# M.E. COMPUTER INTEGRATED MANUFACTURING (FT & PT)
## I TO IV SEMESTERS CURRICULUM AND SYLLABUS

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**UNIVERSITY DEPARTMENTS**

**ANNA UNIVERSITY, CHENNAI 600 025**

**REGULATIONS - 2013**

**M.E. COMPUTER INTEGRATED MANUFACTURING**

**I TO VI SEMESTERS CURRICULUM AND SYLLABUS (PART TIME)**

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<td>CI8073</td>
<td>Industrial Robotics and Expert Systems</td>
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COURSE 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.
- To make the students capable of learning to operate and use advanced metrological devices with ease in industrial environments.

COURSE OUTCOME:
Students will:
1. Understand the advanced measurement principles with ease.
2. Operate sophisticated measurement and inspection facilities.
3. Design and develop new measuring methods.

UNIT I CONCEPTS OF METROLOGY: 8
Terminologies – Standards of measurement – Errors in measurement – Interchangeability and Selective assembly – Accuracy and Precision – Calibration of instruments – Basics of Dimensional metrology and Form metrology.

UNIT II MEASUREMENT OF SURFACE ROUGHNESS: 9

UNIT III INTERFEROMETRY: 8

UNIT IV COMPUTER AIDED AND LASER METROLOGY: 10

UNIT V IMAGE PROCESSING FOR METROLOGY: 10
Overview, Computer imaging systems, Image Analysis, Preprocessing, Human vision system, Image model, Image enhancement, gray scale models, histogram models, Image Transforms - Examples.

TOTAL: 45 PERIODS

REFERENCES:

WEB REFERENCES:
1. www.metrologytooling.com
2. www.iuk’tu-harburg.de
OBJECTIVE:
- At the end of this course the students are expected to understand special machining processes, unconventional machining processes, micro machining process, nano fabrication processes and rapid prototyping.

OUTCOME:
At the end of this course the students are expected
1. to produce useful research output in machining of various materials
2. use this knowledge to develop hybrid machining techniques
3. Application of this knowledge to manage shop floor problems

UNIT I  UNCONVENTIONAL MACHINING  10
Introduction-Bulk processes - surface processes- Plasma Arc Machining- Laser Beam Machining-Electron Beam Machining-Electrical Discharge Machining – Electro chemical Machining-Ultrasound Machining- Water Jet Machining-Electro Gel Machining-Anisotropic machining-Isotropic machining-Elastic Emission machining – Ion Beam Machining.

UNIT II  PRECISION MACHINING:  10

UNIT III  ADVANCES IN METAL FORMING  7
Orbital forging, Isothermal forging, Warm forging, Overview of Powder Metal techniques –Hot and Cold isostatic pressing - high speed extrusion, rubber pad forming, micro blanking –Powder rolling – Tooling and process parameters

UNIT IV  MICRO MACHINING AND NANO FABRICATION  10

UNIT V  RAPID PROTOTYPING AND SURFACE MODIFICATION TECHNIQUES  8

TOTAL: 45 PERIODS

REFERENCES:
CI8103 COMPUTER AIDED MANUFACTURING  

OBJECTIVE:
- On completion of the course the students are expected to be knowledgeable in Engineering product specification, CAD/CAM integration, CNC machine tool building, CNC programming using manual method, generation of CNC codes using CAM software, Tooling and work holding devices.

OUTCOME:
- At the end of this course the student will be able to apply knowledge in various fields of Computer Aided Manufacturing.

UNIT I INTRODUCTION TO CAM

UNIT II CAD/CAM INTEGRATION

UNIT III CONSTRUCTIONAL FEATURES OF CNC MACHINES

UNIT IV PART PROGRAMMING FOR CNC MACHINES
Structure of CNC program, Coordinate system, G & M codes, cutter radius compensation, tool nose radius compensation, tool wear compensation, canned cycles, sub routines, do loop, mirroring features. Manual part programming for CNC turning and machining centre for popular controllers like Fanuc, Siemens, Generation of CNC program using CAM software.
UNIT V  TOOLING AND WORK HOLDING DEVICES
Introduction to cutting tool materials – HSS, Carbides, Ceramics, CBN, PCD, classification of inserts-
PMK, NSH, qualified, semi qualified and preset tooling, tooling system for CNC Machining centre and
Turning centre, Automatic Tool changers, work holding devices for rotating and fixed work parts,
Automatic Pallet changer, economics of CNC, maintenance of CNC machines. Feedback devices -
Principles of Operation - Robots for loading jobs & material handling - Multi Pallets - Hydraulic and
Pneumatic Fixtures - Anti Vibration Boring Bars - Hydro Gripping & Shrink Fit Adaptors for Drills and
Reamers.

REFERENCES:
   2009.

ED8152  COMPUTER APPLICATIONS IN DESIGN  L  T  P  C
3  0  2  4

OBJECTIVE:
• To impart knowledge on computer graphics which are used routinely in diverse areas as science,
  engineering, medicine, etc.

OUTCOME:
• With laboratory classes in conjunction, It helps the students to get familiarized with the computer
  graphics application in design. This understanding reinforces the knowledge being learned and
  shortens the overall learning curve which is necessary to solve CAE problems that arise in
  engineering.

UNIT I  INTRODUCTION TO COMPUTER GRAPHICS FUNDAMENTALS
Output primitives (points, lines, curves etc.), 2-D & 3-D transformation (Translation, scaling, rotators)
windowing - view ports - clipping transformation.

UNIT II  CURVES AND SURFACES MODELLING
Introduction to curves - Analytical curves: line, circle and conics – synthetic curves: Hermite cubic
spline- Bezier curve and B-Spline curve – curve manipulations.

Introduction to surfaces - Analytical surfaces: Plane surface, ruled surface , surface of revolution and
tabulated cylinder – synthetic surfaces: Hermite bicubic surface- Bezier surface and B-Spline surface-
surface manipulations.

UNIT III  NURBS AND SOLID MODELING
NURBS- Basics- curves , lines, arcs, circle and bi linear surface.

UNIT IV VISUAL REALISM
Hidden – Line – Surface – solid removal algorithms shading – coloring. Introduction to parametric and variational geometry based software’s and their principles creation of prismatic and lofted parts using these packages.

UNIT V ASSEMBLY OF PARTS AND PRODUCT DATA EXCHANGE

Note: Lab Practice of 30 hrs. TOTAL 45 + 30 = 75 PERIODS
Laboratory session: Writing interactive programs generate graphics and to solve design problems - using any languages like Auto LISP/ C / FORTRAN etc. Each assessment should contain a component of Laboratory session.

REFERENCES:

MA8161 STATISTICAL METHODS FOR ENGINEERS

COURSE OBJECTIVE:
• This course aims at providing the necessary basic concepts of a few statistical methods and apply them to various engineering problems.

COURSE OUTCOME:
• It helps the students to have a clear perception of the power of statistical ideas, tools and would be able to demonstrate the applications of statistical techniques to problems drawn from industry, management and other engineering fields.

UNIT I ESTIMATION THEORY
(9+3)

UNIT II TESTING OF HYPOTHESIS
(9+3)
Tests based on Normal, t, χ² and F distributions for testing of means, variance and proportions - Analysis of r x c tables – Goodness of fit.
UNIT III  CORRELATION AND REGRESSION  (9+3)
Multiple and Partial Correlation - Method of Least Squares- Plane of Regression - Properties of
Residuals - Coefficient of Multiple Correlation - Coefficient of Partial Correlation - Multiple Correlation
with total and partial correlations - Regression and Partial correlations in terms of lower order
coefficients.

UNIT IV  DESIGN OF EXPERIMENTS  (9+3)
Analysis of variance - One-way and two-way classifications - Completely randomized design -
Randomized block design - Latin square design.

UNIT V  MULTIVARIATE ANALYSIS  (9+3)
Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density
and its properties - Principal components: Population principal components – Principal components
from standardized variables.

REFERENCES:
2. Devore, J.L., “Probability and statistics for Engineering and the Sciences”, Thomson and Duxbury,
2000.

CI8111  CIM LABORATORY – I

OBJECTIVE:
- To impart knowledge in CAD software package for modeling, assembly, FEA of mechanical
components and CNC programming for Milling/Turning.

OUTCOMES:
At the end of this course the student will be able to model, assemble, FEA of mechanical components
using CAD software and CNC programming for Milling/Turning.
1. Assembly of mechanical components using CAD software SolidWorks/CATIA/Pro-E.
2. Finite Element Analysis (FEA) using Pre-processing (solid modeling, meshing, analysis setup)
and post processing (graphical display and report) with software PATRAN/ NASTRAN/ MARC/
ABAQUS/ LS-DYNA/ ANSYS/PAM-CRASH (Exercises include Simple Beam, Plane Stress,
Strain, axi-symmetric, 3D Solids).
3. CNC code generation for CNC Milling.
4. CNC code generation for CNC Turning.
5. Demonstration of CNC Router Machine/ CNC Lathe/ CNC Milling (Students have to submit
detailed reports on each demonstrations).
LIST OF EQUIPMENTS REQUIRED:
1. Computers 20
2. CAD software Solid Works/CATIA/Pro-E.
3. FEA Software PATRAN/NASTRAN/ MARC/ ABAQUS/ LS-DYNA/ ANSYS.
4. CAM Software for CNC machining/simulation (CAPS Mill, CAPS Turn and Edge CAM).

TOTAL: 45 PERIODS

CI8201 APPLIED MATERIALS ENGINEERING  L T P C
3 0 0 3

OBJECTIVE:
- This course provides knowledge in the areas of Industrial metallurgy, advanced materials and selection of materials for industrial applications.

OUTCOME:
- At the end of this course the student will be able to select the materials for Engineering applications by understanding basic mechanical properties of materials, the relation of the microstructure and mechanical properties, processing techniques for controlling shape and properties in the final product and able to work in R&D activity in the field of materials science.

UNIT I ELASTIC AND PLASTIC BEHAVIOUR  8
Mechanism of Elastic and Plastic deformation, Anelasticity and viscoelasticity - role of dislocations, yield stress, shear strength of perfect and real crystals - Strengthening mechanism, 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.

UNIT II FRACTURE BEHAVIOUR  8

UNIT III SELECTION OF MATERIALS  8
Motivation, 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.

UNIT IV MATERIAL PROCESSING  9
Processing of engineering materials – Primary and Secondary processes – astability, Weldability, forgeability and malleability Criteria – Process induced defects – Monitoring and control.

UNIT V MODERN MATERIALS AND TREATMENT  12
Dual phase steels, high strength low alloy steel, transformation included plasticity steel, maraging steel, smart materials, properties and applications of engineering plastics and composites materials - advanced structural ceramics – WC, TiC, TaC, Al2O3, SiC, Si3N4, CBN, diamond – Plasma, PVD, CVD- thick and thin film deposition – Functionally Gradient Materials, Nano materials

TOTAL: 45 PERIODS
REFERENCES:

WEB REFERENCES:
1. www.astm.org/labs/pages/131350.htm
2. www.appliedmaterials.com/carrers/agu-ei.html

CI8202 COMPUTER INTEGRATED PRODUCTION AND INVENTORY SYSTEMS L T P C 3 0 0 3

OBJECTIVES:
• To familiarize the student with current trend in production management activities.
• To impress and prepare them to use modern technologies in future management systems.

OUTCOMES:
At the end of this course the students are expected
• To manage efficiently various activities of production with the help of technology
• Expected to use modern technologies in future management systems

UNIT I PRODUCTION PLANNING AND CONTROL AND FORECASTING: 9

UNIT II AGGREGATE PLANNING: 8
Planning hierarchy-Aggregate production planning (APP)-need-Alternatives for managing supply and demand-basic strategies-numerical problems-APP methods-Master Production Scheduling.

UNIT III RESOURCE PLANNING: 10
Inventory Management - Inventory types and general control procedures-Order point systems-The inventory management module- -Material Requirements Planning- Basic MRP Concepts-capacity requirements planning-Distribution requirements planning-Independent versus dependent demand-Lumpy demand-Lead times-Common use items-Inputs to MRP-numerical problems- Manufacturing Resource planning-Enterprise planning.
UNIT IV  SHOP FLOOR CONTROL:  9
Shop Floor Control - Functions of Shop Floor Control - Priority control and assignment of shop orders -
Maintain information on work-in-process - Monitor shop order status - Production output data for capacity control - The Shop Floor Control System - Order release - Order scheduling - Order progress -

UNIT V  COMPUTER PROCESS MONITORING AND CONTROL:  9
Computer Process Monitoring: Data logging systems - Data acquisition systems - Multilevel scanning -

TOTAL: 45 PERIODS

REFERENCES:

CI8252  COMPETITIVE MANUFACTURING SYSTEMS  L T P C
3 0 0 3

OBJECTIVE:
- To emphasize the knowledge on the quality improvement, automation, and advanced manufacturing techniques to create the highest-caliber products quickly, efficiently, inexpensively, and in synchronization with the marketing, sales, and customer service of the company.

OUTCOME:
- At the end of this course the student will be able to apply the knowledge to implement and work in competitive manufacturing systems. Student will be able to practice the principles of flexible manufacturing, Kaizen, 5S, Jidoka, Poka Yoke and Lean manufacturing.

UNIT I  MANUFACTURING IN A COMPETITIVE ENVIRONMENT  9
UNIT II
GROUP TECHNOLOGY & FLEXIBLE MANUFACTURING SYSTEMS

UNIT III
COMPUTER SOFTWARE, SIMULATION AND DATABASE OF FMS

UNIT IV
LEAN MANUFACTURING

UNIT V
JUST IN TIME:

REFERENCES:

QE8252
DISCRETE SYSTEM SIMULATION
L T P C
3 0 0 3

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.
- To understand the applications of random probability distributions in real time environments.
- Train students to solve discrete event problems through hand simulation and to develop simulation models using Extend simulation software.

OUTCOMES:
Students will:
1. Learn to simulate models matching real life scenarios and obtain superior results
2. Develop capabilities of taking up consultancy projects.
UNIT I INTRODUCTION:
Systems, modeling, general systems theory, concept of simulation, simulation as a decision making tool, types of simulation.

UNIT II RANDOM NUMBERS:
Methods of generating random numbers, Pseudo random numbers and random variates, discrete and continuous random probability distributions, tests for random numbers.

UNIT III DESIGN OF SIMULATION:
Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation, validation.

UNIT IV SIMULATION SOFTWARE:
Study and selection of simulation languages, Use of simulation software such as GPSS, Extend, Matlab, Simulink, LabView etc., for simulation.

UNIT V CASE STUDIES IN SIMULATION:
Development of simulation models for queuing systems, production systems, inventory systems, Industrial scheduling problems.

TOTAL: 45 PERIODS

REFERENCES:

CI8211 CIM LABORATORY – II

OBJECTIVE:
- To impart knowledge in Programmable Logic Control, Robot, Matlab programming and inspection of mechanical components using Video Measurement System and Coordinate Measuring Machine.

OUTCOMES:
At the end of this course the student will be able to programme in PLC, Robot, Matlab environment and they can also inspect mechanical components using VMS and CMM.
1. Programmable Logic Control (PLC) using PLC software Keyence ladder builder and working of PLC trainer kit.
2. Robot Programming.
3. Matlab Programming. (Matrix manipulations, plotting of functions and data, implementation of algorithms and creation of user interfaces).
4. Inspection of mechanical components using Video Measuring System (VMS).
6. Demonstration of various facilities (Students have to submit detailed reports on each).
demonstrations) such as Non-Contact Surface Roughness Tester, Contact Type Surface Roughness Tester, Tool Makers Microscope, Wire Electrical Discharge Machine, Pin-on-Disc apparatus, Multipurpose Micro-Machine Tool, Physical Vapor Deposition, Fiber Forming Chamber Machine, Abrasive Waterjet Machine, Machining Centre, etc which will help the students to aware about the facilities available for their project works).

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS REQUIRED:
1. Computers 20
2. PLC trainer kit
3. Video Measuring System (VMS)
4. Digital Height Gauge
5. Coordinate Measuring Machine (CMM)
6. Robot

CI8212 TECHNICAL SEMINAR

OBJECTIVE:
- To enrich the communication skills of the student through presentation of topics in recent advances in engineering/technology

OUTCOMES:
- Students will develop skills to read, write, comprehend and present research papers.
- Students shall give presentations on recent areas of research in manufacturing engineering in two cycles. Depth of understanding, coverage, quality of presentation material (PPT/OHP) and communication skill of the student will be taken as measures for evaluation.

TOTAL: 30 PERIODS

CI8001 ADVANCES IN WELDING AND CASTING TECHNOLOGY

OBJECTIVE:
- To impart knowledge on advances in welding and casting technology, cast design and advanced welding and casting processes.

OUTCOME:
At the end of this course the students are expected
1. To produce useful research output in welding and casting.
2. Use this knowledge in advancing the welding and casting process.
3. Application of design knowledge to understand and to overcome defects in welding and casting.

UNIT I WELDING DESIGN AND METALLURGY: 10
Weld joint design- Heat Affected Zone (HAZ) - Weldability of steels - Cast iron - Stainless steels, aluminum, copper and titanium alloys - Hydrogen embrittlement - Pre and Post weld heat treatments - Weld defects.

UNIT II SPECIAL WELDING PROCESSES: 10
UNIT III  CASTING DESIGN AND METALLURGY:  8

UNIT IV  SPECIAL CASTING PROCESSES:  8
Evaporative Pattern Casting Process and full mould process – Vacuum sealed moulding- vacuum casting-Magnetic Moulding - Squeeze Casting-types- Plaster mould casting-Ceramic mould casting-Thixoforming or semi solid forming-Single crystal growing.

UNIT V  AUTOMATION OF WELDING AND FOUNDRY:  9
Use of robots in welding- weld positioner and manipulators -weld seam tracking-arc sensing-vision system-automation of foundry-use of robots-moulding machines-Automation of sand plant, moulding and fettling sections of foundry-Dust and fume control.

TOTAL: 45 PERIODS

REFERENCES:

CI8002  COMPOSITE MATERIALS  L T P C  3 0 0 3

OBJECTIVE:
• To impart knowledge of various manufacturing methods of different composite materials, their properties, machining characteristics and their applications.

OUTCOME:
• At the end of this course the student will be able to select appropriate composite materials for specific applications.

UNIT I  INTRODUCTION:  9

UNIT II  POLYMER MATRIX COMPOSITES:  9
UNIT III METAL MATRIX COMPOSITES:
Introduction – Types, Metallic matrices: Aluminium, Titanium, Magnesium, copper Alloys – Processing of MMCs: Solid state, Liquid state, Vapour state, In-situ – Interface/Interphase in MMCs – Interfacial bonding in MMCs – Mechanical properties, coefficient of thermal expansion, environmental effects, moisture effects – Applications of MMCs – Recycling of MMCs.

UNIT IV CERAMIC MATRIX COMPOSITES:

UNIT V MACHINING OF COMPOSITES
Traditional (turning, milling, drilling, abrasive machining) and non-traditional (abrasive waterjet machining, electric discharge machining, ultrasonic, laser–assisted) machining of Composites – Characterisation and surface integrity studies on the machined surface.

TOTAL: 45 PERIODS

REFERENCES:

CI8003 CORROSION AND SURFACE ENGINEERING

OBJECTIVES:
- To impart knowledge on the scientific principles and methods that underlie the cause, detection, measurement and prevention of corrosion problems in engineering practices.
- To impart knowledge on the hands-on approaches for matching surface treatments with design and performance requirements.

OUTCOMES:
1. Students can able to provide solution for the typical Industrial corrosion problem.
2. Students can able to provide solution for different types of Surface Engineering problem.
UNIT I  MECHANISMS AND TYPES OF CORROSION :  

UNIT II  TESTING AND PREVENTION OF CORROSION:  
Planning and preparation of corrosion tests – In-service monitoring, simulated service, laboratory testing – Evaluation of corrosion - Prevention of Corrosion, suitable designing and modifications of corrosive environment, corrosion inhibitors -Cathodic Protection - Anodic protection - Protective surface coatings.

UNIT III  CORROSION BEHAVIOR OF MATERIALS:  
Selection of material for various corrosive environments - Corrosion of Steels, Stainless Steel, Aluminum alloys, Copper alloys, Nickel and Titanium alloys –Corrosion of Polymers, Ceramics and Composite materials.

UNIT IV  SURFACE COATINGS:  
Solid surface significance, surface properties, superficial layer – changing surface metallurgy, chemistry and adding a surface layer or coating - Diffusion coatings- Electro and Electro less Plating- Hot dip coating-Hard facing-Metal spraying, Plasma spraying

UNIT V  THIN LAYER ENGINEERING PROCESSES:  
Laser and Electron Beam hardening- Thermal evaporation, Arc Vaporization, Sputtering, Ion plating- Vapor deposition processes, Implantation technique – Coating of tools, TiC, TiN, Al2O3 and Diamond coating – Properties and applications of thin coating

TOTAL: 45 PERIODS

REFERENCES:
6. ASM Metals Hand Book – Volume 13 , Corrosion, 1999

CI8004  DESIGN FOR MANUFACTURING  
OBJECTIVE:  
- At the end of this course the student should be able to apply the design for manufacturing principles in casting, welding, forming, machining and assembly, by considering various manufacturing constraints.

OUTCOME:  
- At the end of this course the student will be able to design castings, weldings, formed and machined components. He / She will be able to practice design for assembly principles.
UNIT I INTRODUCTION: 6
Economics of Process selection – General design principles of manufacturability – Proper material selection – Strength and Mechanical factors- Application of form design.

UNIT II CASTING DESIGN AND WELDMENT DESIGN: 10
Factors affecting casting design- Strength aspects – Sand casting and die casting design-Factors affecting weldment design-Gas and arc welding design.

UNIT III FORMED METAL COMPONENTS AND NON METALLIC PARTS DESIGN: 10
Design considerations for the manufacture of extruded, cold headed metal parts – Tube and section bends – Powder metal parts-Thermo setting plastic parts-Reinforced – Plastic/Composite parts.

UNIT IV MACHINED COMPONENTS DESIGN: 10
Design considerations for the manufacture of turned parts-drilled parts-milled parts, planned, shaped and slotted parts-Ground parts-parts produced by EDM.

UNIT V DESIGN FOR ASSEMBLY: 9

REFERENCES:

CI8005 DESIGN OF CELLULAR MANUFACTURING SYSTEM L T P C
3 0 0 3

OBJECTIVE:
• To impart knowledge on group technology, optimization algorithms, implementation of GT/CMS, Performance measurements and economical aspects of CMS.

OUTCOME:
• At the end of this course the student should be able to plan and implement Cellular manufacturing systems, distinguish between traditional and non-traditional approaches of Problem solving, involve in performance measurement and determine human and economical aspects of CMS.

UNIT I INTRODUCTION: 12
Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT.

UNIT II CMS PLANNING AND DESIGN: 10
UNIT III IMPLEMENTATION OF GT/CMS: 10
Inter and Intra cell layout, cost and non-cost based models, establishing a team approach, Managerial structure and groups, batch sequencing and sizing, life cycle issues in GT/CMS.

UNIT IV PERFORMANCE MEASUREMENT AND CONTROL: 8
Measuring CMS performance - Parametric analysis - PBC in GT/CMS, cell loading, GT and MRP - framework.

UNIT V ECONOMICS OF GT/CMS: 5
Conventional Vs group use of computer models in GT/CMS, Human aspects of GT/CMS - cases.

TOTAL: 45 PERIODS

REFERENCES:

CI8006 ELECTRONICS MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE:
- To impart the knowledge in electronic packaging technology

OUTCOME:
- At the end of this course the student will be able to apply knowledge in various steps in electronics packaging technology.

UNIT I INTRODUCTION TO ELECTRONICS MANUFACTURING 9
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. Electronic packaging – Through Hole Technology (THT) and Surface Mount Technology (SMT).

UNIT II COMPONENTS AND PACKAGING 8
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 SOLDERING AND CLEANING 9
UNIT IV SURFACE MOUNT TECHNOLOGY: 
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 storage and handling, stencils and squeegees, process parameters, quality control - Component Placement, Equipment Type, Chip shooter, IC placer, Flexibility, Accuracy of Placement, Throughput, reflow soldering, adhesive, underfill and encapsulation process, applications, storage and handling, process & parameters.

UNIT V INSPECTION, TEST AND REWORK FOR PCB: 

TOTAL: 45 PERIODS

REFERENCES:

CI8007 ENVIRONMENT CONSCIOUS MANUFACTURING L T P C 3 0 0 3

OBJECTIVE:
- To impart the knowledge in sustainable manufacturing, ISO 14000 series standards, green manufacturing, recycling and life cycle assessment.

OUTCOME:
- On completion of the course the students will be able to follow the guidelines of ISO 14000, implement green design, follow environmental norms in manufacturing and do lifecycle assessment of products and processes.

UNIT I SUSTAINABLE MANUFACTURING AND EMS:

UNIT II GREEN MANUFACTURING:
Green Design and Quality Initiatives - Environmental Cost Accounting and Business Strategy - Accounting for an Environmentally Conscious Setting - The Development of Eco labelling Schemes
UNIT III  RECYCLING:  
Recycling as Universal Resource Policy - Innovation Towards Environmental Sustainability In Industry - A Systematic Framework for Environmentally Conscious Design

UNIT IV  ENVIRONMENTAL ATTRIBUTES OF MANUFACTURING:  
Environmental Attributes of Manufacturing Processes - Environmental Decision Support Systems - Decision Models for Reverse Production System Design - Environmentally Sound Supply Chain Management

UNIT V  LIFE CYCLE ASSESSMENT:  
Life Cycle Assessment - Multipath way and Cumulative Risk Assessment - Reclamation And Recycling of Waste

TOTAL:  45 PERIODS

REFERENCES:

CI8008  EVOLUTIONARY COMPUTATION  
L T P C  3 0 0 3

OBJECTIVE:
• To impart the knowledge in optimization, multi objective optimization, evolutionary algorithms, Multi-Objective Evolutionary Algorithms and programming.

OUTCOME:
• On completion of the course the students will be able to apply optimization using techniques like evolutionary strategies and evolutionary programming.

UNIT I  INTRODUCTION TO OPTIMIZATION:
Introduction to optimization - single and multi objective optimization - Evolutionary algorithms - principles of multi objective optimization.

UNIT II  MULTI OBJECTIVE OPTIMIZATION:
Convex programming, Karush-Kuhn-Tucker conditions, Direct functional evaluation and derivative based optimization techniques;

UNIT III  EVOLUTIONARY ALGORITHMS:
Simulated annealing, Tabu search; NFL theorem; Biological principles of evolution, General scheme of EAs, Representation, Selection schemes, Population evaluation, Variation operators; Constraint handling; Schema theorem; Binary coded genetic algorithm, Real coded genetic algorithm.

UNIT IV  EVOLUTIONARY STRATEGIES AND EVOLUTIONARY PROGRAMMING
Evolutionary strategies, Evolutionary programming, genetic programming, Differential evolution, Particle swarm optimization;
UNIT V          APPLICATIONS OF MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS

Pareto-optimality, Multi-objective evolutionary algorithms; Statistical analysis of EC techniques; Customization in EAs; Applications of multi-objective evolutionary algorithms - Mechanical component design - Truss-structure design - Other applications.

TOTAL: 45 PERIODS

REFERENCES:

CI8009            FINITE ELEMENT ANALYSIS IN MANUFACTURING ENGINEERING

OBJECTIVE:
- The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behavior of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and thermal engineering applications.

OUTCOME:
- At the end of this course the students would have developed a thorough understanding of the basic principles of the finite element analysis techniques with an ability to effectively use the tools of the analysis for solving problems in Manufacturing Engineering

UNIT I           GENERAL INTRODUCTION


UNIT II          PROBLEM IN 2D:

UNIT III APPLICATIONS TO FIELD PROBLEMS 9

UNIT IV NON-LINEAR ANALYSIS 9
Introduction to Non-linear problems - some solution techniques - computational procedure - simple material non-linearity - Plasticity and viscoplastcity, stress stiffening, contact interfaces - problems of gaps and contact - geometric non-linearity - modeling considerations - Impact analysis.

UNIT V ANALYSIS OF PRODUCTION PROCESSES 8
Application to Bulk forming, sheet metal forming, casting, metal cutting, welding - Features of software packages

REFERENCES:
UNIT IV  APPLICATION OF NEURAL NETWORKS:  
Neural Networks for Intelligent Process Monitoring and Control: Applications to CNC machining, Metal Forming - Intelligent Manufacturing Planning, Scheduling and Control - Intelligent Assembly and Layout Planning.

UNIT V  INTERNET BASED COLLABORATIVE CAD/CAM:  
Applications to web based CAD, CAPP, CNC, Assembly planning, and Rapid Prototyping - Challenging issues of Collaborative CAD/CAM.

TOTAL:  45 PERIODS

REFERENCES:

CI8011  INTRODUCTION TO ARTIFICIAL INTELLIGENCE  
L T P C  
3 0 0 3

OBJECTIVE:
• To introduce the student various types of artificial intelligence and its applications.

OUTCOME:
• At the end of this course the student should be able to apply the AI techniques to create applications which involve perception, reasoning and learning.

UNIT I  INTRODUCTION:  

UNIT II  SEARCHING TECHNIQUES:  

UNIT III  KNOWLEDGE REPRESENTATION:  
First order logic – representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution - Knowledge representation - Ontological Engineering - Categories and objects – Actions - Simulation and events - Mental events and mental objects.

UNIT IV  LEARNING:  

UNIT V APPLICATIONS: 8

TOTAL: 45 PERIODS

REFERENCES:

CI8012 LEAN MANUFACTURING L T P C 3 0 0 3

OBJECTIVE:
- At the end of this course the students should be able to implement lean manufacturing concepts in the factories.

OUTCOME:
- The student will be able to practice the principles of lean manufacturing like customer focus, reduction of MUDA, just in time, Jidoka and Hoshin planning.

UNIT I INTRODUCTION: 9
The mass production system – Origin of lean production system – Necessity – Lean revolution in Toyota – Systems and systems thinking – Basic image of lean production – Customer focus – Muda (waste).

UNIT II STABILITY OF LEAN SYSTEM: 9
Standards in the lean system – 5S system – Total Productive Maintenance – standardized work – Elements of standardized work – Charts to define standardized work – Man power reduction – Overall efficiency - standardized work and Kaizen – Common layouts.

UNIT III JUST IN TIME: 9

UNIT IV JIDOKA (AUTOMATION WITH A HUMAN TOUCH): 9

UNIT V WORKER INVOLVEMENT AND SYSTEMATIC PLANNING METHODOLOGY 9
Involvement – Activities to support involvement – Quality circle activity – Kaizen training - Suggestion Programmes – Hoshin Planning System (systematic planning methodology) – Phases of Hoshin Planning – Lean culture

TOTAL: 45 PERIODS
REFERENCES:

CI8013 MICRO AND NANO MANUFACTURING L T P C 3 0 0 3

OBJECTIVE:
• The purpose of this subject is to understand the principles of various micro and nano manufacturing methods.

OUTCOME:
• At the end of this course the student will be able to apply knowledge in micro and nano manufacturing methods, synthesis of nano materials and characterization techniques

UNIT I INTRODUCTION
Introduction to Meso, Micro and Nano manufacturing, Miniaturization and applications, classification-

UNIT II MANUFACTURING METHODS
Material deposition – PVD, CVD, LIGA, Micro stereo lithography, Electro discharge deposition,

UNIT III ADVANCED MACHINING / FINISHING PROCESSES

UNIT IV SYNTHESIS OF NANOMATERIALS

29
UNIT V CHARACTERISATION TECHNIQUES
Metrology for micro machined components-Optical Microscopy, White Light Interferrometry, Molecular Measuring Machine, Micro CMM

REFERENCES:

CI8014 MICROELECTROMECHANICAL SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
- To impart knowledge of design, fabrication and characterization of Micro Electro Mechanical systems.

OUTCOME:
- At the end of this course the student will be able to apply the knowledge in mechanics, scaling, design, fabrication and characterization of micro systems.

UNIT I INTRODUCTION

UNIT II MECHANICS, SCALING AND DESIGN

UNIT III MICRO SYSTEM FABRICATION PROCESSES
Introduction- Photolithography- Ion implantation- Chemical Vapor Deposition-Physical Vapor Deposition - clean room- Bulk micromachining :etching, isotropic and anisotropic etching, wet and dry etching- Surface micro machining :process, mechanical problems associated with surface micro
machining- LIGA process: general description, materials for substrates and photo resists-SLIGA process-Abrasive jet micro machining-Laser beam micro machining- Micro Electrical Discharge Micro Machining-Ultrasonic Micro Machining- Electro chemical spark micro machining- Electron beam micro machining-Focused Ion Beam machining

UNIT IV  MICROSYSTEMS PACKAGING  8
Introduction - Microsystems Packaging-Interfaces in Microsystems Packaging-Essential Packaging Technologies- Die preparation, surface bonding, wire bonding, sealing- Three dimensional Packaging-Assembly of Microsystems, Signal Mapping and Transduction

UNIT V  MICROMETROLOGY AND CHARACTERIZATION  8

TOTAL: 45 PERIODS

REFERENCES:

CI8015  PRECISION ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
- The student will be able to understand the striving need for precision and application.
- Motivate the students to learn about the advanced concepts of precision and ultra precision Machining methods
- In addition, the student will enhance his/her knowledge in Precision Engineering and its applications.

OUTCOME:
Students will:
1. Operate high precision machineries with ease.
2. Research and explore new areas of cutting tools.

UNIT I  INTRODUCTION:  8

UNIT II  MATERIALS FOR PRECISION ENGINEERING:  8
UNIT III  PRECISION MACHINING:  

UNIT IV  ERRORS: CAUSES AND REMEDIES:  
Static stiffness - influence on machining accuracy – over all stiffness in a machine/instrument – errors due to variation of cutting forces – clamping forces – errors due to compliance while machining. Inaccuracy due to thermal effects: Heat sources and dissipation – Geometry of thermal deformation-influence of forced isstratics dimensional wear of elements – instruments; Machining tools and their influence on accuracy- error due to clamping and setting location.

UNIT V  PRECISION MACHINE ELEMENTS:  

REFERENCES:

CI8016  PRODUCTION PLANNING AND MANAGEMENT  L T P C  3 0 0 3

OBJECTIVE:
• To provide the student with the knowledge of how to manage different aspects of manufacturing including design, facilities, jobs, inventory, MRP and reengineering.

OUTCOME:
• At the end of this course the student should be able to design products, facilities, jobs, inventory systems and embark on business process reengineering.

UNIT I  INTRODUCTION:
Elements – Manufacturing Strategies and competitiveness - Meeting the competitive Project management.

UNIT II  DESIGNING OF PRODUCTS:

UNIT III  DESIGN OF FACILITIES AND JOBS:
Capacity planning – Strategies – Planning service capacity - JIT – Facility location and layout - Job Design and Work measurement.
UNIT IV  INVENTORY SYSTEMS AND MRP: 10
Definition-Purposes of Inventory-Inventory models-Fixed order Quantity models and Fixed-time period models.MRP Systems-MRP system structures- Improvements for MRP system-Advanced MRP-type systems.

UNIT V  REVISING THE SYSTEM: 10
TOTAL: 45 PERIODS

REFERENCES:

CI8017  RELIABILITY AND TOTAL PRODUCTIVE MAINTENANCE  L T P C 3 0 0 3

OBJECTIVE:
- To provide the student with the knowledge of reliability, failure analysis, reliability prediction, management and also the principles and practices of TPM.

OUTCOME:
- At the end of this course the student should be able to do all calculations relating to reliability of a product or a system. The student should be able to predict reliability and implement total productive maintenance in factories.

UNIT I  INTRODUCTION 9
Reliability function - MTBF - MTTF - mortality curve - availability - Maintainability.

UNIT II  FAILURE DATA ANALYSIS: 9
Repair time distributions - exponential, normal, log normal, gamma, and Weibull - reliability data requirements - Graphical evaluation.

UNIT III  RELIABILITY PREDICTION: 9

UNIT IV  RELIABILITY MANAGEMENT: 9
Reliability demonstration testing - Reliability growth testing - Duane curve - Risk assessment - FMEA, Fault tree.

UNIT V  TOTAL PRODUCTIVE MAINTENANCE: 9

TOTAL: 45 PERIODS
REFERENCES:

CI8018 SENSORS FOR MANUFACTURING AND CONDITION MONITORING

OBJECTIVE:
- To impart knowledge of sensor technologies used in the manufacturing industry for monitoring workpieces, machine tools, machining processes and advanced sensors.

OUTCOME:
- At the end of this course the student will be able to apply appropriate sensors for monitoring work pieces, machine tools, machining processes and advanced sensors in manufacturing industries.

UNIT I INTRODUCTION TO SENSORS
Role of sensors in manufacturing and condition monitoring – Principles – Classification Applications – Basic requirements of sensor – Signal processing and decision making.

UNIT II SENSORS FOR WORKPIECE MONITORING
Mechanical, Electrical, Electro-mechanical, Opto-electrical, Optical, Pneumatic, Capacitance, Eddy-current and Magnetic sensors.

UNIT III SENSORS FOR MACHINE TOOL MONITORING
Position measurements: Linear, angular and velocity sensors – Calibration of machine tools – Collision detection measurements.

UNIT IV SENSORS FOR MACHINING PROCESSES

UNIT V ADVANCED SENSORS

TOTAL: 45 PERIODS

REFERENCES:

CI8019 SUSTAINABLE MANUFACTURING L T P C 3 0 0 3

OBJECTIVE:
- To provide the student with the knowledge of sustainability in manufacturing, its evaluation, strategy to achieve sustainability, supply chain management and sustainable operations.

OUTCOME:
- On completion of the course the students will be able to apply techniques of environmental valuation, formulate strategy for sustainable manufacturing and plan sustainable operations and supply chain management.

UNIT I ENVIRONMENTAL VALUATION:
Introduction to the environmental issues pertaining to the manufacturing sector - pressure to reduce costs - processes that minimize negative environmental impacts - environmental legislation and energy costs - acceptable practice in society - adoption of low carbon technologies - need to reduce the carbon footprint of manufacturing operations.
Techniques for non-market valuation: cost and income based approaches, demand estimation methods - expressed and revealed preference, choice modeling - Multi-criteria analysis- Stakeholder analysis - Environmental accounting at sector and national levels.

UNIT II EVALUATING SUSTAINABILITY:
Sustainability performance evaluators- Frameworks and techniques - environmental management systems - life cycle assessment - strategic and environmental impact assessments - carbon and water foot-printing.

UNIT III MANUFACTURING STRATEGY FOR SUSTAINABILITY:

UNIT IV SUPPLY CHAIN MANAGEMENT:
Challenges in logistics and supply chain - developing the right supply chain strategy for the products - need to align the supply network around the strategy - Tools that can be used systematically to identify areas for improvement in supply chains - Specific challenges and new thinking in the plan, source and delivering of sub-processes.
UNIT V  SUSTAINABLE OPERATIONS:  9

TOTAL: 45 PERIODS

REFERENCES:

CI8020  TECHNIQUES OF MATERIAL CHARACTERIZATION  L T P C
3 0 0 3

OBJECTIVE:
• On completion of the course the students are expected to be knowledgeable in microstructure evaluation, crystal structure analysis, electron microscopy, Chemical, Thermal analysis and mechanical testing methods.

OUTCOME:
• At the end of this course the student will be able to apply various material characterization techniques for research and analysis.

UNIT I  MICRO STRUCTURAL EVALUATION:  9

UNIT II  CRYSTAL STRUCTURE ANALYSIS:  9

UNIT III  ELECTRON MICROSCOPY:  9

UNIT IV  CHEMICAL AND THERMAL ANALYSIS:  9
Basic principles, practice and applications of X-ray spectrometry, Wave dispersive X-ray spectrometry, Auger spectroscopy, Secondary ion mass spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR) – proton induced X-ray Emission spectroscopy, Differential thermal analysis, Differential Scanning Calorimetry (DSC) and Thermo Gravimetric Analysis (TGA)
UNIT V MECHANICAL TESTING:

REFERENCES:

CI8021 TOOL ENGINEERING L T P C
3 0 0 3

OBJECTIVE:
• This course provides knowledge in the areas of design of single point and multi point cutting tools, dies, jigs, fixtures and limit gauges and toll design for CNC machines.

OUTCOME:
At the end of this course
1. This domain knowledge will increase their employability skills
2. Use this knowledge to develop innovative ideas work holding methods
3. Encourages to involve in research in the area of machining

UNIT I INTRODUCTION: 7
Broad Classification of Tools-Cutting tools, Dies , Holding and Measuring tools, Tool materials and heat treatment- Ferrous, Non-ferrous and Non metallic materials, tool making practices.

UNIT II DESIGN OF CUTTING TOOLS: 11
Single Point Cutting Tools: Classification, Nomenclature, geometry, design of single point tools for lathes, shapers, planers etc. Chip breakers and their design. Multipoint Cutting Tools: Classification and specification, nomenclature, Design of drills, milling cutters, broaches, taps etc. Design of Form Tools: Flat and circular form tools, their design and applications.

UNIT III DESIGN OF DIES: 10
UNIT IV  DESIGN OF JIGS AND FIXTURES:  9
Classification of Jigs and Fixtures, Fundamental Principles of design of Jigs and Fixtures, Location and Clamping in Jigs and fixtures, Simple design for drilling Jigs, Milling fixtures etc. Indexing Jigs and fixtures.

UNIT V  DESIGN OF LIMIT GAUGES AND TOOL DESIGN FOR CNC MACHINES:  8
Fixed gauges, gauge tolerances, indicating gauges, automatic gauges, selection of materials, tool design for CNC machines- fixture design, cutting tools, tool holding, tool pre-setter, automatic tool changers and positioners.

REFERENCES:

TOTAL: 45 PERIODS

CI8022   TOTAL QUALITY SYSTEMS AND ENGINEERING  L T P C
3 0 0 3

OBJECTIVE:
• This course provides knowledge in the areas of quality management, its pioneers, practices and techniques. It also provides knowledge in quality by design and product liability.

OUTCOME:
• At the end of this course the student should be able to apply the principles, practices and techniques of quality systems and engineering in factories.

UNIT I  INTRODUCTION:  10

UNIT II  PRACTICES OF TQM:  10

UNIT III  TECHNIQUES OF TQM:  10

UNIT IV  QUALITY BY DESIGN:  8

UNIT V  PRODUCTS LIABILITY:  7

TOTAL: 45 PERIODS
REFERENCES:

CI8023 WAREHOUSE LAYOUT PLANNING AND PART FEEDING METHODS L T P C
3 0 0 3

OBJECTIVE:
- Students will learn various part feeding methods, optimum design of feeding routes and feeding methods and develop knowledge on warehouse management systems, safety requirements of warehouse panning

OUTCOME:
Students will be able to:
1. Design and plan warehouse layouts
2. Plan racking systems and Material handling systems for warehouse requirements.

UNIT I LAYOUT PLANNING:
- Layout Planning - Importance of Layout Planning - General Steps in Layout and Space Requirements Planning - Warehouse Activities - Determining Space Requirements – Develop realistic and Ideal Layout for Storage and Retrieval – Material storage methods for each part

UNIT II RACKING SYSTEMS FOR WAREHOUSE:

UNIT III MATERIAL HANDLING SYSTEMS FOR WAREHOUSE:
- Material Handling System - Material Flow Path - Selection Criteria to Determine Equipment - Material Handling Equipment Classification – MHE Manufacturer's Worldwide Ranking - Comparison of Fork Lift, Reach Truck and Narrow Aisle Truck - MHE Service and Battery Charging - Crane Design Requirements

UNIT IV PART FEEDING:
- Part feeding - Number of Tow Truck Requirements - Calculations - Kitting Trolley Route Map - Kitting Time Estimation - Kitting Trolley Feeding Man Power Calculation - Kitting Trolley Design Methodology - Assumptions in Kitting Design - Kit Trolley Design - Key Ware House Planning- Issues to be Considered during Ware Housing Planning - Check List for Warehouse Layout Planning - Return on Assets
UNIT V  WAREHOUSE MANAGEMENT SYSTEMS, SAFETY AND STAFFING  9
WMS Support in Warehouse Management - Benefits of a WMS - Components of a WMS - WMS
Data - WMS Functions - WMS Reports - Warehouse Safety Requirements, Warehouse Staffing -
Personnel Requirements for a Typical Warehouse.

REFERENCES:
chain and logistics Institute, School of Industrial and systems Engineering, Georgia Institute of
Technology, Atlanta, GA 30332-0205 USA, Revised August 20, 2008.
3. Hanson, R., "In-plant materials supply: Supporting the choice between kitting and continuous
supply", Department of Technology Management and Economics, Chalmers University of
Technology, Gothenburg, Sweden 2012. (http://publications.lib.chalmers.se/records/fulltext/
155418.pdf)
4. Richards, G., "Warehouse Management: A complete guide to improving efficiency and minimizing
Part 1 General provisions and buildings, (Fifth Revision).

CI8071 ADDITIVE MANUFACTURING

OBJECTIVE:
- To educate students with fundamental and advanced knowledge in the field of Additive
  manufacturing technology and the associated Aerospace, Architecture, Art, Medical and industrial
  applications.

OUTCOME:
- On completion of this course, they will learn about a variety of Additive Manufacturing (AM)
technologies, their potential to support design and manufacturing, case studies relevant to mass
customized manufacturing, and some of the important research challenges associated with AM
and its data processing tools

UNIT I  INTRODUCTION:  8
Need - Development of AM systems – AM process chain - Impact of AM on Product Development -
Virtual Prototyping- Rapid Tooling – RP to AM -Classification of AM processes-Benefits- Applications.

UNIT II  REVERSE ENGINEERING AND CAD MODELING:  10
Basic concept- Digitization techniques – Model reconstruction – Data Processing for Rapid
Prototyping: CAD model preparation, Data requirements – Geometric modeling techniques: Wire
frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support
generation, Support structure design, Model Slicing, Tool path generation-Software for AM- Case
studies.

UNIT III  LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS  10
Stereolithography Apparatus (SLA): Principle, pre-build process, part-building and post-build
processes, photo polymerization of SL resins, part quality and process planning, recoating issues,
materials, advantages, limitations and applications.

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS: 10

UNIT V OTHER ADDITIVE MANUFACTURING SYSTEMS: 7
Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballastic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.

REFERENCES:

CI8072 COMPUTER AIDED PROCESS PLANNING

OBJECTIVE:
To familiarize the students with process planning in the manufacturing cycle, design, drafting, geometric modeling, systems in CAPP and report generation.

OUTCOMES:
At the end of this course the students are expected to use
1. Application of computers in the documentation
2. Creating database for the future use
3. Use of commercially available CAPP system in Industries

UNIT I INTRODUCTION:
Production Planning and Process Planning - The role of Process Planning in the Manufacturing cycle - Experience based planning - Need for computer aided process planning. - Process Planning and Concurrent Engineering, Group Technology
UNIT II PART DESIGN REPRESENTATION: 10
Basic part representation methods: CAD models-Feature based design-Design interface: syntactic pattern recognition-State transition diagram-Decomposition approach-Logic approach-Graph based approach.

UNIT III KNOWLEDGE REPRESENTATION: 7

UNIT IV SYSTEM FORMULATION: 10

UNIT V COMPUTER AIDED PROCESS PLANNING SYSTEMS: 10
Computer aided Process Planning – Variant process planning – Generative process planning—Forward and Backward planning, input format - Totally Integrated process planning systems – Expert process planning-Commercial systems: CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP- TOTAL: 45 PERIODS

REFERENCES:

WEB REFERENCES:

CI8073 INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS L T P C 3 0 0 3

OBJECTIVE:
• To teach students the basics of robotics, construction features, sensor applications, robot cell design, robot programming and application of artificial intelligence and expert systems in robotics.

OUTCOME:
• The student will be able to design robots and robotic work cells and write program for controlling the robots. The student will be able to apply artificial intelligence and expert systems in robotics.
UNIT I  INTRODUCTION AND ROBOT KINEMATICS

UNIT II  ROBOT DRIVES AND CONTROL

UNIT III  ROBOT SENSORS

UNIT IV  ROBOT CELL DESIGN AND APPLICATION

UNIT V  ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI8074  MANUFACTURING INFORMATION SYSTEMS
OBJECTIVE:
- The purpose of the course is to provide an importance of databases and its application in manufacturing systems that prepare students for their engineering practice by organization by conversant with order policies, data base terminologies, designing, manufacturing considerations.
OUTCOME:
- On completion of this course, the students are expected to create simple to moderately complex manufacturing information system for manufacturing industry.

UNIT I  INTRODUCTION:
The Evolution of order policies, from mrp to MRP II to ERP – Agile Manufacturing Information Systems, Manufacturing Database Integration.

UNIT II  DATABASE:

UNIT III  DESIGNING DATABASE:
Hierarchical model – Network approach- Relational Database concepts, principles, keys,– functional dependency – Normalization types – relational operations- Query Languages-Case studies.

UNIT IV  MANUFACTURING CONSIDERATION:
The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various models – the order scheduling module, Input/output analysis module, and stock status database – the complete IOM database.

UNIT V  INFORMATION SYSTEM FOR MANUFACTURING:
Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems, Computer based production management system, computerized manufacturing information system -RFID-Telecommunication– case study.

TOTAL: 45 PERIODS

REFERENCES:

WEB REFERENCES:
1. www.ist.psu.edu
2. www.cse.wustl.edu(UML Notation Guide)
UNIT I  INTRODUCTION:

UNIT II  SENSORS AND TRANSDUCERS:

UNIT III  ACTUATORS:
Actuators – Mechanical - Electrical - Fluid Power - Piezoelectric – Magnetostrictive - Shape memory alloy - applications - selection of actuators.

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 CASE STUDIES:
Steps in mechatronics design - Possible design solutions-Traditional and Mechatronics design concepts - Case studies of Mechatronics systems - Pick and place Robot - Conveyor based material handling system - PC based CNC drilling machine – Mechatronics Control in automated Manufacturing – Data Acquisition - Case studies.

TOTAL: 45 PERIODS

REFERENCES:

QE8053  SUPPLY CHAIN MANAGEMENT
L T P C 3 0 0 3

UNIT I  INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

UNIT II  DESIGNING THE SUPPLY CHAIN NETWORK
UNIT III SOURCING, TRANSPORTATION AND PRICING 10

UNIT IV COORDINATION AND TECHNOLOGY 10

UNIT V EMERGING CONCEPTS 8
3PL- 4PL- Global Logistics -Reverse Logistics; Reasons, Activities, Role. Warehouse Management- RFID Systems; Components, applications, implementation. Lean supply Chains- Sustainable supply Chains

TOTAL: 45 PERIODS

REFERENCES

ED8075 DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
- To impart students on the science, use and application of hydraulics and pneumatics as fluid power in Industry. Also to impart knowledge on the methodology of basic and advanced design of pneumatics and hydraulics systems.

OUTCOME:
- It helps students to get knowledge on the need, use and application of fluid power and make them familiar to industrial design that lead to automation.

UNIT I OIL HYDRAULIC SYSTEMS AND HYDRAULIC ACTUATORS 5
Hydraulic Power Generators – Selection and specification of pumps, pump characteristics. Linear and Rotary Actuators – selection, specification and characteristics.

UNIT II CONTROL AND REGULATION ELEMENTS 12
Pressure - direction and flow control valves - relief valves, non-return and safety valves - actuation systems.
UNIT III  HYDRAULIC CIRCUITS  5

UNIT IV  PNEUMATIC SYSTEMS AND CIRCUITS  16
Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods - step counter method - compound circuit design - combination circuit design.

UNIT V INSTALLATION, MAINTENANCE AND SPECIAL CIRCUITS  7
Pneumatic equipments- selection of components - design calculations – application -fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

REFERENCES:

IL8081  PROJECT MANAGEMENT  L T P C
UNIT I  STRATEGIC MANAGEMENT AND PROJECT SELECTION  9
Project selection models, Project portfolio process, Analysis under uncertainty, Project organization, Matrix organization

UNIT II  PROJECT PLANNING  9

UNIT III  PROJECT IMPLEMENTATION  12

UNIT IV  MONITORING AND INFORMATION SYSTEMS  9
Information needs and the reporting process, computerized PMIS, Earned value analysis, Planning-Monitoring-Controlling cycle, Project control: types of control processes, design of control systems, control of change and scope.

UNIT V PROJECT AUDITING  6
Construction and use of audit report, Project audit life cycle, Essentials of audit and evaluation, Varieties of project termination, the termination process, The Final Report – A project history.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES: