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AIM:
To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES:
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z-transform techniques which will perform the same task for discrete time systems as Laplace techniques which will perform the same task for discrete time systems

UNIT I  FOURIER SERIES  9+3
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT II  FOURIER TRANSFORM  9+3

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  9+3
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  9+3
Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT V  Z-TRANSFORM AND DIFFERENCE EQUATIONS  9+3

L: 45, T: 15, TOTAL : 60 PERIODS

TEXT BOOK

REFERENCES
OBJECTIVE:
To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I  CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS  9

UNIT II  HEAT TREATMENT  9

UNIT III  FERROUS AND NON FERROUS METALS  9
Effect of alloying additions on steel (Mn, Si, Cr, Mo, V, Ti & W)- classification of steels ( tool steel, stainless)– cast irons – alloy cast irons- Copper and Copper alloys – Aluminum and its alloys- Magnesium and its alloys– Titanium and its alloys- Nickel and Cobalt alloys, properties and applications of these materials.

UNIT IV  NON-METALLIC MATERIALS  9
Types, properties and applications: Polymers, Ceramics and Composites– Superconductors- nanomaterials and their properties.

UNIT V  MECHANICAL PROPERTIES AND TESTING  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To provide knowledge in the area of electrical drives and their control techniques

PREREQUISITE:
Basic Electrical Engineering

OBJECTIVE:
To impart knowledge on
- Basics of electric drives
- Different speed control methods
- Various motor starters and controllers
- Applications

UNIT I INTRODUCTION

UNIT II SPEED CONTROL OF DC MACHINES

UNIT III SPEED CONTROL OF AC MACHINES
Induction motor – Speed torque Characteristics – pole changing, stator frequency variation - slip-ring induction motor – stator voltage variation - Rotor resistance variation, slip power recovery – basic inverter circuits- variable voltage frequency control.

UNIT IV MOTOR STARTERS AND CONTROLLERS

UNIT V HEATING AND POWER RATING OF DRIVE MOTORS
Load diagram, over load capacity, insulating materials, heating and cooling of motors, service condition of electric drive – continuous, intermittent and short time – industrial application.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 8

UNIT II TRANVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 13

UNIT III TORSION 6
Stresses and deformation in circular and hollows shafts – Stepped shafts – Shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

UNIT IV DEFLECTION OF BEAMS 10
Double Integration method – Macaulay’s method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam and energy method – Maxwell’s reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses – deformation in thin cylinders –spherical shells subjected to internal pressure – deformations in spherical shells - Lame’s theory – application of theories of failure

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and torques acting on simple mechanical systems.
- To understand the importance of balancing and vibration.

UNIT I  KINEMATIC OF MECHANICS  10

UNIT II  GEARS AND GEAR TRAINS  9

UNIT III  FRICTION  8

UNIT IV  FORCE ANALYSIS  9

UNIT V  BALANCING AND VIBRATION  9

TEXT BOOKS

REFERENCES

STANDARDS
AIM:
To provide the coverage of the breadth and depth of the field of manufacturing. So that students can become familiar with some of the basic metal cutting, and related machining process.

OBJECTIVES:
At the end of this course the student should be able to understand

- Methods to solve problems on cutting forces, tool life and analytical methods of estimating cutting temperature.
- Constructional features of lathe, drilling, shaper, planer, boring, broaching, and grinding machines, accessories and common operations performed on these machines.
- Machine tool structures, erection and testing of machine tools
- Concept of automation of machine tools.

UNIT I  FUNDAMENTALS OF METAL CUTTING  9

UNIT II  BASIC MACHINING PROCESSES  12

UNIT III  GRINDING AND FINISHING OPERATIONS  8

UNIT IV  GEAR CUTTING  8
Gear cutting methods-Kinematics of gear shaping and gear hobbing – template gear cutting methods-Gear generation principles specifications - Bevel gear generator – Gear finishing methods-gear grinding –lapping

UNIT V  MACHINE TOOL STRUCTURE AND AUTOMATION  8
Classification Machine tool structures-Vibration and chatters in machining-erecting and testing of machine tools-Automation: Cam controlled automats, single spindle and multi spindle automats - Swiss type, automatic screw mechanism - Feeding mechanism Transfer mechanism, Tracer controller mechanism.

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

CE9214 STRENGTH OF MATERIALS LABORATORY

OBJECTIVE:
To study the properties of materials when subjected to different types of Loading.

LIST OF EXPERIMENTS
1. Tension test on mild steel rod.
2. Double shear test on metals.
3. Torsion test on mild steel rod.
4. Impact test on metal specimen.
5. Hardness test on metals.
6. Compression test on helical spring
7. Deflection test on carriage spring.

TOTAL : 45 PERIODS

EE9212 ELECTRICAL ENGINEERING & MEASUREMENTS

AIM
To provide the practical knowledge and control methods of electrical machines

OBJECTIVE
To impart practical knowledge on
• Characteristic of different machines
• Method of speed control of machines
• Measurement of various electrical parameters

LIST OF EXPERIMENTS
1. Study of DC & AC Starters
2. Study of Transducers
3. Wheatstone Bridge and Schering Bridge
4. ADC and DAC Converters
5. Speed Control of DC Shunt Motor
6. Load Test on DC Shunt Motor
7. OCC & Load Characteristics of DC Shunt Generator
8. Load Test on Single-Phase Transformer
9. Load Test on Three-Phase Induction Motor
10. Load Test on Single-Phase Induction Motor.

TOTAL : 45 PERIODS
ME9204 MANUFACTURING TECHNOLOGY LABORATORY - I  LT P C 0 0 3 2

OBJECTIVE
Student should have knowledge on common basic machining operations

LIST OF EXPERIMENTS
Measurement of the Machined Components and Machining time estimation of:

1. Taper Turning
2. External thread cutting
3. Internal thread cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Drilling and Tapping

TOTAL : 45 PERIODS

REFERENCES

MF9202 METALLURGY AND NON DESTRUCTIVE TESTING LABORATORY  L T P C 0 0 2 1

OBJECTIVES
To gain practical knowledge in
- Microstructure analysis of various steels, Cast Iron and Non ferrous Materials.
- Heat Treatment of steels
- Creep and formability tests and
- Important Non Destructive Tests.

LIST OF EXPERIMENTS
1. Microstructure analysis of steel (Mild, Medium carbon, High carbon, Hardened & Spheroidised Steel), Cast iron
2. Sintering processes
3. Microstructure analysis of Non ferrous alloys
4. Heat treatment of steel
5. Creep test
6. Formability test
7. Cooling curve experiment
8. Liquid penetrant test
9. Ultrasonic flaw detection
10. Magnetic particle testing
11. Eddy current testing.

TOTAL : 30 PERIODS
AIM:
This course aims at providing the required skill to apply the statistical tools in engineering problems.

OBJECTIVES:
- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomena.
- Have the notion of sampling distributions and statistical techniques used in management problems.

UNIT I RANDOM VARIABLES 9 + 3
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9 + 3
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 9 + 3

UNIT IV DESIGN OF EXPERIMENTS 9 + 3
Completely randomized design – Randomized block design – Latin square design - 22 - factorial design.

UNIT V STATISTICAL QUALITY CONTROL 9 + 3
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

T : 45 + 15, TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To give the insight, principles of basic forming, casting and joining processes to the student. So that they will be able to analyze the merits and limitations of each processes while making process selection.

OBJECTIVE:
- At the end of this course the student should be able to understand
- The tools, equipment and principle of operation of primary and secondary manufacturing processes.
- Defects, causes and their remedies of welding, casting and metal forming operations.
- Processing of plastics and fabrication of various types composite material.
- Equipment, principle of operation of non traditional machining and forming processes.

UNIT I  CASTING PROCESSES  9

UNIT II  METAL FORMING PROCESSES  9
Hot working & Cold working of metals – Forging Machines - Forging operations– Rolling Types of Rolling mills – Rolling operations – Extrusion – Extrusion processes– Rod, wire and tube drawing - Bending – Principle & types- Deep drawing – Principle & Types Sheet metal forming operations such as squeezing, spinning, peen , stretch forming and super plastic forming.

UNIT III  FABRICATION PROCESSES  9

UNIT IV  PROCESSING OF PLASTICS AND COMPOSITES  9

UNIT V  UNCONVENTIONAL METHODS OF MANUFACTURING  9

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

CE9211 FLUID MECHANICS AND MACHINERY
(Common for Manufacturing, Mechanical, Mining and Industrial Engineering)

AIM:
The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.

OBJECTIVES:
- The applications of the conservation laws to flow through pipes and hydraulics machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I INTRODUCTION
Units and dimensions, Properties of fluids – specific gravity, specific weight, viscosity, compressibility, vapor pressure and gas laws – Capillarity and surface tension – Flow characteristics: Concepts of system and control volume. Application of control volume to continuity equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III DIMENSIONAL ANALYSIS
Dimensions and units; Buckingham’s Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

UNIT IV ROTODYNAMIC MACHINES

UNIT V POSITIVE DISPLACEMENT MACHINES

T: 45 + 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

ME9261 MACHINE DESIGN L T P C
3 1 0 4

OBJECTIVE
- To familiarise the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data.
- To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS

UNIT II DESIGN OF SHAFTS AND COUPLINGS

UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS

UNIT IV DESIGN OF ENERGY STORING ELEMENTS
Design of various types of springs, optimization of helical spings – rubber springs – Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS
Sliding contact and rolling contact bearings – Design of hydrodynamic journal bearings, McKee’s Eqn., Sommerfield Number, Raimondi & Boyd – Selection of Rolling Contact bearings – Design of Seals and Gaskets – Design of Connecting Rod.

L : 45, T : 15, TOTAL : 60 PERIODS
Note : (Use of PSG Design Data Book is permitted in the University examination)

TEXT BOOKS

REFERENCES

STANDARDS

ME9215 THERMODYNAMICS L T P C
4 0 0 4

AIM:
To impart the importance of thermal science aspects in the field of manufacturing engineering.

OBJECTIVES:
- To understand the basic laws of thermodynamics and heat transfer.
- To understand the principle of operation of thermal equipments like IC engine, boilers, turbine and refrigerator etc.

UNIT I BASIC CONCEPTS OF THERMODYNAMICS

UNIT II FIRST AND SECOND LAW OF THERMODYNAMICS

UNIT III HEAT ENGINES
UNIT IV  GASES AND VAPOUR MIXTURES  9

UNIT V  HEAT TRANSFER  9

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

MF9252  ENGINEERING METROLOGY  LT P C  3 0 0 3

AIM:
To give a thorough knowledge of measurement and instrumentation of increasing importance in industry. The student will be knowledgeable in various standards and proliferation of computerized and automated inspecting techniques along with the classical metrology.

OBJECTIVE:
To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries. Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

UNIT I  BASIC CONCEPTS OF MEASUREMENTS  8

UNIT II  LINEAR AND ANGULAR MEASUREMENTS  9

UNIT III  FORM MEASUREMENTS  9
UNIT IV  OPTICAL MEASUREMENTS

UNIT V  ADVANCES IN METROLOGY

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

ME9256  MANUFACTURING TECHNOLOGY LAB - II

AIM:
To acquire skills on common basic machining operations and press working

OBJECTIVE:
To study and practice the basic machining operations in the special purpose machines and acquire its applicability in the real time components manufacturing industries.

LIST OF EXPERIMENTS
1. Contour Milling using vertical milling machine
2. Gear Cutting & Gear Hobbing
3. Hexagonal Machining using Horizontal Milling Machine
4. Gear Cutting – Gear Shaping
5. Spline Broaching
6. Exercise in Surface Grinding
7. Exercise in Cylindrical Grinding
8. Exercise in Tool and Cutter Grinder
9. Spur and helical gear cutting in Milling Machine
10. Determination of cutting forces in Milling Machine
11. Study of Turret and Capstan lathe
12. Forming of Simple Components in Press Working and simple Calculations of sheet metal work

TOTAL : 45 PERIODS
REFERENCES

CE9212 FLUIDS MECHANICS AND MACHINERY LABORATORY LT P C 0 0 3 2

AIM:
To perform experiments on various types of pumps and turbines to understand their characteristics.

OBJECTIVES:
- To understand the concepts flow through different cross sections.
- To understand and draw characteristics of various pumps.
- To understand and draw performance characteristics of different turbines.

UNIT I FLOW MEASUREMENT

UNIT II PUMPS
Determination of performance characteristics of pumps – centrifugal pumps, submersible pumps, turbine pumps and positive displacement pumps – reciprocating and gear pumps.

UNIT III TURBINES
Determination of performance characteristics of turbines – reaction turbines and impulse turbines.

REFERENCE
1. CWR, Hydraulics Laboratory Manual, 2004

TOTAL : 45 PERIODS

ME9307 DYNAMICS LABORATORY LT P C 0 0 3 2

AIM:
To apply the knowledge gained in kinematics and dynamics of machines to real system.

OBJECTIVES:
- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS:
1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies.
b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
b). Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
c) Determination of transmissibility ratio using vibrating table.

Students should be familiar with the use of the following device/equipments depending upon availability.

1. Tachometers – Contact and non contact
2. Dial gauge
3. Stroboscope
4. Accelerometers – Vibration pickups
5. Displacement meters.
6. Oscilloscope
7. Vibration Shaker
8. F.F.T. Analyzer, and

TOTAL : 45 PERIODS
UNIT I  FUNDAMENTALS OF MACHINE DRAWING  8
Code of practice for Machine Drawing – Conventions, Abbreviation and Symbols
Sectional views – Types of sectional views Selection of Fits and Tolerances – Method of
placing limit dimensions.

UNIT II  BASIC MACHINE ELEMENTS  24
The required sectional view of the following machine elements are to be drawn as per
the standards.
Threaded joints
Riveted joints
Welded joints
Key, Cotter and Pin joints
Shaft coupling
Bearing
Pipe joints
Gears
Surface finish and its representation

UNIT III  ASSEMBLY DRAWING  28
The assembly drawing of the following machine tool parts is to be drawn from the given
detailed drawing.
Screw jack, machine vice, swivel bearing
Lathe tailstock, Lathe tool post- Tool head of a shaper
Drilling jig- Drilling machine spindle
Engine piston and connecting rod
Recirculating ball screw, LM guide ways,
Hydraulic and Pneumatic chuck of CNC machine.

TOTAL : 60 PERIODS

TEXT BOOK

REFERENCES
1. N.D.Bhatt, Machine drawing, published by RC Patel, Chartstar bookstall, Anand,
   India, 1997.

MF9301  CASTING AND WELDING TECHNOLOGY  3 0 0 3

AIM:
To impart knowledge on fundamentals of welding technology , cast design and
advanced welding and casting processes.

OBJECTIVE:
At the end of this course the student should be able to understand
• Melting procedure of various materials
• Design principles of welding and casting
• Principles of advanced welding and casting processes
• Automation of welding and casting plant
UNIT I  MELTING AND POURING  8
Principles of melting practice-fluxing- Degasification and inoculation- types of furnaces-
Crucibles, Cupola, Oil fired furnaces – Electric arc and induction furnaces –Melting
practice of cast iron, SG iron, steel, aluminum and copper alloys.

UNIT II  CASTING DESIGN  10
Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner
,gate and risers-problems in design and manufacture of thin and unequal sections
designing for directional solidification, minimum distortion and for overall economy -
design problems of L,T,V,X and Y junctions.

UNIT III  WELD DESIGN AND WELDING METALLURGY  10
Design of welded components-symbolic representation of welds on drawings- welding
classes-residual stresses in welds-weld distortions-design consideration-strength
consideration of welded joints-analysis of statistically loaded welded joints-welded
structures subjected to fatigue loads.

UNIT IV  SPECIAL CASTING AND WELDING PROCESSES  8
Evaporative pattern casting-ceramic mould casting –electro magnetic moulding-squeeze
casting –investment casting-shell moulding- PAW-electron beam welding-laser beam
welding- friction welding-ultrasonic welding – diffusion welding-high velocity oxy fuel
processes

UNIT V  QUALITY CONTROL AND AUTOMATION  9
Cleaning and inspection of castings – Casting defect and remedies – foundry
automations-moulding machines-Automation of sand plant, moulding and fettling
sections of foundry-Dust and fume control-Welding defects –causes and remedies – Non
destructive tests – arc welding using robots-weld positioner and manipulators –weld
seam tracking-vision system-arc sensing Welding

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
4.  HEINE, R.W., LOPER,L.R., and ROSENTHAL,C, Principles of Metal Casting, Tata
5.  MINKOFF,J., solidification and cast structure,wiley,1986

MF9302  METAL FORMING TECHNOLOGY  LT P C
AIM:  3 0 0 3
To impart knowledge in various metal forming process

OBJECTIVES:
At the end of this course the student should be able to understand
• The tools, equipment and principle of operation of primary and secondary
manufacturing processes.
• Defects, causes and their remedies of welding, casting and metal forming operations.
• Processing of plastics and fabrication of various types composite material.
• Methods to solve problems on cutting forces, tool life and analytical methods of estimating cutting temperature.

UNIT I  INTRODUCTION TO METAL FORMING  7
Classification of Forming Processes - Temperature in Metal working - Hot and Cold working - Introduction to the theory of Plastic Deformation.

UNIT II  THEORY AND PRACTICE OF BULK FORMING PROCESSES 15
Analysis of plastic deformation in Forging, Rolling, Extrusion and rod/wire drawing processes - Effect of friction, calculation of forces, work done - Process parameters, equipment used - Defects - applications - Recent advances in Forging, Rolling, Extrusion and drawing processes - Experimental techniques of evaluation of friction in metal forming.

UNIT III  SHEET METAL FORMING  9

UNIT IV  SPECIAL FORMING PROCESSES  7

UNIT V  POWDER METALLURGY FORMING  7
Overview of P/M technique - Advantages - applications - Powder preform forging - powder rolling - Tooling and process parameters.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

MF9303  PRECISION ENGINEERING  LT P C
3 0 0 3

AIM:
To enable this students to understand the concept of precision engineering, its principles and importance as applicable to instruments and machines.

OBJECTIVE:
To provide and enhance the technical knowledge in precision engineering, its components and applications.
UNIT I  PRECISION ENGINEERING  9

UNIT II  TOLERANCE AND FITS  8

UNIT III  ULTRA PRECISION MACHINE ELEMENTS  9

UNIT IV  MEMS  10

UNIT V  ERROR CONTROL  9

TOTAL : 45 PERIODS

TEXT BOOKS
2. Precision Engineering – R.L. Murthy

REFERENCE
1. Institute of Physics Publishing, Bristol and Philadelphia, Bristol, BSI 6BE U.K.

MF9304  COMPUTER AIDED DESIGN  LT PC  3 0 0 3

AIM:
To impart knowledge in the theoretical principles of Computer Aided Design

OBJECTIVE:
To familiarize the student with computer hardware and peripheral Devices, mathematics of computer graphics, geometric modeling, CAD standards And to impart fundamental knowledge in Finite Element Analysis

UNIT I  INTRODUCTION  5

UNIT II  COMPUTER GRAPHICS  9
UNIT III GEOMETRIC MODELLING

UNIT IV CAD STANDARDS

UNIT V FINITE ELEMENT ANALYSIS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

ME9303 HYDRAULICS AND PNEUMATICS L T P C 3 0 0 3

AIM:
To understand the basic of fluid power and its application in industrial automation.

OBJECTIVE:
This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic machines, components and systems and their application in recent automation revolution.

UNIT I FLUID POWER PRINCIPLES AND FUNDAMENTALS (REVIEW) 3

UNIT II HYDRAULIC SYSTEM AND COMPONENTS 13
UNIT III  HYDRAULIC CIRCUITS  9
Industrial hydraulic circuits- Regenerative, Pump Unloading, Double-pump, Pressure
Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-safe, Speed
control, Hydrostatic transmission, Accumulators, Electro hydraulic circuits, Mechanical
Hydraulic servo systems.

UNIT IV  PNEUMATIC SYSTEM  8
Compressors- Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust
valves, Pneumatic actuators, Servo systems. Introduction to Fluidics, Pneumatic logic
circuits.

UNIT V  DESIGN OF HYDRALIC AND PNEMATIC CIRCUITS  12
Designing the components of hydraulic system for Drilling, Planning, Shaping, Punching,
Press. – Selection, fault finding and maintenance of hydraulic components- Sequential
circuit design for simple application using cascade method, Electro pneumatic circuits.
Selection criteria of pneumatic components – Installation fault finding and maintenance
of pneumatic components. Microprocessor and PLC- Applications in Hydraulic and
Pneumatics- Low cost Automation – Hydraulic and Pneumatic power packs- case
studies.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
McGraw Hill, 2001

MF9305  CNC MACHINING TECHNOLOGY  L T P C
3 0 0 3

AIM:
To provide knowledge on principle, constructional features, programming, tooling and
work holding devices in CNC machine tools

OBJECTIVE:
Upon completion of this subject, student will be able to:
• Understand evolution and principle of CNC machine tools
• Describe constructional features of CNC machine tools
• Explain drives and positional transducers used in CNC machine tools
• Write simple programs for CNC turning and machining centres
• Generate CNC programs for popular CNC controllers
• Describe tooling and work holding devices for CNC machine tools

UNIT I  INTRODUCTION TO CNC MACHINE TOOLS  6
Evolution of CNC Technology, principles, features, advantages, applications, CNC and
DNC concept, classification of CNC Machines – turning centre, machining centre,
grinding machine, EDM, types of control systems, CNC controllers, characteristics,
interpolators– Computer Aided Inspection
UNIT II  STRUCTURE OF CNC MACHINE TOOL  10
CNC Machine building, structural details, configuration and design, guide ways – Friction, Anti friction and other types of guide ways, elements used to convert the rotary motion to a linear motion – Screw and nut, recirculating ball screw, planetary roller screw, recirculating roller screw, rack and pinion, spindle assembly, torque transmission elements – gears, timing belts, flexible couplings, Bearings.

UNIT III  DRIVES AND CONTROLS  9

UNIT IV  CNC PROGRAMMING  11
Coordinate system, structure of a part program, G & 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 such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages.

UNIT V  TOOLING AND WORK HOLDING DEVICES  9
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, economics of CNC, maintenance of CNC machines.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

MF9306  CAM LABORATORY  L T P C
0 0 4 2

AIM:
To provide practical knowledge in the area of CNC machine tools, PLC and Robots.

OBJECTIVE:
At the end of the course the student should understand
- Concepts of CNC programming and Machining on CNC turning center and Machining center
- Robot and PLC programming Methods
CNC LATHE
Programming, Simulation and Machining using the following features:
Straight & step turning - taper turning - thread cutting - machining of internal surface.

CNC MILLING
Programming, Simulation and Machining using the following features:
Linear, circular interpolation, pocket milling, slotting, peck drilling and other canned cycles
Generation of CNC program using CAM packages
Robot programming - Material handling applications
PLC ladder logic programming

TOTAL : 60 PERIODS

MF9307 METROLOGY LABORATORY
L T P C
0 0 2 1

AIM:
To acquire skills in measuring basic contact and contact measuring instruments

OBJECTIVE:
To make the students understand the fundamental principles of measuring techniques by practicing exercises on various measuring instruments.

LIST OF EXERCISES:
Contact methods:
1. Linear and Angular measurement using Autocollimator.
3. Calibration of optical comparator and measurement of dimension
4. Determining the accuracy of electrical and optical comparator.

Non-contact measurement techniques:
3. Experiments in CMM.

TOTAL : 30 PERIODS

MF9308 CAD LABORATORY
L T P C
0 0 2 1

AIM:
To provide practical knowledge in Computer aided modeling and assembly

OBJECTIVE:
To impart hands on experience to students in Geometric Modeling, Assembly and Engineering Drafting.
1. SKETCHER
   Introduction- Basic sketch, Constraints – Geometry & Dimensional.

2. SOLID MODELING
   Extrude, Revolve, Sweep, Loft, Datum plane creation etc.

3. SURFACE MODELING
   Extrude & Revolve surfacing, Advance surfacing technique – Ruled & Loft surfacing,
   Mesh of curves, Free form surfaces, Surface operations – trium, merge, intersect, etc.

4. FEATURE MANIPULATION
   Copy, Edit, Pattern, Suppress, History operations etc.

5. ASSEMBLY
   Constraints, Patterns, exploded Views, Interference check, creating components from
   assembly, mass property calculations, BOM generations and assembly cut sections.

6. DRAFTING
   Standard view, Sectional views and Detailing, BOM and Balloon creation.

TOTAL : 30 PERIODS

MF9309  
TECHNICAL SEMINAR  
LT P C  
0 0 2 1

To enrich the communication skills of the student and presentations of technical topics of 
interest, this course is introduced. In this course, a student has to present three 
Technical papers or recent advances in engineering/technology that will be evaluated by 
a Committee constituted by the Head of the Department.

MG9362  
INDUSTRIAL MANAGEMENT  
LT P C  
3 0 0 3

AIM:
To provide a clear understanding of basic management principles that leads to corporate 
building.

OBJECTIVES:
- To develop Industrial Management deals with not only functions of management but 
  also organizational structure and dynamics.
- To develop modern concepts of Industrial Management

UNIT I  
INTRODUCTION  
Technology Management - Definition – Functions – Evolution of Modern Management – 
Scientific Management -Development of Management Thought. Approaches to the study 
of Management- Forms of Organization – Individual Ownership – Partnership – Joint 
Stock Companies – Co-operative Enterprises – Public Sector Undertakings, Corporate 
Frame Work – Share Holders – Board of Directors – Committees – Chief Executive – 
Union–
UNIT II FUNCTIONS OF MANAGEMENT

UNIT III ORGANIZATIONAL BEHAVIOUR

UNIT IV GROUP DYNAMICS

UNIT V MODERN CONCEPTS

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

ME9301 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

OBJECTIVES:
• To understand the functions and design principles of Jigs, fixtures and press tools
• To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES
Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – Locating methods and devices – Redundant Location –
Principles of clamping – Mechanical actuation – pneumatic and hydraulic actuation
Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

UNIT II JIGS AND FIXTURES
10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES
10

UNIT IV BENDING FORMING AND DRAWING DIES
10

UNIT V MISCELLANEOUS TOPICS
7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke - Course should be supplemented with visits to industries.
(Use of Approved design Data Book permitted).

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To enable the students to understand the importance of Computer Integrated Production Management System and related topics.

OBJECTIVE:
The course provides basic concepts of production planning and control, its bottlenecks, material requirement planning, shop floor control and different approaches to computer aided process planning in manufacturing sector.

UNIT I PRODUCTION PLANNING AND CONTROL 10

UNIT II MATERIAL REQUIREMENT PLANNING 10

UNIT III SHOP FLOOR CONTROL 7
Functions of shop floor control – order scheduling – order progress – Data logging and acquisition – Automated data collection – Control types – Sensor Technology.

UNIT IV COMPUTER AIDED PROCESS PLANNING 8

UNIT V APPROACHES TO CAPP 10

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To appreciate the need for and applications of numerical techniques for solving problems in mechanical Engineering.

OBJECTIVES:
- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I INTRODUCTION


UNIT II ONE-DIMENSIONAL PROBLEMS


UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS


UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION AND MISCELLANEOUS TOPICS

Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress problems - Matrix solution techniques – Solutions Techniques to Dynamic problems –

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To know the architecture, programming aspects application of 8085 microprocessor and microcontroller.

OBJECTIVE:
To impart knowledge on 8085 Microprocessor and 8051 Microcontroller and its applications. In addition the basic concepts and programming of 8085 Microprocessor and 8051 Microcontroller are introduced which are very much required in the emerging field of automation.

UNIT I 8085 MICROPROCESSOR 10

UNIT II TIMING DIAGRAM AND PROGRAMMING 8

UNIT III PERIPHERALS AND INTERFACING 12
Basic interfacing concepts-8255 Programmable Peripheral Interface- interfacing input keyboards- interfacing output display-interfacing memory-A/D and D/A Converters Interfacing.

UNIT IV 8051 MICROCONTROLLER 9
Introduction- Architecture of 8051- Pin configuration- Ports- External Memory- counters and Timers- Serial and Parallel Data I/O- Interrupts – Assembly language programming

UNIT V APPLICATIONS USING INTEL 8085 AND 8051 6

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
ME9358 MICROPROCESSOR AND MICRO CONTROLLER LABORATORY

AIM:
To impart the knowledge on assembly language programming in 8085 microprocessor, its interfacing and applications,

LIST OF EXPERIMENTS

1. Study of 8085 Microprocessor and 8051 Microcontroller trainer kits and identifying the components.
2. 8085 and 8051 Assembly language programs
   i) Arithmetic operation
   ii) Ascending/descending order and finding largest/smallest number in an array.
3. 8085 and 8051 Assembly Language Program for code conversion
   i) BCD to binary
   ii) binary to BCD
4. 8051 Assembly Language Program for timer operations.
5. Interfacing of 8 bit A/D and D/A converters using 8085 and 8051
6. Stepper motor interface using 8085 and 8051
7. Display unit interface with 8051 and 8051

TOTAL : 60 PERIODS

MF9352 ADVANCED MACHINE TOOLS LABORATORY

AIM:
To provide practical knowledge in Advanced machine tools

OBJECTIVE:
At the end of the course the students will be able to understand principle of working of advanced machine tools.

Simple exercises using the following machines:

1. CNC Wire cut EDM
2. CNC Precision grinding machine (surface and cylindrical)
3. CNC Laser engraving machine
4. Micro machining of 3D parts using
   a. Micro Turning
   b. Micro Milling
   c. Micro EDM
   d. Micro WEDM
   e. Micro WEDG
5. 3D Rapid Prototyping machine
6. CNC Machining centre
7. CNC Turning centre
8. Super finishing machines (Lapping and honing etc)
9. Ultrasonic welding machine

TOTAL : 60 PERIODS
AIM:
To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:
• To equip students of engineering and technology with effective speaking and listening skills in English.
• To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
• To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session

A. Career Lab (15 periods) Viewing and discussing audio-visual materials

1. Resume / Report Preparation / Letter Writing:
   Letter writing – Job application with Resume - Project report - Email etiquette.
2. Presentation skills:
   Elements of effective presentation – Structure of presentation - Presentation tools – Body language.
3. Soft Skills:
   Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.
4. Group Discussion:
   Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. Interview Skills:
   Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

TOTAL 30 PERIODS

II. Class Room Session

1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report.
2. Presentation Skills: Students make presentations on given topics.
3. Group Discussion: Students participate in group discussions.
4. Interview Skills: Students participate in Mock Interviews

Note: Classroom sessions are practice sessions.

REFERENCES:
5. David Evans, Decision maker, CUP, 1997

Lab Requirement:
1. Teacher console and systems for students.
2. English Language Lab Software
3. Tape recorders
AIM:
To develop the student efficient in optimizing using limited resources by knowledge in building different mathematical modeling and finding optimal solutions.

OBJECTIVE:
To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I  LINEAR MODELS  
15

UNIT II  TRANSPORTATION MODELS AND NETWORK MODELS  
8

UNIT III  INVENTORY MODELS  
6
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV  QUEUEING MODELS  
6
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  DECISION MODELS  
10

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
AIM
To understand the principles, techniques & components of Mechatronics system
And its design

OBJECTIVE
This syllabus is formed to create knowledge in Mechatronic systems and impart the
source of concepts and techniques, which have recently been applied in practical
situation. It gives a framework of knowledge that allows engineers and technicians to
develop an interdisciplinary understanding and integrated approach to engineering.

UNIT I INTRODUCTION
Introduction to Mechatronics- Systems- Concepts of Mechatronics approach-Need for
Mechatronics- Emerging area of Mechatronics- Classification of Mechatronics.

UNIT II SENSORS AND TRANSDUCERS
Introduction – Performance Terminology- Potentiometers-LVDT-Capacitance sensors-
Strain gauges- Eddy current sensor-Hall effect sensor- Temperature sensors- Light
sensors- Selection of sensors- Signal processing

UNIT III MOTION CONTROL AND MEASUREMENT SYSTEM
Control system- Open Loop and Feedback Control-Measurement system-Drives and
actuators-Control devices- Servo systems- Motion converters.

UNIT IV PROGRAMMABLE LOGIC CONTROLLERS
Introduction- Basic structure- Input and output processing- Programming- Mnemonics-
Timers, counters and internal relays- Data handling-Selection of PLC.

UNIT V DESIGN AND MECHATRONICS
Design process-stages of design process-Traditional and Mechatronics design
concepts- Case studies of Mechatronics systems- Pick and place Robot- Autonomous
mobile robot-Wireless surviellance balloon- Engine Management system- Automatic car
park barrier.

TOTAL : 45 PERIODS

TEXT BOOKS
   2003

REFERENCES
2. Devadas Shetty and Richard A.Kolk, “Mechatronics systems design”, PWS
4. Michael B.Histand and Davis G.Alciatore,” Introduction to Mechatronics and
   Hall, 1993.
AIM:
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

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

UNIT I  INTRODUCTION  9

UNIT II  TQM PRINCIPLES  9
Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS & TECHNIQUES I  9

UNIT IV  TQM TOOLS & TECHNIQUES II  9

UNIT V  QUALITY SYSTEMS  9

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
AIM:
To impart knowledge on group technology, simulation, computer control, automatic
manufacturing systems and factory of the future.

OBJECTIVE:
At the end of this course the student should be able to understand
• Modern manufacturing systems
• To understand the concepts and applications of flexible manufacturing systems

UNIT I  PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE
MANUFACTURING SYSTEMS  9
Introduction to FMS—development of manufacturing systems—benefits—major
elements—types of flexibility—FMS application and flexibility—single product, single
batch, n—batch scheduling problem—knowledge based scheduling system.

UNIT II  COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE
MANUFACTURING SYSTEMS  9
Introduction—composition of FMS—hierarchy of computer control—computer control of
work center and assembly lines—FMS supervisory computer control—types of software
specification and selection—trends.

UNIT III  FMS SIMULATION AND DATABASE  9
Application of simulation—model of FMS—simulation software—limitation—manufacturing
data systems—data flow—FMS database systems—planning for FMS database.

UNIT IV  GROUP TECHNOLOGY AND JUSTIFICATION OF FMS  9
Introduction—matrix formulation—mathematical programming formulation—graph
formulation—knowledge based system for group technology—economic justification of
FMS—application of possibility distributions in FMS systems justification.

UNIT V  APPLICATIONS OF FMS AND FACTORY OF THE FUTURE  9
FMS application in machining, sheet metal fabrication, prismatic component production—
aerospace application—FMS development towards factories of the future—artificial
intelligence and expert systems in FMS—design philosophy and characteristics for
future.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
Age International Ltd., 1994.
5. Taiichi Ohno, “Toyota production system: beyond large-scale production”,
MF9403 DESIGN AND FABRICATION PROJECT LT P C 0 0 6 3

The main objective was to give the students hands on training in the fabrication of one or more component working model which has been designed by them. The students may be grouped into small groups and work under a Project supervisor. The components to be fabricated may be decided in consultation with the Supervisor and if possible with an industry.

TOTAL : 90 PERIODS

ME9403 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY LT P C 0 0 3 2

AIM:
To acquire the skills needed to analyze and simulate engineering systems.

OBJECTIVES:
To give exposure to software tools needed to analyze engineering systems.
To expose the students to different applications of simulation and analysis tools.

LIST OF EXPERIMENTS

A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration and Laplace Transforms

B. ANALYSIS
1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of plane strain problems
4. Stress analysis of an axi-symmetric components
5. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
6. Mode frequency analysis of a 2 D component
7. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
8. Harmonic analysis of a 2D component
9. Transient analysis of spring mass system
10. Spectrum analysis of spring mass system
11. Thermal stress analysis of a axisymmetric component
12. Conductive heat transfer analysis of a 2D component
13. Convective heat transfer analysis of a 2D component

TOTAL : 45 PERIODS

ME 9404 MECHATRONICS LABORATORY LT P C 0 0 3 2

AIM:
To know the design, modeling & analysis of basic electrical, hydraulic & pneumatic systems using software and trainer kits.

OBJECTIVES:
1. Design and testing of the circuits such as
i) Pressure control valves
ii) Flow control valves
iii) Directional control valves

2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic hydraulics, pneumatic and electric circuits using software.
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC
5. Speed measurement using inductive pickup/Proximity sensor.
6. Temperature measurement using thermocouple, thermistor and RTD
7. Servo controller interfacing i) open loop ii) closed loop
8. PID controller interfacing
9. Computer controlled relays, solenoids and DC motors
10. Study of CMM based instrumentation
11. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using
12. LAB VIEW software

TOTAL : 45 PERIODS

MF9404 COMPREHENSION

To achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing processes, product and process control, computer integrated manufacture quality. The students work in groups and solve a variety of problems given to them. The problems given to the students should be of real life industrial problems selected by a group of faculty members of the concerned department. A minimum of three small problems have to be solved by each group of students. The evaluation is based on continuous assessment by a group of Faculty Members constituted by the Head of the Department.

TOTAL: 30 PERIODS

MF9451 PROJECT WORK

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

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.
AIM:
The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

OBJECTIVE:
The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

UNIT I INTRODUCTION

UNIT II CONCEPT GENERATION AND SELECTION

UNIT III PRODUCT ARCHITECTURE

UNIT IV INDUSTRIAL DESIGN

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
AIM:
To impart knowledge in various methods of Non Destructive Testing

OBJECTIVE:
On completion of this course, the students are expected to be conversant with

- Principles of various NDT techniques
- The equipment required for the NDT
- The mechanism involved in there NDT techniques
- Applications of NDT and recent trends in NDT

UNIT I LIQUID PENETRANT AND MAGNETIC PARTICLE INSPECTION 9
Liquid penetrant systems – processing cycles – inspection of surface defects –
Generation of Magnetic fields – Magnetic particle inspection equipments –
Demagnetization – Applications and limitations.

UNIT II RADIOGRAPHY 11
Production of x-rays – Characteristic rays and white ray – Tube current and Voltage –
Sources of 8 rays – Half life period – Penetrating power – Absorption of x and y rays –
Radiation contrast and film contrast – exposure charts – pentameters and sensitivity –
Safety.

UNIT III EDDY CURRENT INSPECTION 7
Eddy current production – Impedance concepts – Inspection of magnetic materials –
Inspection of non magnetic materials – influences of various parameters – Advantages
and limitations.

UNIT IV ULTRASONIC TESTING 10
Production of ultrasonic waves – Different types of waves – normal beam inspection –
Angle beam inspection – thickness measurements – Applications.

UNIT V RECENT TECHNIQUES 8
Non destructive inspection– Instrumentation for non destructive testing – Principles of
holography– Principle of acoustic emission – Applications of holographic techniques–
advantages and limitations – Other techniques.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
3. Proceedings of the 10th International Acoustic Emission Symposium, Japanese
   Society for Non Destructive Inspection, Sendai, 1990.
AIM:
To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields.

OBJECTIVE:
Generating a good understanding of RP history, its development and applications.
To expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

UNIT I  INTRODUCTION  8

UNIT II LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS 10
Classification – Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

UNIT III POWDER BASED RAPID PROTOTYPING SYSTEMS 10

UNIT IV MATERIALS FOR RAPID PROTOTYPING SYSTEMS 10

UNIT V REVERSE ENGINEERING AND NEW TECHNOLOGIES  7
Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications - Case study.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To teach the various aspects of simulation and its applications

OBJECTIVES:
- To understand the importance and advantages of applying simulation techniques for solving various problems on discrete event systems.
- To teach various random number generation techniques, its use in simulation, tests and validity of random numbers etc. Development of simulation models, verification, validation and analysis. Introduction to various simulation languages and comparison

UNIT I  INTRODUCTION
Concept of simulation – simulation as a decision making tool-Monte Carlo simulation.

UNIT II  RANDOM NUMBERS/VARIATES
Pseudo random numbers – methods of generating random variates – random variates for uniform, normal, binominal, passion, exponential distributions.

UNIT III  DESIGN OF SIMULATION EXPERIMENTS
Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation – development of models using higher level languages for systems like queuing, production, inventory and maintenance – output analysis and interpretation, validation.

UNIT IV  DISCRETE SYSTEM SIMULATION LANGUAGES
Need for simulation language – Comparison of simulation languages: SIMSCRIPT, GASP, SIMULA, GPSS, PROMODEL, etc...

UNIT V  CASE STUDIES USING SIMULATION LANGUAGES
Development of simulation models using the simulation language studies for systems for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

WEB REFERENCE BOOK
1. http:www.bcnn.net
MF9025 QUALITY CONTROL AND RELIABILITY ENGINEERING

AIM:
To impart knowledge about Quality, controlling methods and reliability

OBJECTIVE:
- Teach the essentiality of SQC, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques.
- Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

UNIT I STATISTICAL QUALITY CONTROL
Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes - Cumulative sum and Exponentially weighted moving average control charts - Other SPC Techniques - Process - Capability Analysis - Six sigma concept.

UNIT II ACCEPTANCE SAMPLING
Acceptance Sampling Problem - Single sampling plans for attributes – double sampling - multiple sampling - sequential sampling - Military standards - The Dodge Roming sampling plans - Random sampling.

UNIT III RELIABILITY ENGINEERING
Definition of reliability – Performance and reliability - Reliability requirements – System life cycle – Mean time between failures – Mean time to failure - Mortality Curve - Availability – Maintainability.

UNIT IV FAILURE DATA ANALYSIS

UNIT V RELIABILITY PREDICTION AND MANAGEMENT

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To impart knowledge in process planning, cost estimation and budgeting

OBJECTIVE:
At the end of this course the student should be able to understand
- Traditional process planning and need methods of computer aided process planning
- Importance and procedure of costing
- Elements of costing
- Budgeting and decision making
- Cost estimation of various manufacturing methods

UNIT I  PROCESS PLANNING

UNIT II  ESTIMATION AND COSTING

UNIT III  ELEMENTS OF COSTS

UNIT IV  COST ECONOMICS
Budget – Essentials of budgeting – Types of Budgets – Budgetary control – Objectives – Benefits – Measures of cost economics – Make or buy decision and Analysis

UNIT V  PRODUCT COST ESTIMATION

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To provide sound knowledge in plastics, composites and their processing

OBJECTIVE:
To impart sound knowledge in
- Types of plastics, their structure, properties and applications
- Processing, machinery and joining of plastics
- Processing of Polymer Matrix and Metal Matrix Composites and their applications.

UNIT I  INTRODUCTION TO PLASTICS AND COMPOSITES  7

UNIT II  PROCESSING OF PLASTICS  9

UNIT III  MACHINING AND JOINING OF PLASTICS  7
General Machining properties of plastics – Machining Parameters and their effect – Joining of Plastics – Mechanical Fasteners – Thermal bonding – Press Fitting.

UNIT IV  PROCESSING OF POLYMER MATRIX COMPOSITES  13

UNIT V  PROCESSING OF METAL MATRIX COMPOSITES  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To impart knowledge in nuclear physics and nuclear reactions

OBJECTIVE:
To impart knowledge in the nuclear physics, materials and manufacturing methods of nuclear reactors and its safety aspects.

UNIT I  NUCLEAR PHYSICS  7

UNIT II  NUCLEAR REACTIONS AND REACTOR MATERIALS  7
Mechanism of fission and fusion – radio activity – Chain Reactions – Critical mass and composition – Nuclear fuel cycles and its characteristics – Uranium production and purification Zirconium, thorium, beryllium.

UNIT III  REPROCESSING  12
Nuclear fuel cycles – spent fuel characteristics – Role of solvent Extraction in reprocessing – Solvent extraction equipment.

UNIT IV  NUCLEAR REACTIONS  9

UNIT V  SAFETY, DISPOSAL AND PROFILERATION  10

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To teach various methods of maintenance and planning methods

OBJECTIVE:
At the end of this course the student should be able to understand
• To understand maintenance concepts
• To understand the modern practices in maintenance

UNIT I MAINTENANCE CONCEPTS
Objectives and functions – Tero technology – Reliability Centered Maintenance (RCM) –
maintainability prediction – availability and system effectiveness - maintenance costs –
maintenance organization

UNIT II MAINTENANCE MODELS
Minimal repair – maintenance types – balancing PM and breakdown maintenance- PM
schedules: deviations on both sides of target values – PM schedules: functional
characteristics – replacement models

UNIT III TOTAL PRODUCTIVE MAINTENANCE
Zero breakdowns – Zero Defects and TPM – maximizing equipment effectiveness –
autonomous maintenance program – five pillars of TPM – TPM small group activities –
TPM organization – management decision – educational campaign – creation of
organizations – establishment of basic policies and goals – formation of master plan. -
TPM implementation

UNIT IV MAINTENANCE LOGISTICS
Human factors in maintenance – maintenance manuals – maintenance staffing methods
– queuing applications – simulation – spare parts management – maintenance planning
and scheduling

UNIT V ONLINE MONITORING
Condition Monitoring Techniques– Vibration Monitoring, Signature Analysis – Wear
Debris Monitoring – Maintenance Management Information System - Expert systems –
Corrosion Monitoring and Control

TOTAL : 45 PERIODS

TEXT BOOKS
2. Gopalakrishnan, P. and Banerji, A.K., Maintenance and Spare Parts Management,

REFERENCES
2. Shirose, K., “Total Productive Maintenance for Workshop Leaders”, Productivity
AIM:
The purpose of this subject is understand the principles of various micro fabrication processes.

OBJECTIVES:
Upon completion of this subject, student will be able to:
- Understand principle of microsystems and feed back systems
- Know the different methods of microfabrication.
- Understand the properties and microstructure of materials
- Appreciate Integration processes in detail
- Enhance his knowledge in semiconductor manufacturing processes.

UNIT I  INTRODUCTION  8
Introduction to Micro System design, Material properties, micro fabrication technologies.
Structural behavior, sensing methods, micro scale transport - feed back systems.

UNIT II  MICROMECHANICS  9
Microstructure of materials, its connection to molecular structure and its consequences on macroscopic properties – Phase transformations in crystalline solids including martensite, ferroelectric, and diffusional phase transformations, twinning and domain patterns, smart materials

UNIT III  BASIC MICRO-FABRICATION  10
Bulk Processes – Surface Processes – Sacrificial Processes and Bonding Processes–
Special machining: Laser beam micro machining – Electrical Discharge Machining –
Ultrasonic Machining – Electro chemical Machining. Electron beam machining.

UNIT IV  MECHANICAL MICROMACHINING  10
Theory of micromachining – Chip formation – Size effect in micromachining –
microturning, micromilling, microdrilling - Micromachining tool design – Precision
Grinding – Partial ductile mode grinding – Ultraprecision grinding – Binderless wheel –
Free form optics.

UNIT V  SEMI CONDUCTORS MANUFACTURING  8
Basic requirements - clean room – yield model – Wafer IC manufacturing – feature micro
fabrication technologies – PSM – IC industry – New Materials – Bonding and layer
transfer – devices – micro fabrication industries.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
AIM:
To provide in-depth knowledge in various elements of Industrial Robotics

OBJECTIVE:
The objective of this course is to impart knowledge in the fundamentals of Industrial Robotics, viz. Robot Anatomy, Drives, Sensors, end effectors, Robot kinematics and programming.

UNIT I: FUNDAMENTALS OF ROBOT 8

UNIT II: ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

UNIT III: SENSORS AND MACHINE VISION 10
Requirements of a sensor, Principles and Applications of the following types of Sensors – Types of sensors – contact and non-contact sensors.

UNIT IV: ROBOT KINEMATICS AND ROBOT PROGRAMMING 9
Homogeneous Transformation equation – DH representation - Forward kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of manipulators with Three Degrees of Freedom, Six Degrees of freedom – Deviations and problems.
Lead Through Programming, Robot Programming Languages – VAL programming – Motion Commands, Sensor Commands, End Effector commands and simple programs.

UNIT V: IMPLEMENTATION AND ROBOT ECONOMICS 9

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
AIM:
To give the basic principles, structure and application of different types of logical systems, softwares and knowledge representations.

OBJECTIVE:
The objective of this course is to familiarize the students in the basic principles of Artificial Intelligence and important topics such as Heuristics, game playing, knowledge representation.

UNIT I  INTRODUCTION  10

UNIT II  GAME PLAYING  8

UNIT III  KNOWLEDGE REPRESENTATION  10

UNIT IV  KNOWLEDGE REPRESENTAION USING OTHER LOGIC  8

UNIT V  STRUCTURAL REPRESENTATIONS OF KNOWLEDGE  9

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES
OBJECTIVES:
- To understand the fundamental knowledge on vibrating systems.
- To understand how to model the physical vibrating systems mathematically and the basic behavior of vibration measuring instruments and their industrial applications.
- To understand the fundamental of noise and its control.

UNIT I INTRODUCTION

UNIT II TWO DEGREE OF FREEDOM SYSTEMS

UNIT III MULTI DEGREE OF FREEDOM SYSTEMS

UNIT IV VIBRATION MEASUREMENT

UNIT V FUNDAMENTALS OF NOISE
Sources of noise –noise terminology and concepts.- noise measurements – Systematic approach to diagnosing and correcting noise-Managing - Noise and Vibration at Work-Noise control methods

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To teach the concepts of value engineering as applied in industries

OBJECTIVE:
- To understand and analyse the theory and methodology of Value Engineering with the Guidelines, Performa and Checklist for a systematic, step by step application of the technique to the current industrial problems.
- To provide the knowledge about Reengineering Principles, the various models and implementation method, which are adopted in the industries.

UNIT I  FUNDAMENTALS OF VALUE ENGINEERING  8
Value Types – How to add value job plan – Technique employed – who will do value engineering – Organizing the value engineering study – Benefits.

UNIT II  STEP BY STEP APPLICATION OF JOB PLAN  10

UNIT III  WORK SHEETS AND GUIDE LINES  9

UNIT IV  REENGINEERING PRINCIPLES  10

UNIT V  IMPLEMENTATION OF REENGINEERING  8

TOTAL : 45 PERIODS

TEXT BOOKS
2. Del L.Younker, “Value Engineering” Marcel Dekker, Inc. 2003

REFERENCE
AIM:
To import knowledge on electronics manufacturing and packaging technology.

OBJECTIVE:
Upon the completion of the subject, student will be able to:
- Understand wafer preparation and PCB fabrication
- Know the types of Mounting Technologies and components for electronics assembly
- Appreciate SMT process in detail.
- Know various Defects, Inspection Equipments SMT assembly process.
- Learn repair, rework and quality aspects of Electronics assemblies.

UNIT I  INTRODUCTION TO ELECTRONICS MANUFACTURING  8
History, definition, wafer preparation by growing, machining, and polishing, diffusion, microlithography, etching and cleaning, Printed circuit boards, types- single sided, double sided, multi layer and flexible printed circuit board, design, materials, manufacturing, inspection.

UNIT II  COMPONENTS AND PACKAGING  8
Introduction to packaging, types-Through hole technology(THT) and Surface mount technology(SMT), Through hole components – axial, radial, multi leaded, odd form. Surface-mount components- active, passive. Interconnections - chip to lead interconnection, die bonding, wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, miniaturization and trends.

UNIT III  SURFACE MOUNT TECHNOLOGY PROCESS  12
Introduction to the SMT Process, SMT equipment and material handling systems, handling of components and assemblies - moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - solder paste material, storage and handling, stencils and squeegees, process parameters, quality control. Component placement- equipment type, flexibility, accuracy of placement, throughput, packaging of components for automated assembly, Cp and Cpk and process control. soldering- reflow process, process parameters, profile generation and control, solder joint metallurgy, adhesive, underfill and encapsulation process - applications, materials, storage and handling, process and parameters.

UNIT IV  INSPECTION AND TESTING  9
Inspection techniques, equipment and principle - AOI, X-ray. Defects and Corrective action - stencil printing process, component placement process, reflow soldering process, underfill and encapsulation process, electrical testing of PCB assemblies- In circuit test, functional testing, fixtures and jigs.

UNIT V  REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES  7
Repair tools, methods, rework criteria and process, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES
6. www.ipc.org
7. www.smta.org

ML9254 POWDER METALLURGY LT P C
3 0 0 3

OBJECTIVE:
- This course teaches powder preparation, characterization, compaction and sintering.
- This knowledge is essential to understand powder metallurgy applications in aerospace, automobile and machining materials.

UNIT I CHARACTERISTICS AND TESTING OF METAL POWDERS 10
Sampling, chemical composition purity, surface contamination etc. Particle size and its measurement, Principle and procedure of sieve analysis, microscopic analysis: sedimentation, elutriation, permeability, adsorption methods and resistivity methods: particle shape, classifications, microstructure, specific surface area, apparent and tap density, green density, green strength, sintered compact density, porosity, shrinkage.

UNIT II POWDER MANUFACTURE AND CONDITIONING 10
Mechanical methods: Machine milling, ball milling, atomization, shotting. Chemical methods: condensation, thermal decomposition, carbonyl reduction by gas-hydride, dehydride process, electro deposition, precipitation from aqueous solution and fused salts, hydrometallurgical method. Physical methods: Electrolysis and atomization processes, types of equipment, factors affecting these processes, examples of powders produced by these methods, applications, powder conditioning, heat treatment, blending and mixing, types of equipment, types of mixing and blending.

UNIT III POWDER COMPACTION 7
Pressureless compaction: slip casting and slurry casting. Pressure compaction lubrication, single ended and double ended compaction, isostatic pressing, powder rolling, forging and extrusion, explosive compaction.

UNIT IV SINTERING 8
Stage of sintering, property changes, mechanisms of sintering, liquid phase sintering and infiltration, activated sintering, hot pressing and Hot Isostatic Pressing HIP, vacuum sintering, sintering furnaces and sintering atmosphere, finishing operations – sizing, coining, repressing and heat treatment.

UNIT V APPLICATIONS 10

TOTAL : 45 PERIODS
TEXT BOOKS

REFERENCES

IE9035 SUPPLY CHAIN MANAGEMENT

OBJECTIVE:
To cover the basics of supply chain concepts, associated networks, tools and techniques required for evaluating various supply chain processes.

UNIT I STRATEGIC FRAMEWORK
Objective, decision phases, process views, examples, strategic fit, supply chain drivers and metrics

UNIT II SUPPLY CHAIN NETWORKS
Distribution networks, Facility networks and design options, Factors influencing, Models for facility location and capacity allocation, Transportation networks and design options, Evaluating network design decisions

UNIT III MANAGING DEMAND AND SUPPLY IN A SUPPLY CHAIN
Predictable variability in a supply chain, Economies of scale and uncertainty in a supply chain – Cycle and safety inventory, Optimum level of product availability, Forward Buying, Multi-echelon cycle inventory

UNIT IV SOURCING AND PRICING IN A SUPPLY CHAIN
Cross-Functional drivers, Role of sourcing in a supply chain, Logistics providers, Procurement process, Supplier selection, Design collaboration, Role of Pricing and Revenue Management in a supply chain

UNIT V INFORMATION TECHNOLOGY AND COORDINATION IN A SUPPLY CHAIN
The role of IT in supply chain, The supply chain IT frame work, Customer Relationship Management, Supplier relationship management, Future of IT in supply chain, EBusiness in supply chain, Bullwhip effect – Effect of lack of co-ordination in supply chain, Building strategic partnerships, CPFR

TOTAL : 45 PERIODS

TEXT BOOK
REFERENCES

ME9022 NEW AND RENEWABLE SOURCES OF ENERGY LT P C
3 0 0 3

AIM:
To instruct the importance of renewable energy and its utilization for the thermal and electrical energy needs and also the environmental aspects of these resources.

OBJECTIVE:
At the end of the course, the student expected to understand and analyze the pattern of renewable energy resources. Suggest methodologies / technologies for its utilization. Economics of the utilization and environmental merits.

UNIT I SOLAR ENERGY 9

UNIT II WIND ENERGY 9

UNIT III BIO-ENERGY 9

UNIT IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY 9

UNIT V NEW ENERGY SOURCES 9
Hydrogen, generation, storage, transport and utilisation, Applications: power generation, transport – Fuel cells – technologies, types – economics and the power generation.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To give exposure to interrelation between design and manufacture.

OBJECTIVES:
- To understand the principles of design such the manufacturing of the product is possible.
- Various design aspects to be considered for manufacturing the products using different processes.

UNIT I DESIGN FOR MANUFACTURING APPROACH AND PROCESS
Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment. Taguchi method, robustness assessment, manufacturing process rules, designer's tool kit, Computer Aided group Technology, failure mode effective analysis, Value Analysis. Design for minimum number of parts, development of modular design, minimizing part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poka Yoke principles.

UNIT II GEOMETRIC ANALYSIS
Surface finish, review of relationship between attainable tolerance grades and difference machining processes. Analysis of tapers, screw threads, applying probability to tolerances.

UNIT III FORM DESIGN OF CASTINGS AND WELDMENTS
Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols.

UNIT IV MECHANICAL ASSEMBLY
Selective assembly, deciding the number of groups, control of axial play, examples, grouped datum systems - different types, geometric analysis and applications – design features to facilitate automated assembly.

UNIT V TRUE POSITION THEORY
Virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM:
To impart the knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.

OBJECTIVE:
- To introduce Governing Equations of viscous fluid flows
- To introduce numerical modeling and its role in the field of fluid flow and heat transfer
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

PREREQUISITE:
Fundamental Knowledge of partial differential equations, Heat Transfer and Fluid Mechanics

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  8

UNIT II  FINITE DIFFERENCE METHOD  9

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

UNIT IV  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  10
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes-properties of discretization schemes – Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICK Schemes.

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

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES
5. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.

MA9262 NUMERICAL METHODS

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS (10 +3)

UNIT II INTERPOLATION AND APPROXIMATION (8 +3)
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION (9 +3)

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS (9 +3)

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (9 +3)
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.

L: 45 T: 15 TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES

GE9021 PROFESSIONAL ETHICS IN ENGINEERING LT P C
3 0 0 3

AIM
To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES
- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one’s own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER’S RESPONSIBILITY FOR SAFETY

UNIT IV RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
GE9023  FUNDAMENTALS OF NANOSCIENCE  L T P C
3 0 0 3

AIM
To make the students understand the importance, relevance and potentialities of this emerging field of study.

OBJECTIVES
- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the importance role of physics, chemistry, biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

UNIT I  INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II  PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMB.

UNIT III  PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV  PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V  CHARACTERISATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SiMS-Nanoindentation

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

PT9071 PACKAGING MATERIALS & TECHNOLOGY LT P C
3 0 0 3

OBJECTIVES:
To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I FUNDAMENTALS OF PACKAGING
6
Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II PACKAGING MATERIALS
11
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polysters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Naphthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals - Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III CONVERSION TECHNOLOGY
12

UNIT IV SPECIALITY PACKAGING
9
Aerosol packaging, Shrink and Stretch wrapping, Blister packaging, Anti-static packaging, Aseptic packaging, Active packaging, Modified Atmospheric Packaging, Ovenable package; Cosmetic packaging, Hardware packaging, Textile packaging, Food packaging; Child resistant and Health care packaging, Export packaging, Lidding, RFID in packaging.

UNIT V TESTING
7

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES