### SEMESTER I

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## ELECTIVES

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AIM: The course aims at providing knowledge for the basic concepts of Probability and Statistics and the techniques for solving mathematical problems for probability analysis which will be useful in solving some Engineering problems.

OBJECTIVES:

- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES:
Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of a Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES:
Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY:

UNIT IV TESTING OF HYPOTHESES:
Sampling distributions - Type I and Type II errors - Tests based on Normal, t, \( \chi^2 \) and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS:
Covariance matrix – Correlation Matrix – Multivariate Normal density function – Principal components – Sample variation by principal components – Principal components by graphing

REFERENCE:

TOTAL : 60 PERIODS
AIM: To impart knowledge at an advanced level in applied materials Engineering.

OBJECTIVE: This course provides knowledge in the areas of Industrial Metallurgy, chemical Properties, heat treatment, advanced materials and selection of materials for important applications.

UNIT I PLASTIC BEHAVIOUR & STRENGTHENING 8
Mechanism of Plastic deformation, 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 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.

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 (HSLA) Steel transformation included plasticity (TRIP), Steel, maraging steel, shape memory alloys, properties applications of engineering plastics and composites materials advanced structural ceramics – WC, Tic, Tac, Al2O3, Sic, Si3N4, CBN diamond, heat treatment alloy and tool steels, vapour deposition – Plasma, PVD- thick and thin film deposition – Nano materials-production of Nano sized materials.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:
2. “Surface Engg of Meterials”- Principles of Equipment, Techniques, TadensZ

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

CI 9112 COMPETITIVE MANUFACTURING SYSTEMS

AIM
To impart knowledge on the pace of changes in the manufacturing technology.

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.

UNIT I MANUFACTURING IN A COMPETITIVE ENVIRONMENT

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:

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9113 COMPUTER AIDED DESIGN AND MANUFACTURING

AIM:
To impart in depth knowledge in various fields of Computer Aided Design and Manufacture.

OBJECTIVES:
On completion of the course the students are expected to be knowledgeable in 2 dimensional and 3 dimensional transformations, modeling and analysis, CAD/CAM integration, CNC machine tool building, CNC programming using manual method and generation of CNC codes using CAM software.

UNIT I TWO DIMENSIONAL AND THREE DIMENSIONAL TRANSFORMATIONS 9

UNIT II MODELLING AND ANALYSIS: 8

UNIT III CAD/CAM INTEGRATION: 9
UNIT IV COMPUTER NUMERICAL CONTROL MACHINES: 10

UNIT IV CNC PROGRAMMING: 10
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, Generation of CNC program using popular CAM software.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

CI 9114 ADVANCES IN MANUFACTURING TECHNOLOGY

AIM:
The aim of this course is to impart knowledge in various fields of advanced manufacturing technology

OBJECTIVE:
At the end of this course the students are expected to understand metal cutting and cutting tool materials, special machining processes, unconventional machining processes, micro machining process and rapid prototyping.

UNIT I METAL CUTTING AND TOOL MATERIALS 9

UNIT II SPECIAL MACHINING PROCESSES & EXPERIMENTAL TECHNIQUES 9
UNIT III  UNCONVENTIONAL MACHINING
Principles, Processes. Various influencing parameters and Applications of Ultrasonic Machining, Electro Discharge Machining, Electro Chemical Machining, Electron and Laser Beam Machining, Plasma Arc Machining and Water Jet Machining.

UNIT IV  MICRO MACHINING
Introduction to MEMS, principle, process capabilities, types, advantages, limitations and applications of bulk micro machining, surface micro machining and tool based micro machining processes.

UNIT V  RAPID PROTOTYPING

TOTAL:45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9115  CIM Lab I  L T P C
0 0 3 2

1. Using of Preprocessor and post processor in finite element analysis (Exercise must include importing model from a modeling package, model correction, meshing, and addressing quality of mesh issues).
2. Model analysis of engineering structures (Exercises must include model analysis of simple beams and plates and comparison of FEA and analytical solutions, and model analysis of actual components like brackets, machine tool structures etc).
3. Nonlinear analysis (Exercise must include plastic deformation of simple objects or crash analysis simple structures.
4. 3 Axis CNC code generation for CNC machining.
5. CNC Machining of complex features like machining of hemispherical cavity, tapered hole, hole of parabolic shape etc..
LIST OF EQUIPMENT REQUIRED:

1. Computers 18
2. Preprocessor for FEA (Like Hyper mesh)
3. CAD Workstation
4. FEA Software
5. FEA Software for Nonlinear Analysis
6. CAM Software for 3 axis machining or more
7. CNC Production type lathe or Milling Machine.

CI 9121 ROBOTICS AND ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

AIM:
This course aims at providing advanced knowledge in the field of Industrial Robotics and the associated artificial intelligence.

OBJECTIVE:
On completion of the course the students are expect to the knowledgeable in Robot anatomy, end effectors, sensors, vision systems, kinematics, programming and the application of Artificial Intelligence in Robotics And Artificial Intelligence.

UNIT I INTRODUCTION: 7
Historical Perspective of Robots – Classification by Co-Ordinate system – classification by control method, Major Components of a Robot – Links and joints – Currents and future applications of Robots.

UNIT II ROBOT END EFFECT AND SENSORS: 11

UNIT III ROBOT ACTUATORS: 9

UNIT IV TRANSFORMATIONS AND KINEMATICS: 8

UNIT V ROBOT PROGRAMMING & ARTIFICIAL INTELLIGENCE: 10
strategies, Heuristic search, Rule based problem solving, Knowledge Representation.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9122 MECHATRONICS IN MANUFACTURING SYSTEMS

AIM
To impart knowledge in the inter disciplinary field of Mechatronics as related to Manufacturing.

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

UNIT I INTRODUCTION

UNIT II SENSORS AND TRANSDUCERS

UNIT III ACTUATORS
Actuators – Mechanical - Electrical - Fluid Power - Piezoelectric - Magnetostrictive - Shape memory allo y - 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
Designing - 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
TEXT BOOKS:

REFERENCES:

CI 9123 COMPOSITE MATERIALS

AIM:
To impart knowledge about the ingredients, properties, manufacturing methods of various types of composite materials.

OBJECTIVE:
The objective of the course is to train the students at an advanced level in the field of composite materials by imparting knowledge about fibers, matrices, their properties, manufacturing methods involved in polymer matrix, metal matrix, ceramic matrix composites and macro mechanics of composite materials.

UNIT I INTRODUCTION:

UNIT II POLYMER MATRIX COMPOSITES:

UNIT III METAL AND CERAMIC MATRIX COMPOSITES:

UNIT IV GEOMETRICAL ASPECTS & MICROMECHANICS:
Unidirectional laminas – Volume fraction and weight fraction woven roving, inplane range fibres – fibre length and fibre orientation distribution – voids – fibre Orientation
during flow. Micromechanics models for stiffness – micromechanics models for strength – thermal and moister effects.

UNIT V FATIGUE AND CREEP IN COMPOSITE MATERIALS: 05

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9124 ADVANCED METROLOGY AND COMPUTER AIDED INSPECTION

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

OBJECTIVE:
1. 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.
2. Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

UNIT I GENERAL CONCEPTS OF MEASUREMENT: 8
Definition – Standards of measurement – Errors in measurement – Interchangeability and Selective assembly – Accuracy and Precision – Calibration of instruments.

UNIT II MEASUREMENT OF SURFACE FINISH AND MEASURING MACHINES: 9

UNIT III INTERFEROMETRY: 8

UNIT IV COMPUTER AIDED AND LASER METROLOGY: 10

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

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

**REFERENCES:**

**WEB REFERENCES:**
1. www.metrologytooling.com
2. www.iuk'tu-harburg.de

CI 9126  
CIM LAB II  
0 0 3 2

1. Automated component inspection using vision System.
2. Automation using programmable Logic Control.
3. Dimensional and geometric measurement using CMM.
4. Study on RDBMS and its application in problems like inventory control MRP etc.
5. Robot Programming.

**LIST OF EQUIPMENTS REQUIRED:**
1. Computers 18 ( Same as in CIM Lab I)
2. Vision System
3. Programmable Logic Controller
4. Coordinate Measuring Machine
5. RDMBS Package with relevant modules like Inventory Control and MRP
6. Robot Simulator.
AIM
To impart knowledge on the Design of Hydraulic and Pneumatic Systems as practiced in industries.

OBJECTIVE
To study the principles, practices and techniques of Design of Hydraulic and Pneumatic Systems.

UNIT I. OIL HYDRAULIC SYSTEMS 10
Hydraulic Power Generators - Selection and specification of pumps, pump characteristics - Linear and Rotary Actuators - selection, specification and characteristics - Pressure - direction and flow control valves - relief valves, non-return and safety valves - Hydraulic actuation systems.

UNIT II. HYDRAULIC CIRCUIT DESIGN 10

UNIT III. PNEUMATIC SYSTEMS AND CIRCUITS 8
Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits - switching circuits - fringe conditions - modules and their integration.

UNIT IV. PNEUMATIC CIRCUIT DESIGN 9

UNIT V. COMPUTER CONTROL &MAINTENANCE OF FLUID POWER CIRCUITS: 08
Fuzzy logic in fluid power circuits- PLC in fluid powers- PLC ladder diagram – Low cost automation - Robotic circuits - Installation -Fault finding in fluid power circuits.

TOTAL: 45 PERIODS

TEXTBOOK:

REFERENCES:
AIM
To impart knowledge on logistics, supply chain network design, selection and coordination of supply chain.

OBJECTIVE:
At the end of this course the student should be able to understand
1. Importance of supply chain
2. Logistics management
3. Design factors of supply chain
4. Sourcing and revenue management
5. Managing the supply chain.

UNIT-I  INTRODUCTION:

UNIT-II  LOGISTICS MANAGEMENT:

UNIT-III  SUPPLY CHAIN NETWORK DESIGN:

UNIT-IV  SOURCING AND PRICING IN SUPPLY CHAIN:
Supplier Selection and contracts – design collaboration – Procurement process. Revenue management in supply chain.

UNIT-V  COORDINATION AND TECHNOLOGY IN SUPPLY CHAIN:

TOTAL: 45 PERIODS

TEXT BOOK:

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

OBJECTIVE: At the end of this course the student should be able to understand
1. Design principles of welding and casting
2. Principles of advanced welding and casting processes
3. Automation of welding and casting plant.

UNIT- I WELDING DESIGN AND METALLURGY: 10
Weld joint design-principle of stresses-weld thermal cycles - 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: 08

UNIT-IV SPECIAL CASTING PROCESSES: 08
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: 09
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

TEXT BOOKS:

REFERENCES:
2. MINKOFF,J., Solidification and cast structure,wiley.1986.
CI 9151  RELIABILITY AND TOTAL PRODUCTIVE MAINTENANCE  

AIM  
To impart knowledge about reliability and total productive maintenance

OBJECTIVE  
To teach the essentiality of reliability engineering, reliability prediction and the implementation of total productive maintenance.

UNIT – I INTRODUCTION: 09  
Reliability function - MTBF - MTTF - mortality curve - availability -Maintainability.

UNIT – II FAILURE DATA ANALYSIS: 09  
Repair time distributions - exponential, normal, log normal, gamma, and Weibull - reliability data requirements - Graphical evaluation.

UNIT – III RELIABILITY PREDICTION: 09  

UNIT – IV RELIABILITY MANAGEMENT: 09  
Reliability demonstration testing - Reliability growth testing - Duane curve -Risk assessment - FMEA, Fault tree.

UNIT – V TOTAL PRODUCTIVE MAINTENANCE: 09  

TOTAL: 45 PERIODS

TEXT BOOK:  

REFERENCES:  

CI 9152  COMPUTER AIDED PROCESS PLANNING  

AIM: To provide sound knowledge in process planning in the manufacturing using computers.

OBJECTIVE  
To familiarize the students with process planning in the manufacturing cycle, design, drafting, geometric modeling, systems in CAPP and report generation.
UNIT I INTRODUCTION:
The role of Process Planning in the Manufacturing cycle – Process Planning and Production Planning – Process Planning and Concurrent Engineering, CAPP, Group Technology.

UNIT II PART DESIGN REPRESENTATION:

UNIT III PROCESS ENGINEERING AND PROCESS PLANNING:
Experience based planning - Decision table and decision trees – Process capability analysis – Process Planning – Variant process planning – Generative process planning– Forward and Backward planning, input format.

UNIT IV COMPUTER AIDED PROCESS PLANNING SYSTEMS:
Logical Design of Process Planning – Implementation considerations – Manufacturing system components, production volume, No. of production families – CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP

UNIT V INTEGRATED PROCESS PLANNING SYSTEMS:

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

4. WEB REFERENCES:

CI 9153 CORROSION AND SURFACE ENGINEERING  L T P C 3 0 0 3

AIM: To impart knowledge on the corrosion and surface problems in Engineering practices.
OBJECTIVE:

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

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 - Ceramics - APS, VPS, CCAPS – Flames and Arc processes – Conversion coating.

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 coatings.

TOTAL : 45 PERIODS

TEXT BOOKS:


REFERENCES:

4. ASM Metals Hand Book – Volume 13, Corrosion, 1999
AIM
To impart in depth knowledge in various fields of tool engineering.

OBJECTIVES
This course provides knowledge in the areas of design of single point and multipoint cutting tools, dies, jigs, fixtures and limit gauges and tool design for CNC machines.

UNIT – I INTRODUCTION:
07
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:
09
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:
08
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.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM
To impart knowledge on the total quality system and engineering as practiced in industries.

OBJECTIVE
To study the principles, practices and techniques of quality systems and engineering.

UNIT – I INTRODUCTION

UNIT – II PRACTICES OF TQM

UNIT - III TECHNIQUES OF TQM

UNIT – IV QUALITY BY DESIGN

UNIT V PRODUCTS LIABILITY

TOTAL: 45 PERIODS

TEXTBOOK:

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

OBJECTIVE:
1. To understand the importance and advantages of applying simulation techniques for solving various problems on discrete event systems.
2. 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.
3. Introduction to various simulation languages and comparison.

UNIT-I INTRODUCTION:
Systems, modeling, general systems theory, concept of simulation, simulation as a decision making tool, types of simulation.

UNIT-II RANDOM NUMBERS:
Pseudo random numbers, methods of generating random variates, discrete and continuous distributions, testing of random numbers.

UNIT-III DESIGN OF SIMULATION EXPERIMENTS:
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 LANGUAGES:
Comparison and selection of simulation languages, study of any one simulation language.

UNIT-V CASE STUDIES IN SIMULATION:
Development of simulation models using the simulation language studied for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

AIM
The aim is to understand the principles and applications of Precision Engineering.
OBJECTIVES
The student is motivated learn about the concept of part accuracy, Machining accuracy and to discuss on the types of errors, and their sources. The student will be able to understand the need for precision and application. In addition, the student will enhance his/her knowledge in Precision Engineering and its applications.

UNIT - I PRECISION ENGINEERING

UNIT - II MATERIALS FOR PRECISION ENGINEERING:

UNIT - III PRECISION MACHINING:

UNIT - IV ERRORS: CAUSES AND REMEDIES:
Static stiffness - influence on machining accuracy. Introduction – 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 –war dissipation – Geometry of thermal deformation-influence of forced isstratics dimensional wear of elements – instruments; Machining tools their influence an accuracy- error due to clamping and setting location.

UNIT - V PRECISION MACHINE ELEMENTS:

TOTAL: 45 PERIODS

TEXT BOOKS:-

REFERENCE:
AIM
The aim is to impart the students with knowledge of the general design principles of manufacturing and to provide complete informations for further study.

OBJECTIVE
At the end of this course the student should be able to understand the design principles of casting, welding, forming, machining and assembly, by considering various manufacturing constraints.

UNIT – I INTRODUCTION
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
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:
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:
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

TOTAL: 45 PERIODS

TEXTBOOK:

REFERENCES:
AIM: To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields.

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

UNIT I INTRODUCTION: 8

UNIT II REVERSE ENGINEERING AND CAD MODELING: 10

UNIT III LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS: 10

UNIT IV POWDER BASED RAPID PROTOTYPING SYSTEMS: 10

UNIT V OTHER RAPID PROTOTYPING TECHNOLOGIES: 07

TOTAL:45

PERIODS
TEXT BOOK:

REFERENCE:

CI 9160 ELECTRONICS MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

AIM: This course aims at providing knowledge in the field of electronic manufacturing and packaging.

OBJECTIVES: Upon completion of this course students will able to
1. Understand various steps in wafer preparation
2. Describe the method of manufacture and types of Printed circuit board (PCB)
3. Describe various components in THT and SMT
4. Explain Soldering and cleaning in Electronic packaging
5. Describe Surface Mount Technology (SMT)
6. Explain inspection, testing and rework of populated PCB.

UNIT – I INTRODUCTION TO ELECTRONICS MANUFACTURING: 08
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: 09
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: 09

UNIT – IV SURFACE MOUNT TECHNOLOGY: 11
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: 08

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

CI 9161 MICRO MACHINING METHODS L T P C 3 0 0 3

AIM: The Purpose of this subject is to understand the principles of various micro fabrication processes.

OBJECTIVES:
Upon completion of this subject, student will be able to:
1. Understand principle of Microsystems and feedback systems
2. Know the different methods of micro fabrication.
3. Understand the properties and microstructure of materials
5. Enhance his/her knowledge in semiconductor manufacturing processes.

UNIT I INTRODUCTION: 08
Introduction to Micro System design, Material properties, micro fabrication Technologies. Structural behavior, sensing methods, micro scale transport – feedback systems.
UNIT II MICROMECHANICS: 09
Microstructure of materials, its connection to molecular structure and its consequences on macroscopic properties – Phase transformations in crystalline solids including martensite, ferroelectric, and diffusional phase transformations, twinning and domain patterns, smart materials.

UNIT III MICRO-FABRICATION: 10

UNIT IV MECHANICAL MICROMACHINING: 10

UNIT V MICRO ELECTRO MECHANICAL SYSTEM FABRICATION: 08

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS:
Amorphous, crystalline, microcrystalline, quasi-crystalline and nano-crystalline materials. Historical development of nanomaterials – Issues in fabrication and characterization of nanomaterials

UNIT – II SYNTHESIS OF NANOMATERIALS: 09

UNIT – III CHARACTERISATION OF NANOMATERIALS: 09

UNIT – IV APPLICATIONS OF NANOMATERIALS: 09
Applications in Mechanical, Electronics engineering industries – Use of nanomaterials in automobiles, aerospace, defense and medical applications – Metallic, polymeric, organic and ceramic nanomaterials.

UNIT – V NANO FABRICATION AND MACHINING: 09
LIGA, Ion beam etching, Molecular manufacturing techniques – Nano machining techniques –, Top/Bottom up Nano fabrication techniques - Sub micron lithographic technique, conventional film growth technique, Chemical etching, Quantum materials.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

CI 9163 TECHNIQUES OF MATERIAL CHARACTERIZATION L T P C
3 0 0 3

AIM
This course aims at imparting 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, static and dynamic mechanical testing methods.
UNIT-I MICTRO STRUCTURAL EVALUATION: 09

UNIT – II CRYSTALSTRUCTURE ANALYSIS: 09

UNIT – III ELECTRON MICROSCOPY: 09

UNIT – IV MECHANICAL TESTING – STATIC TESTS: 09

UNIT – V MECHANICAL TESTING – DYNAMIC TESTS: 09

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

CI 9164 PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING LT PC
3 0 0 3

AIM
The aim is to appreciate the students with the background, applications and current status of productivity management and re-engineering, and to make them understand the relevant basic principles of these fields.

OBJECTIVES:
At the end of this course the students are expected to understand the general issues relating to Productivity management and re-engineering.

UNIT I INTRODUCTION: 05
Productivity concepts - Macro and Micro factors of productivity - Productivity benefit model, Productivity cycle.

UNIT II PRODUCTIVITY MODELS: 12
Productivity measurement at International, National and Organisational level - Total productivity models - Productivity management in manufacturing and service sectors - Productivity evaluation models - Productivity improvement models and techniques.

UNIT III ORGANISATIONAL TRANSFORMATION: 08
Principles of organisational transformation and re-engineering - fundamentals of process reengineering - preparing the workforce for transformation and reengineering - methodology – guidelines - DSMCQ and PMP model.

UNIT IV RE-ENGINEERING PROCESS IMPROVEMENT MODELS: 10
PMI models - Edosomwan model - Moen and Nolan strategy for process improvement - LMICIP model - NPRDC model.

UNIT V RE-ENGINEERING TOOLS AND IMPLEMENTATION: 10
Analytical and process tools and techniques - Information and communication technology - Enabling role of IT, RE-opportunities, process redesign - cases. Software methods in BPR - specification of BP, case study - Order processing - user interfaces - maintainability and reusability.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

OBJECTIVE: At the end of this course the student should be able to understand
1. Concepts and applications of Cellular manufacturing systems
2. Traditional and non-traditional approaches of Problem solving
3. Performance measurement
4. 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: 08
Measuring CMS performance - Parametric analysis - PBC in GT/CMS, cell loading, GT and MRP - framework.

UNIT V ECONOMICS OF GT/CMS: 05
Conventional Vs group use of computer models in GT/CMS, Human aspects of GT/CMS - cases.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM
To impart knowledge on the advanced metal forming techniques.

OBJECTIVES
At the end of the course the student should be able to understand the theory of plasticity and the advances in metal forming.

UNIT – I THEORY OF PLASTICITY: 09

UNIT – II CONSTITUTIVE RELATIONSHIPS AND INSTABILITY: 07
Uniaxial tension test – Mechanical properties – Work hardening, Compression test, bulge test, plane strain compression stress, plastic instability in uniaxial tension stress, plastic instability in biaxial tension stress.

UNIT – III ANALYSIS OF METAL FORMING PROBLEMS: 12

UNIT – IV SHEET METAL FORMING: 08

UNIT – V ADVANCES IN METAL FORMING: 09
Orbital forging, Isothermal forging, Warm forging, Hot and Cold isotropic pressing, high speed extrusion, rubber pad forming, micro blanking – Overview of Powder Metal techniques – Powder rolling – Tooling and process parameters

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9167 INFORMATION SYSTEMS ANALYSIS AND DESIGN

AIM
To impart knowledge in the key areas of information systems analysis and design.

OBJECTIVE
To provide knowledge in the concept of information system processing, decision making, analysis and design, quality assurance and knowledge based systems.

UNIT I COMPUTER BASED INFORMATION SYSTEM:

UNIT II MANAGEMENT INFORMATION SYSTEM:
Concepts – Design and implementation of MIS – Information system for decision making, types and levels of decision making – MIS as a technique for making programmed decisions – Decision – Assisting information systems – Conceptual system design – detailed system design.

UNIT III OVERVIEW OF SYSTEM DEVELOPMENT:
System analysis – System Design – Completing the system development process the traditional system life cycle – Stages and limitations of life cycle approach – case study.

UNIT IV QUALITY AND SERVICES:
Traditional tool and Methodologies for quality assurances – New approaches to quality – Information system failure causes – the concept of implementation – controlling risk factor.

UNIT V KNOWLEDGE – BASED SYSTEMS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCE:

WEB REFERENCE:
1. www.dis.uniroma1.it
AIM
The aim is to appreciate the students with the background, applications and current status of lean manufacturing and to make them understand the relevant basic principles in this field.

OBJECTIVES
At the end of this course the students are expected to understand the general issues relating to lean manufacturing.

UNIT-I. INTRODUCTION: 09
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: 09
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: 09

UNIT- IV. JIDOKA (AUTOMATION WITH A HUMAN TOUCH): 09

UNIT-V WORKER INVOLVEMENT AND SYSTEMATIC PLANNING METHODOLOGY: 09
Involvement – Activities to support involvement – Quality circle activity – Kaizen training - Suggestion Programmes – Hoshin Planning System (systematic planning methodology) – Phases of Hoshin Planning – Lean culture

TEXT BOOK:
2. Mike Rother and John Shook, Learning to See: Value Stream Mapping to Add Value and Eliminate MUDA, Lean Enterprise Institute, 1999.

REFERENCES:
AIM
The aim is to provide the students with knowledge of the finite element method that will be of use in different manufacturing areas and to provide a foundation for further study.

OBJECTIVE
The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behaviour 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.

UNIT – I INTRODUCTION: 06

UNIT – II ONE DIMENSIONAL ANALYSIS: 10
Steps in FEA – Discretization, function – derivation of element characteristics 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: 10

UNIT – IV ANALYSIS OF PRODUCTION PROCESSES: 10

UNIT – V COMPUTER IMPLEMENTATION: 09
Pre Processing, Mesh generation, elements connectivity, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages such as ANSYS and DEFORM – Development of code for one dimensional analysis and validation.

TOTAL: 45PERIODS

TEXT BOOK:

REFERENCES:
AIM: To impart the knowledge in manufacturing information system.

OBJECTIVE: On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

UNIT-I INTRODUCTION: 05
The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

UNIT-II DATABASE: 07

UNIT-III DESIGNING DATABASE: 13
Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query

UNIT-IV MANUFACTURING CONSIDERATION: 10
The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the stock status database – the complete IOM database.

UNIT-V INFORMATION SYSTEM FOR MANUFACTURING: 10
Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems; Computer based production management system, computerized manufacturing information system – case study.

TOTAL: 45

PERIODS

TEXT BOOKS:
2. Date.C.J.,“An Introduction to Database Systems” Addison Wesley, 8th Edn., 2003

REFERENCES:
2. RFID in Manufacturing, Gunther Oliver, Kletti Wolfhard, Kubach.vwe.,2008
4. Web reference: www.ist.psu.edu
AIM
To impart the knowledge in manufacturing information system.

OBJECTIVE
On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

UNIT-I INTRODUCTION:
The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

UNIT-II DATABASE:

UNIT-III DESIGNING DATABASE:
Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query

UNIT-IV MANUFACTURING CONSIDERATION:
The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the 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 – case study.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
2. RFID in Manufacturing, Gunther Oliver, Kletti Wolfhard, Kubach.vwe.,2008
4. Web reference: www.ist.psu.edu
AIM
To understand concepts and process involved in project management.

OBJECTIVE
To impart the knowledge that are essential in developing product, design, process improvement and the execution of a project.

UNIT I TOOLS FOR CONCEPT DEVELOPMENT

UNIT II TOOLS FOR PROCESS IMPROVEMENT

UNIT III STATISTICAL PROCESS CONTROL:

UNIT IV BENCHMARKING AND ESTABLISHING ENGINEERING SPECIFICATIONS

UNIT V PROJECT MANAGEMENT
Understanding and representing tasks: Tasks, charts – Baseline project planning – Accelerating projects-project execution – Postmortem execution.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

CI 9172 MANUFACTURING MANAGEMENT L T P C
3 0 0 3

AIM
To impart knowledge on Manufacturing strategies and compositeness, Designing of Products, facilities and jobs, Inventory systems, MRP and revising the systems.

OBJECTIVES:
1. Importance of manufacturing management
2. Designing of new products, facilities and jobs
3. Importance of inventory systems
4. Revising the system.

UNIT FIELD OF MANUFACTURING MANAGEMENT: 06
Introduction – Manufacturing Strategies and competitiveness-Meeting the competitive Project management-

UNIT IIDESIGNING OF PRODUCTS: 09

UNIT - III DESIGN OF FACILITIES AND JOBS: 10
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 in the MRP system-Advanced MRP-type systems.

UNIT-V REVISING THE SYSTEM: 10

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES: