### M.E. Manufacturing Engineering

#### Semester I

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Dr. K.G. Muthurajan        Dr. M. Venkataraman        Prof. J. Senthil        Prof. G. Nagarajan
Prof. N. Rajan               Prof. J. Sathees Babu
### SEMESTER II

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Dr. K.G. Muthurajan  Dr. M. Venkataraman  Prof. J. Senthil  Prof. G. Nagarajan
Prof. N. Rajan  Prof. J. Sathees babu
### SEMESTER - III

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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68**
## ELECTIVES FOR M.E. MANUFACTURING ENGINEERING

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NUMERICAL METHODS AND GRAPH THEORY

AIM:
To solve some engineering models and problems by using Numerical Analysis and Graph Theoretical concepts.

OBJECTIVES:
The engineers will have an exposure on various topics such as Systems of Equation, Interpolation and Numerical Integration, Initial and Boundary Value Problems, Fundamentals of Graphs, Graphs Algorithms to understand their applications in engineering problems.

UNIT I SYSTEMS OF EQUATIONS 12

UNIT II INTERPOLATION AND INTEGRATION 12

UNIT III NUMERICAL METHODS FOR ODE 12

UNIT IV FUNDAMENTALS OF GRAPHS 12

UNIT V TREES AND ALGORITHMS 12
Kruskal’s algorithm – Dijkstra’s shortest path algorithm, Prim’s algorithm – Transport Networks.

TEXT BOOKS:

REFERENCES:
3. Bondy, J.A. and Murthy, U.S.R., Graph Theory with Applications, Macmillan,
ADVANCED MATERIALS TECHNOLOGY

LTCP

AIM:
To impart knowledge on advance concepts of material technology

OBJECTIVE:
- To enlight the PG students on elastic, plastic and fractured behaviour of engineering materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

UNIT I ELASTIC AND PLASTIC BEHAVIOR
Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

UNIT II FRACTURE BEHAVIOUR

UNIT III SELECTION OF MATERIALS
Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

UNIT IV MODERN METALLIC MATERIALS

UNIT V NON METALLIC MATERIALS
Polymeric materials – Formation of polymer structure – Production techniques of fibers, foams, adhesives and coating – structure, properties and applications of engineering polymers – Advanced structural ceramics, WC, TIC, TaC, Al2O3, SiC, Si3N4, CBN and diamond – properties, processing and applications.

REFERENCES:

Dr.K.G.Muthurajan Dr.M.Venkataraman Prof.J.Senthil Prof.G.Nagarajan
Prof.N.Rajan Prof.J.Sathees babu
AUTOMATED AND COMPUTER INTEGRATED MANUFACTURING SYSTEMS

L T P C 3 0 0 3

AIM:
To stress the role of computers in production.

OBJECTIVE:
To teach the role of computers in processing the information knowing across the various stages and various departments in a manufacturing concern.

UNIT I  INTRODUCTION

UNIT II  AUTOMATED MANUFACTURING SYSTEMS


Storage system performance – storage location strategies – Conventional storage methods and equipments – Automated storage/Retrieval system and Carousel storage system

Deadlocks in Automated manufacturing systems – Petrinet models – Applications in Deadlock avoidance.

UNIT III  GROUP TECHNOLOGY AND FMS

UNIT IV  PROCESS PLANNING


UNIT V  TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE


Overview of Automatic identification methods – Bar code technology – Other Automatic data capture technologies.

TOTAL : 45 PERIODS

REFERENCES:

ADVANCED MANUFACTURING PROCESSES

AIM:
To expose the students in the art of manufacturing new products due to the development of new materials and processes. The students will totally get a feel of the relevant suitable process while evaluating and deciding.

OBJECTIVE:
- To inform the students about the various alternative manufacturing processes available.
- To develop an altitude to look for the unconventional manufacturing process to machine
- To make them to understand and appreciate the latest manufacturing process for micro fabrication and devices.

UNIT I     NEWER MACHINING PROCESSES - I

UNIT II     NEWER MACHINING PROCESS – II

UNIT III     NEWER MACHINING PROCESS – III

UNIT IV     FABRICATION OF MICRO DEVICES

UNIT V     MICROFABRICATION TECHNOLOGY

TOTAL: 45 PERIODS

REFERENCES:
1. Serope kelpekijian & stevan r. schmid- manufacturing process engg material – 2003
CIM LAB

AIM:
To impart the knowledge on training the students in the area of CAD/CAM.

OBJECTIVES:
To teach the students about the drafting of 3D components and analyzing the same using various CAD/CAM softwares.

CAM LABORATORY
1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving & canned cycle
4. Mini project on any one of the CIM elements is to be done. This can be either a software or hardware simulating a CIM element. At the end of the semester, the students has to submit a mini report and present his work before a Committee.

CAD LABORATORY
2D modeling and 3D modeling of components such as
1. Bearing
2. Couplings
3. Gears
4. Sheet metal components
5. Jigs, Fixtures and Die assemblies.

TOTAL : 30 PERIODS
ROBOT DESIGN & PROGRAMMING

AIM:
To impart knowledge in the area of Robot designing and programming in Robotic languages.

OBJECTIVES:
To teach the students about the kinematic arrangement of robots and its applications in the area of manufacturing sectors.

UNIT I INTRODUCTION
Definition, Need Application, Types of robots – Classifications – Configuration, work volume, control loops, controls and intelligence, specifications of robot, degrees of freedoms, end effectors – types, selection applications.

UNIT III ROBOT KINEMATICS

UNIT III ROBOT DYNAMICS AND TRAJECTORY PLANNING
Lagrangeon mechanics, dynamic equations for sing, double and multiple DOF robots – static force analysis of robots, Trajectory planning – joint space, Cartesian space description and trajectory planning – third order, fifth order - Polynomial trajectory planning

UNIT IV ROBOT PROGRAMMING & AI TECHNIQUES
Types of Programming – Teach Pendant programming – Basic concepts in A1 techniques – Concept of knowledge representations – Expert system and its components.

UNIT V ROBOT SENSORS AND ACTUATORS
Design of Robots – characteristics of actuating systems, comparison, microprocessors control of electric motors, magnetostriective actuators, shape memory type metals, sensors, position, velocity, force, temperature, pressure sensors – Contact and non contact sensors, infrared sensors, RCC, vision sensors.

TOTAL: 45 PERIODS

REFERENCES
AIM:
To expose the students, the importance of measurement and the various latest measuring techniques using Laser, Coordinate measuring machines and Opto-electronics devices. Also to stress upon the Importance of quality in manufacturing.

OBJECTIVES:
To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices. Also to make the students to understand quality

UNIT – I LASER METROLOGY 8

UNIT – II PRECISION INSTRUMENTS BASED ON LASER 9

UNIT – III CO-ORDINATE MEASURING MACHINE 10

UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 9

UNIT – V QUALITY IN MANUFACTURING ENGINEERING 9
Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

TOTAL: 45 PERIODS

REFERENCES:
METAL FORMING PROCESSES

AIM:
To impart knowledge on plasticity, surface treatment for forming of various types of metal forming process.

OBJECTIVES:
- To study the basic concepts of metal forming techniques and to develop force calculation in metal forming process.
- To study the thermo mechanical regimes and its requirements of metal forming

UNIT I  THEORY OF PLASTICITY  9

UNIT II  THEORY AND PRACTICE OF BULK FORMING PROCESSES  8
Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing – Effect of friction – calculation of forces, work done – Process parameters, equipment used – Defects – applications – Recent advances in Forging, Rolling, Extrusion and Drawing processes – Design consideration in forming.

UNIT III  SHEET METAL FORMING  8
Formability studies – Conventional processes – H E R F techniques – Superplastic forming techniques – Hydro forming – Stretch forming – Water hammer forming – Principles and process parameters – Advantage, Limitations and application

UNIT IV  POWDER METALLURGY AND SPECIAL FORMING PROCESSES  9

UNIT V  SURFACE TREATMENT AND METAL FORMING APPLICATIONS  9

TOTAL: 45 PERIODS
REFERENCES:
MICRO ELECTRO MECHANICAL SYSTEMS AND NANO TECHNOLOGY

AIM:
To inspire the students to expect to the trends in manufacturing micro components and measuring systems to nano scale.

OBJECTIVES:
- To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be aware of micro actuators.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

UNIT I OVER VIEW OF MEMS AND MICROSYSTEMS
Definition – historical development – fundamentals – properties, micro fluidics, design and fabrication micro-system, microelectronics, working principle and applications of micro system.

UNIT II MATERIALS, FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING
Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds silicon piezo resistors, Galium arsenide, quartz, polymers for MEMS, conductive polymers. Photolithography, photo resist applications, light sources, in implantation, diffusion process exudation – thermal oxidation, silicon diode, chemical vapour deposition, sputtering - deposition by epitaxy – etching – bulk and surface machining – LIGA process Micro system packaging – considerations packaging – levels of micro system packaging die level, device level and system level.

UNIT III MICRO DEVICES AND MATERIALS

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

UNIT V CHARACTERIZATION OF NANO MATERIALS

TOTAL: 45 PERIODS
REFERENCES:
AIM:

To impart knowledge in the area of hydraulics and pneumatic components and its functions.

OBJECTIVE:

- To make the students to learn the basic concepts of hydraulics and pneumatics and its applications in the area of manufacturing process.
- To simulate the various hydraulics and pneumatics circuits.

1. Simulation of single and double acting cylinder circuits
2. Simulation of Hydraulic circuits
3. Simulation of electro pneumatic circuits
4. Simulation of electro hydraulic circuits
5. Simulation of PLC circuits
6. Exercises on linear and angular measurements
7. Exercises on speed measurements
8. Exercises on Vibration measurements
9. Exercises on Motion controller using servo motors, encoders, etc.
10. Exercises on fiber optics transducers.
11. Exercises on stepper motor.
12. Exercises on microprocessor based data acquisition system.

TOTAL : 30 PERIODS
LIST OF ELECTIVE SUBJECTS
FINITE ELEMENT APPLICATIONS IN MANUFACTURING

**AIM:**
To impart knowledge in the area of finite element methods and its application in manufacturing.

**OBJECTIVE:**
To study the fundamentals of one dimensional and two dimensional problems using FEA in manufacturing.

**UNIT I  INTRODUCTION**

**UNIT II  ONE DIMENSIONAL ANALYSIS**
Steps in FEM – Discretization, Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

**UNIT III  SHAPE FUNCTIONS AND HIGHER ORDER FORMULATIONS**
Shape functions for one and two dimensional elements- Three noded triangular and four nodded quadrilateral element Global and natural co-ordinates—Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

**UNIT IV  COMPUTER IMPLEMENTATION**
Pre Processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages – Development of code for one dimensional analysis and validation

**UNIT V  ANALYSIS OF PRODUCTION PROCESSES**

TOTAL: 45 PERIODS

**REFERENCES:**
6. www.tbook.com
7. www.pollockeng.com

Dr.K.G.Muthurajan Dr.M.Venkataraman Prof.J.Senthil Prof.G.Nagarajan
Prof.N.Rajan Prof.J.Sathees babu
FLUID POWER AUTOMATION

AIM:
To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

OBJECTIVE:
- To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.
- To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

UNIT I  INTRODUCTION  5

UNIT II  FLUID POWER GENERATING/UTILIZING ELEMENTS  8

UNIT III  CONTROL AND REGULATION ELEMENTS  8
Direction flow and pressure control valves-Methods of actuation, types, sizing of ports-pressure and temperature compensation, overlapped and underlapped spool valves-operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

UNIT IV  CIRCUIT DESIGN  10

UNIT V  ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS  7
Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

TOTAL:  45 PERIODS

REFERENCES:

Dr.K.G.Muthurajan        Dr.M.Venkataraman        Prof.J.Senthil        Prof.G.Nagarajan
Prof.N.Rajan        Prof.J.Sathees babu
UNIT I  TOLERANCE ANALYSIS  8

UNIT II  TOLERANCE ALLOCATION  8

UNIT III  GD&T  10

UNIT IV  TOLERANCE CHARTING  9

UNIT V  MANUFACTURING GUIDELINES  10

TOTAL: 45 PERIODS

REFERENCES:
MATERIALS MANAGEMENT AND LOGISTICS

AIM:
To introduce to the students the various functions of materials management and logistics

OBJECTIVE:
To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

UNIT I    INTRODUCTION          6
Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II   MANAGEMENT OF PURCHASE  7

UNIT III  MANAGEMENT OF STORES AND LOGISTICS  12

UNIT IV   MATERIALS PLANNING     10

UNIT V    INVENTORY MANAGEMENT   10
ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45

REFERENCES
AIM:
To impart knowledge on basic concepts and advances in casting and welding processes.

OBJECTIVES:

- To study the metallurgical concepts and applications of casting and welding process.
- To acquire knowledge in CAD of casting and automation of welding process.

UNIT I CASTING DESIGN 8
Heat transfer between metal and mould — Design considerations in casting — Designing for directional solidification and minimum stresses - principles and design of gating and risering

UNIT II CASTING METALLURGY 8
Solidification of pure metal and alloys — shrinkage in cast metals — progressive and directional solidification — Degasification of the melt-casting defects — Castability of steel, Cast Iron, Al alloys, Babbit alloy and Cu alloy.

UNIT III RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT 8
Shell moulding, precision investment casting, CO₂ moulding, centrifugal casting, Die casting, Continuous casting. Counter gravity low pressure casting. Squeeze casting and semisolid processes. Layout of mechanized foundry — sand reclamation — material handling in foundry pollution control in foundry — Computer aided design of casting.

UNIT IV WELDING METALLURGY AND DESIGN 10

UNIT V RECENT TRENDS IN WELDING 11

TOTAL: 45 PERIODS
REFERENCES:

2. ASM Handbook vol.6, welding Brazing & Soldering, 2003
METAL CUTTING THEORY AND PRACTICE

AIM:
To impart the knowledge and train the students in the area of metal cutting theory and its importance.

OBJECTIVES:
- To make the students familiar with the various principles of metal cutting, cutting tool materials and its wear mechanisms during the machining operation.

UNIT I INTRODUCTION
Need for rational approach to the problem of cutting materials-observation made in the cutting of metals-basic mechanism of chip formation-thin and thick zone modes-types of chips-orthogonal Vs oblique cutting-force velocity relationship for shear plane angle in orthogonal cutting-energy consideration in machining-review of Merchant, Lee and Shafter theories-critical comparison.

UNIT II SYSTEM OF TOOL NOMENCLATURE
Nomenclature of single point cutting tool-System of tool nomenclature and conversion of rake angles-nomenclature of multi point tools like drills, milling-conventional Vs climb milling, mean cross sectional area of chip in milling-specific cutting pressure.

UNIT III THERMAL ASPECTS OF MACHINING
Heat distribution in machining-effects of various parameters on temperature-methods of temperature measurement in machining-hot machining-cutting fluids.

UNIT IV TOOL MATERIALS, TOOL LIFE AND TOOL WEAR

UNIT V WEAR MECHANISMS AND CHATTER IN MACHINING
Processing and Machining – Measuring Techniques – Reasons for failure of cutting tools and forms of wear-mechanisms of wear-chatter in machining-factors effecting chatter in machining-types of chatter-mechanism of chatter.

TOTAL: 45 PERIODS

REFERENCES
PROBABILITY AND STATISTICS

L T P C 3 0 0 3

AIM:
To introduce the concepts of probability, sampling techniques, estimation to the students.

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

UNIT I  PROBABILITY THEORY  14
Random variables – probability density and distribution functions-moment generating and characteristic functions – Binomial, Poisson, Normal distributions and their applications.

UNIT II  SAMPLING THEORY  9
Sampling distributions – Standard error – t, F, Chi square distributions – applications.

UNIT III  ESTIMATION THEORY  5
Interval estimation for population mean, standard deviation, difference in means, ratio of standard deviations – point estimation.

UNIT IV  TESTING OF HYPOTHESIS AND ANOVA  12

UNIT V  CORRELATION, REGRESSION AND TIME SERIES ANALYSIS  5

TOTAL: 45 PERIODS

REFERENCES:
MANUFACTURING SYSTEM SIMULATION

AIM:
To introduce the various concepts of manufacturing system simulation.

OBJECTIVES:

- To model manufacturing systems of different kinds.
- To make use of simulation languages for manufacturing systems.

UNIT I  INTRODUCTION  8
Basic concepts of system – elements of manufacturing system - concept of simulation – simulation as a decision making tool – types of simulation – Monte-Carlo simulation - system modeling – types of modeling – Limitations and Areas of application of simulation.

UNIT II  RANDOM NUMBERS  10
Probability and statistical concepts of simulation – Pseudo random numbers – methods of generating random numbers – discrete and continuous distribution – testing of random numbers – kolmogorov-Smirnov test, the Chi-Square test - sampling - simple, random and simulated.

UNIT III  DESIGN OF SIMULATION EXPERIMENTS  10

UNIT IV  SIMULATION LANGUAGE  9
Comparison and selection of simulation languages - Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.

UNIT V  CASE STUDIES  10
Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems – case studies.

TOTAL: 45 PERIODS

REFERENCES:
OPTIMISATION TECHNIQUES IN ENGINEERING

L T P C
3 0 0 3

AIM:
To introduce the various optimization techniques and their advancements.

OBJECTIVES:
• To make use of the above techniques while modeling and solving the engineering problems of different fields.

UNIT – I  INTRODUCTION

UNIT – II  CLASSIC OPTIMIZATION TECHNIQUES

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

UNIT – IV  INTEGER PROGRAMMING AND DYNAMIC PROGRAMMING AND NETWORK TECHNIQUES

UNIT – V  ADVANCES IN SIMULATION
Genetic algorithms – simulated annealing – Neural Network and Fuzzy systems

TOTAL: 45 PERIODS

REFERENCES:

Dr.K.G.Muthurajan     Dr.M.Venkataraman     Prof.J.Senthil     Prof.G.Nagarajan
Prof.N.Rajan     Prof.J.Sathees babu
INDUSTRIAL ERGONOMICS

AIM:

OBJECTIVES:

UNIT – I  INTRODUCTION  9

UNIT – II  ANTHROPOMETRY  9
Physical dimensions of the human body as a working machine – Motion size relationships – Static and dynamic anthropometry – Anthropometric aids – Design principles – Using anthropometric measures for industrial design – Procedure for anthropometric design.

UNIT – III  DESIGN OF SYSTEMS  10

UNIT – IV  ENVIRONMENTAL FACTORS IN DESIGN  10

UNIT – V  WORK PHYSIOLOGY  8
Provision of energy for muscular work – Role of oxygen physical exertion – Measurement of energy expenditure Respiration – Pulse rate and blood pressure during physical work – Physical work capacity and its evaluation.

TOTAL: 45 PERIODS

REFERENCES:

POLYMERS AND COMPOSITE MATERIALS

AIM:
To impart on types, physical properties and processing of polymer matrix and composites, metal matrix composites and ceramics matrix composites.

OBJECTIVES:

- To study matrix material, particulates and fibres of polymer matrix composites, MMC and ceramic matrix composites.
- To develop knowledge on processing, interfacial properties and application of computers.

UNIT – I PROPERTIES OF POLYMERS
Chemistry and Classification of Polymers – Properties of Thermo plastics – Properties of Thermosetting Plastics – Applications – Merits and Disadvantages.

UNIT – II PROCESSING OF POLYMERS

UNIT – III INTRODUCTION TO FIBRES AND COMPOSITE MATERIALS
Fibres – Fabrication, Structure, properties and applications - Glass, Boron, carbon, organic, ceramic and metallic fibers whiskers– Matrix materials structure – polymers, – metals and ceramics – Physical and chemical properties

UNIT – IV PROCESSING OF POLYMER MATRIX COMPOSITES

UNIT – V Processing of - Metal Matrix Composites and ceramic matrix composites

TOTAL: 45 Periods

REFERENCES:

Dr.K.G.Muthurajan Dr.M.Venkataraman Prof.J.Senthil Prof.G.Nagarajan
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NON-DESTRUCTIVE EVALUATION

AIM:

To stress the importance of NDT in engineering.

OBJECTIVES:

To introduce all types of NNDT and their applications in Engineering.


Introduction to various non-destructive methods, Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.

UNIT – II EDDY CURRENT TESTING & ACOUSTIC EMISSION

Principles, Instrumentation for ECT, Absolute, differential probes, Techniques – High sensitivity techniques, Multi frequency, Phased array ECT, Applications.

UNIT – III MAGNETIC PARTICLE TESTING & THERMOGRAPHY

Principle of MPT, procedure used for testing a component, Equipment used for MPT, Magnetizing techniques, Applications.

UNIT – IV ULTRASONIC TESTING & RADIOGRAPHY

Principle, Ultrasonic transducers, Ultrasonic Flaw detection Equipment, Modes of display A- scan, B-Scan, C-Scan, Applications, Inspection Methods - Normal Incident Pulse-Echo Inspection, Normal Incident Through-transmission Testing, Angle Beam Pulse-Echo testing, Applications of Normal Beam Inspection in detecting fatigue cracks, Inclusions, Slag, Porosity and Intergranular cracks.

UNIT – V CASE STUDIES, COMPARISON AND SELECTION OF NDT METHODS

Case studies on defects in cast, rolled, extruded, welded and heat treated components. Comparison and selection of various NDT techniques. Codes, standards, specification and procedures.

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Prof.N.Rajan        Prof.J.Satthes babu
REFERENCES:
4. www.ndt.net
ARTIFICIAL INTELLIGENCE

AIM:
To understand the various types and applications of Fuzzy Logics and Artificial Neural Networks.

OBJECTIVE:
This course is intended for learning the basic concepts, Operations and Principles of Fuzzy Logic, applications of various Fuzzy Logic systems, architecture and Taxonomy of Neural Networks. This course is also gives the ideas of ANN Architectures, Genetic Algorithms, Meta Heuristic techniques and Applications in Design and Manufacturing.

UNIT – I INTRODUCTION TO FUZZY LOGIC 8

UNIT – II FUZZY LOGIC APPLICATIONS 10

UNIT – III INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 8

UNIT – IV OTHER ANN ARCHITECTURES 10

UNIT – V RECENT ADVANCES 10

TOTAL: 45 PERIODS

REFERENCES:

Dr.K.G.Muthurajan Dr.M.Venkataraman Prof.J.Senthil Prof.G.Nagarajan
Prof.N.Rajan Prof.J.Sathees babu
LEAN MANUFACTURING SYSTEM AND IMPLEMENTATION

AIM:
To introduce the concepts of lean manufacturing system.

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

UNIT – I INTRODUCTION TO LEAN MANUFACTURING

UNIT – II CELLULAR MANUFACTURING, JIT, 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, VSM
Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

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.

REFERENCES:
2. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’, Lean Enterprise Institute, Brookline, MA.
QUALITY AND RELIABILITY ENGINEERING

AIM:
To expose the students to the various quality control techniques and also to understand the importance and concept of reliability and maintainability in industries.

OBJECTIVES:
To make the students to understand the various quality control techniques and to construct the various quality control charts for variables and attributes and also the design concepts for reliable system and maintenance aspects in industries.

UNIT – I QUALITY & STATISTICAL PROCESS CONTROL 8

UNIT – II ACCEPTANCE SAMPLING 8

UNIT – III EXPERIMENTAL DESIGN AND TAGUCHI METHOD 9

UNIT – IV CONCEPT OF RELIABILITY 9
Definition – reliability vs quality, reliability function – MTBF, MTTR, availability, bathtub curve – time dependent failure models – distributions – normal, weibull, lognormal – Reliability of system and models – serial, parallel and combined configuration – Markove analysis, load sharing systems, standby systems, covarient models, static models, dynamic models.

UNIT – V DESIGN FOR RELIABILITY AND MAINTAINABILITY 11
Reliability design process, system effectiveness, economic analysis and life cycle cost, reliability allocation, design methods, parts and material selection, derating, stress-strength and analysis, failure analysis, identification determination of causes, assessments of effects, computation of criticality index, corrective action, system safety – analysis of down-time – the repair time distribution, stochastic point processes system repair time, reliability under preventive maintenance state dependent system with repair. MTTR – mean system down time, repair vs replacement, replacement models, proactive, preventive, predictive maintenance maintainability and availability, optimization techniques for system reliability with redundancy heuristic methods applied to optimal system reliability.

TOTAL: 45 PERIODS
REFERENCES:

COMPUTER AIDED PRODUCT DESIGN

AIM:
To introduce the computer aided modeling and various concepts of product design.

OBJECTIVES:
• To model a product using CAD software.
• To apply the various design concepts and design tools and techniques while designing a product.

UNIT – I  INTRODUCTION  8
Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware & Peripherals – software packages for design and drafting.

UNIT – II  COMPUTER GRAPHICS FUNDAMENTALS AND GEOMETRIC MODEL  8

UNIT – III  PRODUCT DESIGN CONCEPTS  8

UNIT – IV  PRODUCT DESIGN TOOLS & TECHNIQUES  12

UNIT – V  PRODUCT DATA MANAGEMENT  8

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
FINANCIAL MANAGEMENT

AIM:
To introduce the concepts of financial and various functions of financial management so that the students will be able to handle higher level financial decisions.

OBJECTIVES:
To train students in various functions of finance such as working capital management, current assets management so that students will be able to make high investment decisions when they take up senior managerial positions.

UNIT – I
FINANCIAL ACCOUNTING 8
Accounting principles - Basic records - Preparation and interpretation of profit and loss statement - balance sheet - Fixed assets - Current assets.

UNIT – II
COST ACCOUNTING 12

UNIT – III
MANAGEMENT OF WORKING CAPITAL 10
Current assets - Estimation of working capital requirements - Management of accounts receivable - Inventory - Cash - Inventory valuation methods.

UNIT – IV
CAPITAL BUDGETING 8
Significance of capital budgeting - payback period - present value method - accounting rate of return method - Internal rate of return method.

UNIT – V
PROFIT PLANNING AND ANALYSIS 7
Cost - Volume profit relationship Relevant costs in decision making profit management analysis - Break even analysis.

TOTAL: 45 PERIODS

REFERENCES:
MANUFACTURING MANAGEMENT

AIM:
To introduce the concepts of manufacturing management and various manufacturing management function to the students.

OBJECTIVE:
To train the students on various functions of manufacturing management so that the students will be able to take up these functions as they get in to senior managerial positions.

UNIT – I PLANT ENGINEERING

UNIT – II WORK STUDY

UNIT – III PROCESS PLANNING AND FORECASTING
Process planning – Aims of process planning – steps to prepare the detailed work sheets for manufacturing a given component – Break even analysis – Forecasting – Purpose of forecasting – Methods of forecasting – Time series – Regression and Correlation – Exponential smoothing – Forecast errors.

UNIT – IV SCHEDULING AND PROJECT MANAGEMENT

UNIT - V Personnel and Marketing Management

TOTAL: 45 PERIODS

REFERENCES
1. Dr. R. Kesavan, C.Elanchezian and B.Vijayaramnath, Production Planning and Control, Anuratha Publications, Chennai – 2008
5. Martand T. Telsang, Production Management, S.Chand & Co., 2005