Design jigs , fixtures and dies for given component.
CO5: Identify various jigs, fixtures and dies used in industries.
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PR5004 UNCONVENTIONAL MACHINING PROCESSES

COURSE OBJECTIVES:
- To make acquainted the various unconventional machining processes and its applications
- To encourage the students for developing the models (experimental/theoretical) of unconventional machining Processes
- To inculcate specialized knowledge and skill in unconventional machining processes using the principles and methods of engineering analysis and design.
- To cultivate the ability to develop and implement new improved manufacturing processes resulting in creation and distribution of value in engineering applications.
- To impart knowledge about the significance of controlling process parameters for the optimal performance for newly developed engineering materials used in industries and research organizations.

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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to

CO1: The students will be in a position to select and employ an appropriate unconventional machining process for a specific application in industries.

CO2: To categorized the various unconventional manufacturing process based on energy sources and mechanism employed

CO3: To select the best suitable advanced manufacturing process for processing of unconventional materials employed in modern manufacturing industries

CO4: To study the parametric influences during processing of materials using developed models

CO5: Analyze the processes and evaluate the role of each process parameter during machining of various advanced materials.

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TEXT BOOKS:

REFERENCES:

PR5074  MATERIALS PROCUREMENT MANAGEMENT  L T P C

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COURSE OBJECTIVES:
To introduce the various aspects of Purchasing.
To introduce concepts of stores management.
To familiarize the students about basic inventory management
To introduce MRP, aggregate planning, JIT concepts.
To illustrate the usefulness of quantitative techniques in materials management.

UNIT I  PURCHASING MANAGEMENT
Introduction to materials management – objectives – organization — value analysis – make or buy decisions-Purchasing and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Vendor rating methods- Imports – Buyer and Seller relationship.

UNIT II  STORES MANAGEMENT

UNIT III  BASIC INVENTORY MANAGEMENT
Basic EOQ Models- Assumptions- Quantity discount model- Q system- P system- Reorder level-ABC analysis- Deterministic and Probabilistic models- Finite Production
UNIT IV
ADVANCED INVENTORY MANAGEMENT
Bill of Materials-Market Production Schedule requirements planning- Aggregate planning-
Aggregate planning strategies-Costs-Techniques-Tabulation method-Linear Programming Method
– JIT- Lot size under constraints.

UNIT V
O .R TECHNIQUES IN MATERIAL MANAGEMENT
Application of O.R. Techniques in Materials Management- Linear Programming – Distribution
model- Replacement analysis- Scheduling – Forecasting-Forecasting techniques.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
   CO1: Identify a suitable vendor for a given requirement.
   CO2: Design stores layout, select materials handling equipment.
   CO3: Select a suitable inventory system for a given requirement.
   CO4: Develop suitable aggregate planning strategies.
   CO5: Identify suitable quantitative technique for a given situation.

TEXT BOOKS:

REFERENCES:
UNIT II  FACTORS IN SELECTION PROCESS
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
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
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
Automobile materials (Body panels, Engine Components), Marine structural materials (Hull and Propeller), Aircraft structural materials (Wings and landing gears), Materials for Aero engines and compressor and Gas turbines, 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

COURSE OUTCOMES:
At the end of the course, the students will be able to:
CO1: Understand the relationship between the evolution of materials and the development in engineering.
CO2: Find out the various factors governing the materials selection.
CO3: Adopt suitable method and essential steps in materials.
CO4: Identify suitable alternate materials for various engineering applications.
CO5: Suggest and select appropriate materials in an engineering industry.

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COURSE OBJECTIVES:
- Describe the role and drivers of supply chain management in achieving competitiveness.
- Explain about Supply Chain Network Design.
- Illustrate the issues related to Logistics in Supply Chain.
- Appraise about Sourcing and Coordination in Supply Chain.
- Application of Information Technology and Emerging Concepts in Supply Chain.

UNIT I INTRODUCTION
Role of Logistics and Supply chain Management: Scope and Importance - Evolution of Supply Chain - Examples of supply chains - Decision Phases in Supply Chain - Competitive and Supply chain Strategies - Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN

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 - 3PL - 4PL - Global Logistics - Reverse Logistics - Reasons, Activities and issues.

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN
Role of Sourcing in supply chain - Supplier selection - Contracts - Design Collaboration - Sourcing planning and analysis - Supply chain co-ordination - Bull whip effect - Effect of lack of co-ordination in supply chain and obstacles - Building strategic partnerships and trust within a supply chain.

UNIT V IT AND EMERGING CONCEPTS IN SUPPLY CHAIN

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After undergoing this course, students will acquire

CO1: Ability to understand the scope of Supply Chain Management and the Drivers of SC performance

CO2: Ability to design suitable SC network for a given situation.

CO3: Ability to solve the issues related to Logistics in SCM.

CO4: Ability to understand Sourcing, Coordination and current issues in SCM.

CO5: Ability to appraise about the applications of IT in SCM and apply SCM concepts in selected enterprise.

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PR5006  THEORY OF METAL CUTTING  L T P C
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COURSE OBJECTIVES:
- To impart the knowledge to the students about the tool nomenclature and the mechanisms of tool wear
- To make the students familiar with the principles of mechanics of metal cutting
- To learn about the thermal aspects of machining and the usage of cutting fluids
- To familiarize about the various cutting tool materials
- To impart knowledge about the various gear cutting methods

UNIT I  TOOL NOMENCLATURE, TOOL WEAR AND TOOL LIFE  9

UNIT II  MECHANICS OF METAL CUTTING  9

UNIT III  THERMAL ASPECTS AND CUTTING FLUIDS  9

UNIT IV  CUTTING TOOL MATERIALS  9

UNIT V  GEAR CUTTING  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Apply the principles of metal cutting theory.
CO2: Employ the various aspects of mechanics of metal cutting in manufacturing activities.
CO3: Understand the thermal aspects of metal cutting and identify the appropriate cutting fluid for the given metal cutting operation.
CO4: Identify the appropriate cutting tool material for the given metal cutting operation.
CO5: Employ the most suitable gear cutting operation for the given application.
TEXT BOOKS

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PR5007 ELEMENTS OF GREEN MANUFACTURING

COURSE OBJECTIVES:
- To expose the students to the basics of environmental sustainability and impact assessment objectives.
- To incorporate knowledge about the environmental based improvements towards lean manufacturing systems.
- To analyze various machineries with intent to conserve energy.
- To analyze hazardous and solid wastes with intent to point out areas of adverse environmental impact and how this impact could be minimized or prevented.
- To impart the knowledge about the need, procedure and benefits of Green-Co rating.

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

UNIT III ENERGY SAVING MACHINERY AND COMPONENTS

UNIT IV HAZARDOUS AND SOLID WASTE MANAGEMENT
UNIT V GREEN CO-RATING


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Understand the Concepts of environmental sustainability and environmental impact assessment objectives are well known to the students.
CO2: Apply suitable schemes towards design of green manufacturing requirements.
CO3: Analyze manufacturing processes towards conservation of energy.
CO4: Analyze manufacturing processes towards minimization or prevention of hazardous and solid wastes.
CO5: Acquire Knowledge of green co-rating and its benefits are well known to the students.

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PR5008 DESIGN OF CASTINGS AND WELDMENTS

COURSE OBJECTIVES:
- To expose the students to design for conducting the machining processes
- To impart knowledge to the students about the design principles of casting.
- To impart knowledge to the students about the design principles of welding.
- To conduct some of the cleaning and coating processes.
- To outline various casting processes, several defects that appear in cast part and corresponding remedial measures, and general recommendations to achieve a good quality casting.

UNIT I DESIGN FOR MACHINING
Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for machining round holes: Introduction, Suitable materials, Design recommendations, Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines, Design
recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.

UNIT II DESIGN FOR CASTING
Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation,

UNIT III DESIGN FOR WELDING
Different types of welding processes, Design for welding: Design for recommendation for welding process, Design for solder and brazed assembly: Process, Typical characteristics, Suitable materials, Detail Design recommendations, Design for adhesively bonded assemblies: Introduction, Typical characteristics, Suitable materials, Design recommendations for adhesive joint,

UNIT IV DESIGN FOR CLEANING

UNIT V DESIGN FOR ASSEMBLY

TOTAL:45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Apply the machining practices to produce various parts/products.
CO2: Design the gating and riser system needed for casting and requirements to achieve defect free casting.
CO3: The students will become capable to employ the design principles of weldments in the industries.
CO4: Develop new products with clean and coated products to enhance assembly process.
CO5: Design a weld joint to improve the joint performance, and to avoid the possible welding defects.

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COURSE OBJECTIVES:
- To introduce the general design process and software tools being used in the academics and Industries.
- To introduce the computer graphics and concepts related to the design.
- To introduce the concepts on geometric modelling and applications of CAD.
- To give information about product design and process tools.
- To exhibit the knowledge in product data management and product life cycle.

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
Geometric Modeling types – Wire frame surface and solid modeling – Boundary Representation, constructive solid geometry – Graphics standards – assembly modeling – use of software packages

UNIT IV  PRODUCT DESIGN CONCEPTS

UNIT V  PRODUCT DATA MANAGEMENT

COURSE OUTCOMES:
At the end of this course students could be able to
CO1: Understand the basic design process and features of modern design tools.
CO2: Get exposure in fundamentals of computer graphics and its concepts.
CO3: Acquire knowledge on geometric modelling and usage of CAD software packages.
CO4: Develop in-depth knowledge on product design and process tools.
CO5: Gain knowledge on data handling and product life cycle management.

TOTAL: 45 PERIODS
TEXT BOOKS:  

REFERENCES:  

COURSE OBJECTIVES: 
The students will be able to  
- Familiarize the various standards and legislation of modern electronic manufacturing.  
- Know the conventional electronic processing and lead free electronic manufacturing techniques.  
- Recognize the steps involved in assembly process and understand the need of recycle of electronics  
- Implement reliability and product life cycle estimation tools in green electronic manufacturing.  
- Demonstrate the green electronic manufacturing procedure in applications.

UNIT I \hspace{1cm} INTRODUCTION TO GREEN ELECTRONICS \hspace{1cm} 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 \hspace{1cm} GREEN ELECTRONICS MATERIALS AND PRODUCTS \hspace{1cm} 9  
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


TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Get concise awareness of standards and legislation of modern electronic manufacturing for green environment.

CO2: Explain the conventional electronic processing and lead free electronic manufacturing techniques.

CO3: Realize the assembly process and the need of recycle of electronics


CO5: Validate the green electronic manufacturing procedures in applications.

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TEXT BOOKS:


REFERENCES:


COURSE OBJECTIVES:

- To impart knowledge in various manufacturing methods in developing automotive components.
- To study the concepts of automobile engineering.
- To impart the knowledge in various parts of automotive engine.
- To understand the concepts of fuel and transmission system.
- To learn the recent developments in automobile industries.

UNIT I  ENGINE

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 COMPONENTS

Working principle of crank shaft – Cam shaft – valve operating mechanisms – carburetors - spark plug– connecting rod - Production of Connecting rod, Crankshaft, push rod and rocker arm, valves, tappets, carburetors and spark plugs.

UNIT III  FUEL AND TRANSMISSION SYSTEM


UNIT IV  CHASSIS AND SUSPENSION SYSTEM

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 ADVANCEMENTS

Application of sensors and actuators – Emission control system – catalytic converter – Hydro forming of exhaust manifold and lamp housing – stretch forming of Auto body panels – MMC liners – thermal barrier coating of Engine head and valves – Selection of materials for Auto components – sensors and actuators- exhaust gas recycler (EGR)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Acquire knowledge of production of various automotive components.
CO2: Learn the working principles of engines.
CO3: Get knowledge about various engine components.
CO4: Learn working of Fuel and Transmission System and its types.
CO5: Acquire knowledge of recent development in automobile industries.

TEXT BOOKS:


REFERENCES:

ME5081  PROCESS PLANNING AND COST ESTIMATION  L  T  P  C
                       3  0  0  3

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Creating a process plan for a given Product.
2. Preparing cost elements for a given product.
3. Allocating overhead to different departments.
5. Analyzing the costs for machining a product.

UNIT I  PROCESS PLANNING
Defining process planning – Drawing interpretation – Material selection process and methods –
Selection of Production Processes from Tables – Selection of Process Parameters from Tables –
Factors to be considered in selecting: Processes; Process Sequencing; Operation Sequencing;
Equipment & Tool Selection; Tool Holding Devices; Measuring Instruments – Computer Aided
Process Planning – Retrieval / Variance CAPP and Generative CAPP - Case Study in Process
Planning.

UNIT II  FUNDAMENTAL OF ESTIMATING AND ELEMENTS OF COST
Concept and Purpose of Estimating, Functions of Estimating Department, Concept of Costing,
Costing versus Estimating, Types of Estimates, Importance of Estimates, Estimating Procedure,
Cost Estimators and their Qualifications, Principal Constituents in a Cost Estimate – Elements of

UNIT III  OVERHEADS AND DEPRECIATION
Overhead, Allocation or Distribution of Overhead Cost, Depreciation and Methods to Calculate it,
Interest on Capital, Idleness Costs, Repair and Maintenance Cost

UNIT IV  ESTIMATION OF CASTING, FORGING & WELDING COSTS
Estimation of cost for Casting processes, Welding processes and Forging processes.

UNIT V  ESTIMATION OF MACHINING TIME AND COST
Estimation of Machining Time and Cost – Lathe operations, Drilling, Milling, Shaping Planing, and
Grinding operations.

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Create a Process Plan for a given Product.
2. Prepare Cost elements for a given Product.
3. Allocate Overhead to different departments.
4. Estimate cost for casting and forging products.
5. Analyze the costs for machining a product.

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PR5073 ROBOTIC TECHNOLOGY L T P C 3 0 0 3

COURSE OBJECTIVES:
- To study the kinematics, drive systems and programming of robots.
- To study the basics of robot laws and transmission systems.
- To familiarize students with the concepts and techniques of robot manipulator, its kinematics.
- To familiarize students with the various Programming and Machine Vison application in robots.
- To build confidence among students to evaluate, choose and incorporate robots in engineering systems.

UNIT I FUNDAMENTALS OF ROBOT 9

UNIT II ROBOT KINEMATICS 9
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 9

UNIT IV SENSORS IN ROBOTICS 9
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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Interpret the features of robots and technology involved in the control.
CO2: Apply the basic engineering knowledge and laws for the design of robotics.
CO3: Explain the basic concepts like various configurations, classification and parts of end effectors compare various end effectors and grippers and tools and sensors used in robots.
CO4: Explain the concept of kinematics, degeneracy, dexterity and trajectory planning.
CO5: Demonstrate the image processing and image analysis techniques by machine vision system.

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PR5011  FINITE ELEMENT ANALYSIS IN APPLICATION  L T P C

3 0 0 3

COURSE OBJECTIVES:
- To introduce the concept of FEA and to apply in the field of Manufacturing.
- To analyze a given problem using finite element techniques.
- To impart knowledge about various factors, pre-processing and post-processing steps with implementation of computer in FEA.
- To impart knowledge in the area of finite element methods and
- To know the applications of FEA in manufacturing sector.

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
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 ISO-PARAMETRIC ELEMENTS
Isoparametric elements-Dynamic analysis-Equations of motion using Lagrange’s approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems- Solution of Eigen value problems-Transient vibration analysis-Thermal transients.

UNIT V APPLICATION OF FINITE ELEMENT ANALYSIS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Acquire knowledge about fundamentals of solving Finite element problems.

CO2: Discretize and solve one-dimensional solid mechanics and heat transfer problems in FEA.

CO3: Get knowledge about the impact of shape functions and usage of higher order formulation in converging solution to FEA problem.

CO4: Implement of computer on solving FEA based problems.

CO5: Analyze a production process through FEA and control it’s parameters.

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COURSE OBJECTIVES:

- To understand the basics of operation research and its engineering application
- To gain knowledge on linear and its techniques
- To gain knowledge on non-linear programming and its techniques
- To apply basic concepts of mathematics to formulate an integer programming.
- To gain the basic concepts of networking techniques

UNIT I

INTRODUCTION


UNIT II

CLASSICAL OPTIMIZATION TECHNIQUES


UNIT III

NON-LINEAR PROGRAMMING

Introduction – Lagrangian Method – Kuhn-Tucker conditions – Quadratic programming – Separable programming – Stochastic programming

UNIT IV

INTEGER PROGRAMMING AND DYNAMIC PROGRAMMING

Integer Programming- Cutting plane algorithm – Branch and bound technique - Zero-one implicit enumeration; Geometric Programming- Dynamic Programming.

UNIT V

NETWORK TECHNIQUES

Shortest path model- Minimum spanning tree- Maximal Flow problem

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Apply the basic and advanced techniques of operations research.

CO2: Provide a formal quantitative approach to problem solving and an intuition about situations where such an approach is appropriate.

CO3: Introduce some widely used advanced operations research models.

CO4: Identify and develop operational research models from the verbal description of the real system.

CO5: Solve operation research problems using algorithms.

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COURSE OBJECTIVES:
- To introduce the basic concepts and the science behind heat transfer.
- To understand the mechanism of steady and unsteady conduction heat transfer and extended surfaces.
- To learn the convective heat transfer.
- To understand the concepts of radiation heat transfer.
- To learn the thermal analysis and sizing of heat exchangers.

UNIT I: MODES OF HEAT TRANSFER AND GOVERNING EQUATION
9
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
9
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
9
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
9
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
9
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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand basic concept of heat transfer and write the general governing equation.
CO2: Do calculation for steady and transient heat conduction problems.
CO3: Model convective heat transfer and solve problems.
CO4: Apply scientific and engineering principles in the radiative heat transfer solve problems.
CO5: Analyze and design aspects heat exchanger and solve problems.
TEXT BOOKS:

REFERENCE BOOKS:

PR5014 LEAN MANUFACTURING L T P C
3 0 0 3

COURSE OBJECTIVES:
- To introduce the lean manufacturing and identify the waste.
- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.
- To provide knowledge on perfect value creation process that has zero waste.
- To apply the lean manufacturing tools and techniques through case studies

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.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Identify the waste in various manufacturing process.
CO2: Understand the principles of cellular manufacturing, JIT and TPM
CO3: Reduce the manufacturing time by applying concepts of TQM, 5S and VSM.
CO4: Get the knowledge on six sigma approach
CO5: Get knowledge on applying the lean manufacturing tools and Techniques

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REFERENCES:

PR5015 NON-DESTRUCTIVE TESTING METHODS L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand principle behind various NDT techniques.
- To learn working procedures of various NDT techniques.
- To understand the concepts of NDT in various manufacturing processes.
- To impart the knowledge in selection of required NDT for specific applications.
- To learn the importance of inspection and its techniques.

UNIT I INTRODUCTION
Introduction to various non-destructive methods – need for inspection – types of inspection systems – quality of inspection – conditions for effective Non-destructive testing – Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications – benefits of Non-destructive testing.

UNIT II LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING
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

UNIT IV  ULTRASONIC TESTING
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
Basic principle, Effect of radiation of Film, Thermography-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

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the concepts of non-destructive testing and its applications.
CO2: Understand the procedures of Liquid Penetrant Testing and Magnetic
CO3: Apply the concepts of non-destructive techniques in various manufacturing processes.
CO4: Understand the principle of ultrasonic testing and various scanning techniques.
CO5: Select the required NDT for specific applications.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:

- To expose the students to the basics of plastics and their applications.
- To expose the students to the basics of polymers and their applications.
- To impart knowledge about various plastic and polymer processing techniques.
- To enlighten the students about the various polymer mixing and blending techniques.
- To impart knowledge about various properties of polymers and its testing methods.

UNIT I INTRODUCTION TO PLASTICS

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, tears, 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

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: acquire knowledge of plastics and their applications are well known to the students.
CO2: acquire knowledge of polymers and their applications are well known to the students.
CO3: acquire knowledge of uses and techniques of plastics and polymer processing are well known to the students.
CO4: expose about various polymer mixing and blending techniques is well known to the students.
CO5: collect Information of various properties of polymers and its testing methods are well known to the students.

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PR5016 PROCESSING OF COMPOSITES

COURSE OBJECTIVES:
- To introduce the concept of composites and various types of composites.
- To enlighten the students about the different types of fibres and matrix materials
- To analyze the different polymer matrix composites processing methods and their applications
- To expose the students to the various metal matrix composite processing methods
- To analyze the various processing techniques of various ceramic matrix composites.

UNIT I COMPOSITES

UNIT II FIBRES AND MATRIX 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

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: acquire Knowledge about various composites and their properties are well known to the students.

CO2: acquire Knowledge about various types of fibres and matrix materials are well known to the students.

CO3: exposure of the various polymer matrix composites, processing method are well known to the students.

CO4: analyze the various processing methods of metal matrix composites.

CO5: analyze the various processing techniques of ceramic matrix composites.

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PR5017 SMART MATERIALS FOR MANUFACTURING L T P C
3 0 0 3

COURSE 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 9
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  
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, Smart Fluids – introduction, applications - Magnetorheological fluids (MR Fluids), preparation of demineralized water (ion exchange method and permanganate method).

UNIT III  ELECTROCHEMICAL ENERGY SYSTEMS  

UNIT IV  WEAR MECHANISM  
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  

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1:  Familiarize with the use chemicals in the field manufacturing
CO2:  Gain knowledge about the types and applications of shape memory alloys in various industrial applications.
CO3:  Understand the efficiency of the cutting fluids and its effect in the manufacturing process.
CO4:  Gain knowledge about the efficiency of electrochemical energy systems for industrial application
CO5:  Familiarize the various stages, measurement and control of wear.

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PR5018  CORROSION ENGINEERING  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To introduce the types, mechanism of electro-chemical and its control.
- To introduce the types and mechanism of hot corrosion.
- To introduce various types of metallic coatings to combat corrosion.
- To introduce various types of organic coatings to combat corrosion.
- To provide overview of various techniques for surface analysis.

UNIT I  CORROSION AND ITS CONTROL  9
Introduction - chemical and electrochemical corrosions - mechanism of electrochemical and galvanic corrosions - concentration cell corrosion - passivity-Pourbaix diagram - soil, pitting, inter-granular, water line, stress and microbiological corrosions - galvanic series - factors influencing corrosion - measurement of corrosion rate. Corrosion control – material selection and design - electrochemical protection – sacrificial anodic protection and impressed current cathodic protection.

UNIT II  HOT CORROSION AND REFRACTORIES  9
Oxidation, sulfidation and carbonization. Ellingham diagram, Hot corrosion— Coatings for combat; Refractories - characteristics, classification, properties – refractoriness and Refractoriness Under Load (RUL), dimensional stability; thermal spalling, thermal expansion, porosity; acidic refractories – fire clay, silica; basic refractories – magnesite, dolomite; neutral refractories – silicon carbide, zirconia.

UNIT III  METALLIC COATINGS  9
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  9
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  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understanding on the mechanism of corrosion based on electro-chemical aqueous system and its control.
CO2: Understanding on the mechanism of corrosion at high temperature.
CO3: Familiarization on different techniques of metallic coatings to combat corrosion.
CO4: Familiarization on different techniques of organic coatings to combat corrosion.
CO5: Knowledge on application of different characterization and analytical tools for analysis of surface.

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REFERENCES:

GE5071 DISASTER MANAGEMENT L T P C 3 0 0 3

COURSE 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
- To develop rudimentary ability to respond to their surroundings with potential 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 Processes 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

COURSE 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.

TEXT BOOKS:

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

GE5351  ENGINEERING ETHICS AND HUMAN VALUES  L T P C
3 0 0 3

COURSE OBJECTIVES
- To emphasize 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.
- To understand the various safety measures in industry.
- To understand the various global issues.

UNIT I  HUMAN VALUES

UNIT II  ENGINEERING ETHICS

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION
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  

UNIT V  GLOBAL ISSUES  
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.

COURSE OUTCOMES  
Upon the completion of the course the students will be able to:
- Perform with professionalism in industry.
- Understand the various ethics in industry.
- Understand their rights, legal ,ethical issues.
- Understand the responsibilities pertaining to engineering profession.
- Engage in life-long learning with knowledge of contemporary issues.

TEXT BOOKS  

REFERENCES  

GE5072  HUMAN RIGHTS  L T P C  
3 0 0 3  
COURSE OBJECTIVES  
The course aims to
- make students learn about the concept and regulation of human rights
- make students aware about the constitutional human rights

UNIT I  INTRODUCTION TO HUMAN RIGHTS  

UNIT II  REGULATIONS IN HUMAN RIGHTS  
UNIT III MONITORING AGENCIES
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV HUMAN RIGHTS-INDIAN PERSPECTIVE
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V IMPLEMENTATION OF HUMAN RIGHTS IN VARIOUS SCENARIO

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course the students will be able to
CO1 acquire the basic knowledge of human rights.
CO2 acquire knowledge about the regulatory bodies involved in human rights

REFERENCES

PR5019 ELECTRONIC MATERIALS AND PROCESSING L T P C
3 0 0 3

COURSE OBJECTIVES:
- To describe the basic processes of materials that are used to fabricate semiconductor and MEMS devices.
- To gather the knowledge on organic material and its manufacturing techniques.
- To acquire the basics of micro-electromechanical system integration on chip.
- To understand the process electronics fabrication in packing and assembly.
- To learn the thermal considerations of electronic materials for reliability.

UNIT I INTRODUCTION TO ELECTRONIC MATERIALS
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

UNIT III MEMS MATERIALS AND PROCESS
UNIT IV PACKAGING AND ASSEMBLY OF ELECTRONICS
Solder Technologies for Electronic Packaging and Assembly, Electroplating and Deposited Metallic Coatings, Printed Circuit Board Fabrication, Materials and Processes for Hybrid Microelectronics and Multichip Modules - Adhesives under Fills, and Coatings in Electronics Assemblies.

UNIT V THERMAL MANAGEMENT OF MATERIALS AND SYSTEMS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Familiarize the various electronic materials and its fundamentals.
CO2: Know the use of organic materials and processes in electronics
CO3: Describe the MEMS materials and process.
CO4: Explain the packaging and assembly of electronics
CO5: Aware the thermal effects of electronic materials

Text Books:

References:

PR5020 MICRO ELECTRO MECHANICAL SYSTEMS AND NANO TECHNOLOGY

COURSE OBJECTIVES:
- To introduce the changes in properties of materials with dimension reduction and materials for MEMS.
- To provide overview of microfabrication processes applicable for MEMS.
- To introduce students on the working principle of typical micro-sensors, micro-actuators and MEMS devices and the role of packaging.
- To apply knowledge on strength of materials, thermal and design engineering in design of MEMS devices.
- To familiarize the properties and method of synthesis of nanomaterials and progress of MEMS to nano system.
UNIT I  EFFECT OF MINIATURISATION AND MATERIALS FOR MEMS
Definition – historical development – fundamentals – Scaling laws in miniaturization – Rigid Body
dynamics, Electrostatic Forces, Electromagnetic properties, Electricity, diffusion property, optical
property and Heat Transfer, Materials for MEMS and Microsystems – Si, Si compounds, Si Piezo
resistors, GaAs, Quartz, Piezoelectric Crystals and Polymers – Doping of semiconductors – diffusion
process.

UNIT II MICRO-FABRICATION PROCESSES
Photolithography – photo resist applications, light sources and post baking – Ion implantation –
diffusion process – oxidation – thermal oxidation, silicon dioxide, oxidation rate, oxide thickness by
colour – chemical vapour deposition – enhanced CVD – Physical vapour deposition – sputtering –
deposition by epitaxy – etching – chemical and plasma etching. Bulk micro manufacturing – wet
etching, dry etching and etch stop – surface micromachining – LIGA process – SLIGA process.

UNIT III MICROSYSTEM – WORKING PRINCIPLE AND PACKAGING
Micro sensors – Optical, Pressure, Acoustic wave and Thermal sensors – Micro actuation – thermal
forces, shape memory alloys, piezoelectric crystals and Electrostatic Forces – MEMS with micro
actuators – Micro gripper, Micro motor, micro valves and micro pumps – Micro accelerometers –
Microfluidics – micro mirror array for video projection – Microsystem packaging – die level, device
level and system level – Interfaces – Die preparation – surface bonding- wire bonding – sealing –
Assembly of Microsystems – selection of packaging materials – signal mapping and transduction –
pressure sensors packaging.

UNIT IV MICROSYSTEMS DESIGN
Static bending of thin plates – Mechanical Vibration – thin film mechanics – Design considerations
– constraints, selection of materials, selection of Manufacturing processes, selection of signal
transduction, electromechanical system and packaging – Process design – Mechanical Design
Thermomechanical loading, Thermomechanical stress analysis, Dynamic Analysis and Interfacial
fracture Analysis – simulation of Microfabrication process – Design of a Si die for a micro pressure
sensor – Fluid resistance in Micro channels – capillary electrophoresis network systems – Design
of MEMS cell gripper – Micro Optical Electro Mechanical System – Complementary Metal Oxide
Semiconductor.

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 –Fabrication methods – Top down processes – bottom up processes – nano
positioning systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:
CO1: Understand the changes in properties of materials with reduction of dimensions by Scaling
laws and choice of materials for MEMS.
CO2: Overview of principles of microfabrication techniques applicable for MEMS.
CO3: Familiarize on typical MEMS sensors, actuators and devices as well as packaging.
CO4: Apply knowledge on strength of materials, design and thermal engineering for development
of MEMS.
CO5: Understand on properties and method of synthesis of nanomaterials and their role in nano
systems.

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1. Mahalik N P, MEMS, McGraw Hill (India), 2009

REFERENCES:

PR5021 TOTAL QUALITY MANAGEMENT: PRINCIPLES AND APPLICATIONS  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To learn about the evolution and the basic concepts of quality
- 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 9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Barriers to TQM Contributions of Quality Gurus —Deming’s 14 point principles – Crosby’s 14 point principles – Juran Triology

UNIT II TQM PRINCIPLES 9
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 TOOLS & TECHNIQUES I 9

UNIT IV TOOLS & TECHNIQUES II 9

UNIT V QUALITY SYSTEMS 9

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Apply basic concepts of quality gurus
CO2: Gain and apply the knowledge of TQM principles
CO3: Identify the appropriate the statistical tool to achieve the quality control
CO4: Employ the principles of continuous process improvement tools
CO5: Gain and apply the knowledge of quality systems

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PR5022 INTEGRATED PRODUCT DEVELOPMENT

COURSE 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

COURSE 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

TEXT BOOKS:

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

REFERENCES:

COURSE OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working)
Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES


UNIT III ORGANs OF GOVERNANCE

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS


UNIT V LOCAL ADMINISTRATION

District’s Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

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TEXTBOOKS:
AD5092  VALUE EDUCATION  L T P C  3 0 0 0

COURSE OBJECTIVES:
- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

UNIT I   INTRODUCTION TO VALUE EDUCATION  9
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgements

UNIT II  IMPORTANCE OF VALUES  9
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III  INFLUENCE OF VALUE EDUCATION  9
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV  REINCARNATION THROUGH VALUE EDUCATION  9

UNIT V  VALUE EDUCATION IN SOCIAL EMPOWERMENT  9
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

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REFERENCES:
COURSE OBJECTIVES:
- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 9
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

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AD5094 STRESS MANAGEMENT BY YOGA

COURSE OBJECTIVES:
- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do’s and Don’t’s in life through Yam
- Categorize Do’s and Don’t’s in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA
Definitions of Eight parts of yog. ( Ashtanga )

UNIT II YAM
Do’s and Don’t’s in life.
Shaucha, santosh, tapa, swadhyay, ishwarpanidhan

UNIT III NIYAM
Do’s and Don’t’s in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN
Various yog poses and their benefits for mind & body

UNIT V PRANAYAM
Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do’s and Don’t’s in life through Yam
CO3 – Learn Do’s and Don’t’s in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

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1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. “Yogic Asanas for Group Training Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

COURSE OBJECTIVES:
- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9
Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9
Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9
Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

COURSE OUTCOMES:
CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

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1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s ThreeSatakam, Niti-sringar-vairagya, New Delhi, 2010
2. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016