ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
REGULATIONS 2013
M.E. MANUFACTURING ENGINEERING
I TO IV SEMESTERS (FULL TIME) CURRICULUM AND SYLLABUS

SEMESTER I

<table>
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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68**

**LIST OF ELECTIVES FOR M.E. MANUFACTURING ENGINEERING**

#### SEMESTER I (Elective I)

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MA7165  APPLIED PROBABILITY AND STATISTICS  L T P C
                                                    3 1 0 4

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

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

UNIT I  PROBABILITY THEORY  13
Random variables – probability density and distribution functions-moment generating and characteristic functions – Binomial, Poisson, Normal distributions and their applications.

UNIT II  SAMPLING THEORY  13
Sampling distributions – Standard error – t, F, Chi square distributions – applications.

UNIT III  ESTIMATION THEORY  6
Interval estimation for population mean, standard deviation, difference in means, preparation ratio of standard deviations and variances.

UNIT IV  TESTING OF HYPOTHESIS AND ANOVA  8

UNIT V  ANOVA  5
Design of experiments – One, Two factor Models

T = 15, TOTAL: 60 PERIODS

REFERENCES:
1. Levin and Rubin, Statistics for Management, Pearson Education India, 2011

MF7101  ADVANCED MATERIALS TECHNOLOGY  L T P C
                                                  3 0 0 3

AIM:
• To impart knowledge on the advanced concepts of material technology

OBJECTIVES:
• To make the students to understand on elastic, plastic and fractured behaviour of engineering materials.
• To train the students in selection of metallic and non-metallic materials for the various engineering applications.

UNIT I  ELASTIC AND PLASTIC BEHAVIOR  10
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  10

UNIT III  SELECTION OF MATERIALS  10
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  8

UNIT V  NON METALLIC MATERIALS  7
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.

TOTAL: 45 PERIODS

REFERENCES:

MF7102  AUTOMATED COMPUTER INTEGRATED MANUFACTURING  L T P C
SYSTEM  3 0 0 3

AIM:
• To expose the students on the need of automation and integration

OBJECTIVES:
• To teach the role of computers in processing of information knowing across the various stages and various departments in a manufacturing industries
• To train them in process planning.

UNIT I  INTRODUCTION  6
UNIT II  AUTOMATED MANUFACTURING SYSTEMS  10


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

Deadlocks in Automated manufacturing systems – Petri net models – Applications in Deadlock avoidance.

UNIT III  GROUP TECHNOLOGY AND FMS  10


UNIT IV  PROCESS PLANNING  10

Typical process sheet – case studies in Manual process planning.


UNIT V  TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE  9

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

REFERENCES:

TOTAL: 45 PERIODS
MF7103 MICRO MANUFACTURING

AIM:

- To impart the principles of various basic micro manufacturing process

OBJECTIVE:

- The objective of the course is to acquaint the students with the principles, basic machine tools, and developments in the micro manufacturing process and research trends in the area of micro manufacturing process.

UNIT I MICRO MACHINING I


UNIT II MICRO MACHINING II


UNIT III NANO POLISHING


UNIT IV MICRO FORMING AND WELDING


UNIT V RECENT TRENDS AND APPLICATIONS


TOTAL: 45 PERIODS

REFERENCES:
8. www.cmxr.com/industrial/
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
- To expose the students to build a robot for any type of application

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, magnetostrictive 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 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 packages and programming of CNC machines
- To train them to use the various sensors

CAM LABORATORY
1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving & canned cycle

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: 60 PERIODS

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 12
Integer programming - Cutting plane algorithm, Branch and bound technique, Zero-one implicit
enumeration – Dynamic Programming – Formulation, Various applications using Dynamic
Maximal flow problem.

UNIT V ADVANCES IN SIMULATION 9
Genetic algorithms – simulated annealing – Neural Network and Fuzzy systems

REFERENCES:
   2005
5. Ravindran, Philips and Solberg, Operations Research Principles and Practice, John Wiley & Sons,
   Singapore, 1992

MF7202 MANUFACTURING METROLOGY AND QUALITY ENGINEERING 3 0 0 3

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.
• To train them in the area of precision and quality manufacturing

UNIT I LASER METROLOGY AND PRECISION INSTRUMENTS 10
applications in machine systems – Interferometry applications – speckle interferometry – laser
interferometers in manufacturing and machine tool alignment testing – laser Doppler technique – laser
Doppler anemometry - Laser telemetric systems – detection of microscopic imperfections on high
quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high
inertia laser scan technique – rotating mirror technique vibrational deflectors – refractive and
diffractive scanners. – laser gauging – bar coding – laser dimensional measurement system.

UNIT II CO-ORDINATE MEASURING SYSTEM 9
Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors –
UNIT III  OPTO ELECTRONICS AND VISION SYSTEM  9

UNIT IV  QUALITY IN MANUFACTURING AND DESIGN ENGINEERING  9

UNIT V  QUALITY MANAGEMENT SYSTEM AND CONTINUOUS IMPROVEMENT  8

TOTAL: 45 PERIODS

REFERENCES:

MF7203  THEORY OF METAL FORMING  L T P C
3 0 0 3

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

REFERENCES:

MF7204 MICRO ELECTRO MECHANICAL SYSTEMS AND NANO TECHNOLOGY L T P C 3 0 0 3
AIM:
• To inspire the students to expect to the trends in manufacturing of 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 6
Definition – historical development – properties, design and fabrication micro-system, microelectronics, working principle, applications and advantages of micro system. Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds - silicon piezo resistors, Galium arsenide, quartz, polymers for MEMS, conductive polymers.

UNIT II FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING 10

UNIT III MICRO DEVICES 8

UNIT IV SCIENCE AND SYNTHESIS OF NANO MATERIALS 10

UNIT V CHARACTERIZATION OF NANO MATERIALS 11

TOTAL: 45 PERIODS

REFERENCES:
MF7211 AUTOMATION AND METAL FORMING LABORATORY

**AIM**
- To impart practical knowledge on bulk metal forming and sheet metal forming processes

**OBJECTIVE**
- To train the students to have a hands-on having the basic concepts of metal forming processes and to determine some metal forming parameters for a given shape.

**EXPERIMENTS**
1. Determination of strain hardening exponent
2. Determination of strain rate sensitivity index
3. Construction of formability limit diagram
4. Determination of efficiency in water hammer forming
5. Determination of interface friction factor
6. Determination of extrusion load
7. Study on two high rolling process

**AUTOMATION LAB**
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

**TOTAL: 60 PERIODS**

MF7001 FLUID POWER AUTOMATION

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

**OBJECTIVES:**
- 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 various design procedures.

**UNIT I INTRODUCTION**

**UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS**
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:

MF7002  DESIGN FOR MANUFACTURING AND ASSEMBLY  L T P C
3 0 0 3

AIM:
• To impart the knowledge about the significance of design for manufacturing and assembly

OBJECTIVES:
• To make the students learn about tolerance analysis, allocation and geometrical tolerances.
• Guidelines for design for manufacturing and assembly with examples.

UNIT I  TOLERANCE ANALYSIS  8

UNIT II  TOLERANCE ALLOCATION  8

UNIT III  GD&T  10
UNIT IV  TOLERANCE CHARTING  

UNIT V  MANUFACTURING GUIDELINES  

REFERENCES:

MF7003 ADVANCES IN CASTING AND WELDING L T P C 3 0 0 3

AIM:
• To refresh the knowledge on basic concepts and to impart knowledge on 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

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
Heat affected Zone and its characteristics – Weldability of steels, cast iron, stainless steel, aluminum, Mg, Cu, Zirconium and titanium alloys – Carbon Equivalent of Plain and alloy steels Hydrogen

UNIT V  RECENT TRENDS IN WELDING

REFERENCES:
2. ASM Handbook vol.6, welding Brazing & Soldering, 2003

MF7004  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-chip breaker-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 affecting chatter in machining—types of chatter—mechanism of chatter.

TOTAL: 45 PERIODS

REFERENCES

MF7005 FINITE ELEMENT METHODS FOR MANUFACTURING

ENGINEERING

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
Fundamentals—Initial, boundary and eigen value problems—weighted residual, Galerkin and Rayleigh Ritz methods—Integration by parts—Basics of variational formulation—Polynomial and Nodal approximation.

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 nodded 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:
7. www.tbook.com
8. www.pollockeng.com

MF7006       MATERIALS MANAGEMENT     L T P C  
3 0 0 3

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

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

UNIT II   MANAGEMENT OF PURCHASE  

UNIT III   MANAGEMENT OF STORES AND LOGISTICS  
UNIT IV MATERIALS PLANNING 10

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

REFERENCES

MF7007 INDUSTRIAL ERGONOMICS

AIM:
To introduce the concepts of Ergonomics and to indicate the areas of Applications.

OBJECTIVES:
To make the students familiarize with various concepts of Ergonomics, so that students will able to apply the concepts of ergonomics to Design of man – machine system.

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
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:

MF7008 POLYMERS AND COMPOSITE MATERIALS

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

OBJECTIVES:
• To study matrix material, reinforcements of polymer matrix composites, MMC and ceramic matrix composites.
• To develop knowledge on processing, interfacial properties and application of composites.

UNIT I PROCESSING OF POLYMERS

UNIT II FIBERS AND MATRIX MATERIALS

UNIT III PROCESSING OF POLYMER MATRIX COMPOSITES

UNIT IV PROCESSING OF METAL MATRIX COMPOSITES

UNIT V PROCESSING OF CERAMIC MATRIX COMPOSITES AND CARBON-CARBON COMPOSITES
Processing of CMCs: cold pressing, sintering, reaction bonding, liquid infiltration, lanxide process – in situ chemical reaction techniques: chemical vapour deposition, chemical vapour impregnation, sol-gel
– interfaces in CMCs – mechanical properties and applications of CMCs – Carbon-carbon Composites – applications.

REFERENCES:

MF7009 NON-DESTRUCTIVE EVALUATION

AIM:
To stress the importance of NDT in engineering.

OBJECTIVES:
To introduce all types of NDT and their applications in Engineering.

UNIT I NON-DESTRUCTIVE TESTING: AN INTRODUCTION, VISUAL INSPECTION & LIQUID PENETRANT TESTING
Introduction to various non-destructive methods, Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications. Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods-water washable, Post – Emulsification methods, Applications

UNIT II EDDY CURRENT TESTING & ACOUSTIC EMISSION

UNIT III MAGNETIC PARTICLE TESTING & THERMOGRAPHY
Principle of MPT, procedure used for testing a component, Equipment used for MPT, Magnetizing techniques, Applications. Principle of Thermography, Infrared Radiometry, Active thermography measurements, Applications – Imaging entrapped water under an epoxy coating, Detection of carbon fiber contaminants.

UNIT IV ULTRASONIC TESTING
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, TOFD Technique, Applications of Normal Beam Inspection in detecting fatigue cracks, Inclusions, Slag, Porosity and
Intergranular cracks - Codes, standards, specification and procedures and case studies in ultrasonics test.

**UNIT V  RADIOPHOGRAPHY**
Principle of Radiography, x-ray and gamma ray sources- safety procedures and standards, Effect of radiation on Film, Radiographic imaging, Inspection Techniques – Single wall single image, Double wall Penetration, Multiwall Penetration technique, Real Time Radiography - Codes, standards, specification and procedures and case studies in Radiography test.

Case studies on defects in cast, rolled, extruded, welded and heat treated components - Comparison and selection of various NDT techniques

**REFERENCES:**
4. www.ndt.net

**MF7010  LEAN MANUFACTURING**

**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.

**TOTAL: 45 PERIODS**
REFERENCES:
3. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’, Lean Enterprise Institute, Brookline, MA.

MF7011 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

UNIT II ACCEPTANCE SAMPLING

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD

UNIT IV CONCEPT OF RELIABILITY
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 – Markov analysis, load sharing systems, standby systems, covariant models, static models, dynamic models.

UNIT V DESIGN FOR RELIABILITY AND MAINTAINABILITY
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:

MF7012 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
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

UNIT III PRODUCT DESIGN CONCEPTS AND PRODUCT DATA MANAGEMENT

UNIT IV PRODUCT DESIGN TOOLS & TECHNIQUES

UNIT V PRODUCT DESIGN TECHNIQUES

TOTAL: 45 PERIODS
REFERENCES:

MF7013 FINANCIAL MANAGEMENT

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3 0 0 3

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 investment decisions when they take up senior managerial positions.

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

UNIT II COST ACCOUNTING

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

UNIT IV CAPITAL BUDGETING
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
Cost - Volume profit relationship Relevant costs in decision making profit management analysis - Break even analysis.

TOTAL: 45 PERIODS

REFERENCES:

25
AIM:
To introduce the concepts of manufacturing management and various manufacturing management functions 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 into 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.

UNIT IV  SCHEDULING AND PROJECT MANAGEMENT

UNIT V  PERSONNEL AND MARKETING MANAGEMENT

REFERENCES
1. Dr. R. Kesavan, C. Elanchezian and B. Vijayaramnath, Production Planning and Control, Anuratha Publications, Chennai – 2008

TOTAL: 45 PERIODS
AIM
To introduce the various concepts of Research Methodology

OBJECTIVE
- To introduce various types of Research Design
- To introduce various sampling techniques, statistical analysis and interpreting of the results.

UNIT I  INTRODUCTION  10

UNIT II  RESEARCH DESIGN  8

UNIT III  SAMPLING DESIGN  8

UNIT IV  PROCESSING AND ANALYSIS OF DATA  9

UNIT V  INTERPRETATION, REPORT WRITING  10

TOTAL: 45 PERIODS

REFERENCE:
AIM:
To inspire the students to expect to the trends in development and synthesizing of nano systems and measuring systems to nano scale.

OBJECTIVES:
- To expose the students to the evolution of Nano systems, to the various fabrication techniques.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

UNIT I OVER VIEW OF NANOTECHNOLOGY 6
Definition – historical development – properties, design and fabrication Nanosystems, , working principle, applications and advantages of nano system. Nanomaterials – ordered oxides – Nano arrays – potential health effects

UNIT II NANODEFECTS, NANO PARTILES AND NANOLAYERS 8

UNIT III NANOSTRUCTURING 8

UNIT IV SCIENCE AND SYNTHESIS OF NANO MATERIALS 12

UNIT V CHARACTERIZATION OF NANO MATERIALS 11

REFERENCES:

TOTAL: 45 PERIODS
MF7017 MATERIALS TESTING AND CHARACTERIZATION TECHNIQUES

AIM
This course aims to impart knowledge on various techniques of material characterization.

OBJECTIVES
On completion of the course the students are expected to be knowledgeable in microstructure evaluation, crystal structure analysis, electron microscopy, Chemical Thermal Analysis, static and dynamic mechanical testing methods.

UNIT I MICRO AND CRYSTAL STRUCTURE ANALYSIS

UNIT II ELECTRON MICROSCOPY

UNIT III CHEMICAL AND THERMAL ANALYSIS

UNIT IV MECHANICAL TESTING – STATIC TESTS

UNIT V MECHANICAL TESTING – DYNAMIC TESTS

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

MF7018 MECHATRONICS

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

UNIT I
INTRODUCTION

UNIT II
SENSORS AND TRANSDUCERS

UNIT III
MICROPROCESSORS AND MICROCONTROLLERS
Introduction – Architectures of 8 – bit microcontrollers (8051) series, PIC Microcontrollers (16f xxx) series – Assembly language programming instruction format, addressing modes, instruction sets, Basic program examples interface of keypads, leds, leds, A/D and D/A Converters, RS 232 serial communication interface, classification of memories.

UNIT IV
ACTUATORS

UNIT V
MECHATRONIC SYSTEMS
Design process-stages of design process – Traditional and Mechatronics design concepts – Case studies – Engine management system, Automatic camera, Automatic wishing machine, Pick and place robots.

REFERENCES: