



## SCHEME OF EXAMINATION & DETAILED SYLLABUS



Bhopal-Chiklod Road, Near Bangrasia Chouraha,  
Vill-Mendua, Distt-Raisen(Madhya Pradesh), Ph:07480-295707  
e-mail-info@aisectuniversity.ac.in website: www.aisectuniversity.ac.in



Supply Chain Management

FMS AND FEA

Operation Management

Robotics and Automated Material Handling

Reliability and Total Productive Maintenance

## MMCM - 101 ADVANCED MATHEMATICS

### UNIT 1

Linear Algebra: Linear transformation, vector spaces, hash function, Hermite polynomial, Heavisite's unit function and error function. Elementary concepts of Modular mathematics

### UNIT 2

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

### UNIT 3

Probability, compound probability and discrete random variable, Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

### UNIT 4

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Application of Eigen value problems in Markov Process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC fS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

### UNIT 5

FEM: Variational functionals, Euler Lagrange's equation, Variational forms, Ritz method, Galerkin's method, descretization, finite elements method for one dimensional problems.

### REFERENCE BOOKS:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Advance Engineering Mathematics, O'Neil, Cengage (Thomson)
5. Introductory Methods of Numerical Analysis by S.S. Shastry,
6. Krishmurthy Finite element TMH
7. Buchanan Finite element analysis(Schaum Outline S) TMH
8. Numerical Solution of Differential Equation by M. K. Jain

9. Numerical Mathematical Analysis By James B. Scarborough
10. Fourier Transforms by J. N. Sheddon
11. Advance Mathematics for Engr and Sc, Spiegel, Schaum Series, TMH

## MMCM - 102 ADVANCES IN MANUFACTURING TECHNOLOGY

1. METAL CUTTING AND TOOL MATERIALS: Orthogonal and oblique cutting -Types of tool wear, Abrasion. Diffusion, Oxidation. Fatigue and Adhesive wear - Prediction of tool life - Monitoring of tool wear, Cutting forces and vibration - Tool materials, cemented carbide, Coated carbide, Cermet, Ceramic, CBN and PCD - Selection of machine parameters and Tools.
2. SPECIAL MACHINING: Deep hole drilling - Gun drills - Gun boring - Trepanning - Honing - Lapping - Super finishing - Burnishing - Broaching - High speed machining.
3. 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.
4. RAPID PROTOTYPING: Stereo lithography - Laminated object manufacturing - selective laser sintering - solid freeform - Vacuum casting - Resin injection - Applications of RPT - Surface roughness terms - Influence of machining' parameters on surface roughness - Micro finishing process.
5. ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS: Introduction - Pattern recognition - Control strategies - Heuristic search, Forward and Backward reasoning - Search algorithms - Game playing - Knowledge representation - structural representation of knowledge -Expert systems in manufacturing.

### REFERENCE BOOKS:

1. Armarego E.J:A. and Brown RH., "The machining of metals ", Prentice Hall
2. Battacharya," Theory of metal cutting ", NCB Agency
3. HMT Manual, "Non-traditional machining methods "
4. RichE. and KnightK, "Artificial Intelligence ", TMH
5. Pham D.7:, "Expert S~stems in ~ngineering ", IFS Publishers, Springer- Verlag
6. Durvent WR, "The Lithographic handbook ", Narosa Publishers, 1995.
7. Pandey P.S. and Shah N. "Modern Manufacturing Processes ", /980.
8. Sadasivan TA. and Sarathy D. "Cutting tools for Productive Machining ", Widia P.

# **MMCM - 103 COMPUTER INTEGRATED MANUFACTURING**

## **UNIT 1**

Computer Integrated manufacturing System

Definition, CIM wheel concept, Evolution of CIM, CIM and system view of manufacturing, and CIM IT & Concurrent Engineering, Elements of CIM system, CIM hardware and software.

## **UNIT 2**

Computer Aided Design

Historical background, Development of CAD, CAD system hardware, Software, Graphics standards, Basic definitions, Modes of graphic operation, User interface, Software modules, Modeling and viewing.

## **UNIT 3**

2D - Representation and Transformation of Points - -transformation of Lines -Rotation. Reflection. Scaling and combined transformations - 3Dscaling - shearing - Rotation - Reflection - Translation - Projections parametric representation of Ellipse, Parabola, Hyperbola.

## **UNIT 4**

Wire frame, Surface and Solid modeling - Solid modeling packages - Finite Element Analysis (FEA) - Introduction and procedures - Solution Techniques - Introduction to CEA packages.

## **UNIT 5**

Manufacturing Planning and Control - CAD/CAM Integration - Principles of Computer Integrated Manufacturing - Hierarchical Network of Computers - Local Area Networks - Process Planning: Computer Aided Process Planning - Retrieval and Generative approaches.

## **UNIT 6**

CNC Machine Tool and Programming

Development of CNC Technology, Principles, Features, NC,CNC,ONC concepts, Classification of CNC Machine Tools, CNC Controller, CNC Programming for various. Controllers -SI numeric, Fanuc Program, G&M codes, Part Programming of Prismatic and revolved components, APT part programming using CAD, CAM S/w.

## **REFERENCE BOOKS:**

1. Groover, Production System & CIM: PHI
2. Zeid, CAD/CAM Theory & Practice: Mc Graw Hills

# **MMCM - 104 COMPUTER AIDED PROCESS PLANNING**

## **UNIT 1**

INTRODUCTION: The Place of Process Planning in the Manufacturing cycle - Process Planning and Production Planning - Process Planning and Concurrent Engineering, CAPP, Group Technology.

## **UNIT 2**

PART DESIGN REPRESENTATION: Design Drafting - Dimensioning - Conventional tolerancing - Geometric tolerancing - CAD - input / output devices - topology - Geometric transformation - Perspective transformation - Data structure - Geometric modelling for process planning - GT coding - The optiz system - The MICLASS system.

## **UNIT 3**

PROCESS ENGINEERING AND PROCESS PLANNING: Experienced, based planning - Decision table and decision trees - Process capability analysis - Process Planning - Variant process planning - Generative approach - Forward and Backward planning, Input format, AI.

## **UNIT 4**

COMPUTER AIDED PROCESS PLANNING SYSTEMS:

Logical Design of a Process Planning - Implementation considerations - manufacturing system components, production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP.

## **UNIT 5**

AN INTEGRATED PROCESS PLANNING SYSTEMS: Totally integrated process planning systems - An Overview - Modulus structure - Data Structure, operation - Report Generation, Expert process planning.

## **REFERENCE BOOKS:**

1. Gideon Halevi and Roland D. Weill, "Principles of Process Planning ", A logical approach, Chapman & Hall, 1995.
2. Tien-Chien Chang, Richard A. Wysk, "An Introduction to automated process planning systems ", Prentice Hall, 1985.
3. Chang, T.C., " An Expert Process Planning System ", Prentice Hall, 1985.
4. Nanua Singh, "Systems Approach to Computer Intergrated Design and Manufacturing ", John Wiley & Sons, 1996.
5. Rao, "Computer Aided Manufacturing ", Tata McGraw Hill Publishing Co., 2000.

# **MMCM - 105 MANUFACTURING AUTOMATION AND MECHATRONICS**

## **UNIT I**

Fundamental of Manufacturing and Automation ,;

Manufacturing industries, Types of production, Function in manufacturing, Organisation & Information process in manufacturing, Plant layout, Production concept and mathematical model automation strategies

## **UNIT 2**

Analysis of Automated Flow Lines Terminology, Analysis of transfer lines, Partial automation, Automated flow lines with storage buffers, Computer simulation of automated flow lines.

## **UNIT 3**

Automated Assembling System

Design for automated assembly, types of automated assembly, Part feeding devices, Analysis of multi-station assembly M/c, Analysis of single station assembly m/c.

## **UNIT 4**

Mechatronics

Introduction to Mechatronics - Systems - Mechatronics in Products - Measurement Systems - Control Systems -Traditional design and Mechatronics Design.

## **UNIT 5**

Sensors & Transducers

Introduction - Performance Terminology - Displacement, Position and Proximity - Velocity and Motion - Fluid pressure - Temperature sensors - Light sensors - Selection of sensors - Signal processing - Servo systems.

## **UNIT 6**

Microprocessors in Mechatronics

Introduction - Architecture - Pin configuration - Instruction set - Programming of Microprocessors using 8085 instructions - Interfacing input and output devices - Interfacing D/A converters and A/D converters -Applications - Temperature control - Stepper motor controller, Traffic light controller.

## **UNIT 7**

Programmable Logic Controllers

Introduction, basic structure, input-output processing, programming, Mnemonic, Timers, Internal relays and counters, data handling, Analog input / output - Selection of PLC.



## **UNIT 8**

### Design & Mechatronics

Designing, Possible design solutions. Case studies of Mechatronics systems.

#### **REFERENCE BOOKS:**

1. Groover, Production System & CIM: PHI
2. Zeid, CAD/CAM Theory & Practice: Mc Graw Hills
3. Ramesh Gaonkar, Microprocessor Architecture, Programming and Appl. Wiley East P
4. Ghosh P.K., Sridhar P.R., Intro. to Microprocessors for Engrs and Sc., PHI

# MMCM 201 SUPPLY CHAIN MANAGEMENT

## UNIT 1

**INTRODUCTION:** Logistics - Concepts, Definitions. approaches, factors affecting logistics. Supply chain basic tasks of the supply chain - the new corporate model.

## UNIT 2

**SUPPLY CHAIN MANAGEMENT:** The new paradigm, the modular company, the network relations. supply process, Procurement process - Distribution management.

## UNIT 3

**EVOLUTION OF SUPPLY CHAIN MODELS:** Strategy and structure - factors of supply chain - Manufacturing strategy stages, supply chain progress - model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

## UNIT 4

**SUPPLY CHAIN ACTIVITY SYSTEMS:** Structuring the SC, SC and new product, functional roles in SC, SC design frame-work, collaborative product commerce (CPC).

## UNIT 5

**SCM ORGANISATION AND INFORMATION SYSTEM:** The management task, logistics organisation, the logistics information systems -Topology of SC application - MRP, ERP, Warehouse management system, product data management - cases.

## REFERENCE BOOKS:

1. Scharj, P.B., Lasen, TS., Managing the global supply chain , Viva books, New Delhi
2. Ayers, J:B., "Hand book of supply chain management " , The St. Lencie press, 2000.
3. Nicolas, J:N., "Competitive manufacturing management-continuous improvement " , Lean production, customer focused quality, McGraw-Hill, NY; 1998.
4. Steudel, 1Ij: and Desruelle, P., "Manufacturing in the nineties-How to become a mean, lean and world class competitor " , Van Nostrand Reinhold; NY, 1992.

# **MMCM 202 FMS AND FEA**

## **UNIT - 1**

CM System:

Concurrent engineering and design methodology, collaborative product development, Product data management for manufacturing and design data reuse product life cycle management, and collaborative product, commerce, Advance manufacturing, Cellular, Synchronous Agile, Lear, Manufacturing system, concept of rapid prototyping, reverse engineering, re-engineering, case studies.

## **UNIT - 2**

FMS:

Definition of FMS, types and configuration, concept, types of flexibility and performance measures, Function of FMS host computer, FMS host and area controller, function distribution. Development and implementation: Planning phase integration, system configuration, FMS layouts, simulation, FMS project development steps.

## **UNIT - 3:**

Basics of FEM - Initial value and boundary value problems - weighted residual, Galerkin and Raleigh Ritz methods - Review of Variational calculus -Integration by parts - Basics of Variational formulation.

## **UNIT - 4**

Steps In FEA - Descretization, interpolation, derivation of element characteristic matrix function, assembly and imposition of boundary conditions - Solution and post processing, One-dimensional analysis in solid mechanics and heat transfer.

## **UNIT - 5**

Global and Natural co-ordinates - Shape functions for one and two dimensional elements - Three noded triangular and four noded quadrilateral element - non linear analysis - Isoparametric elements - Jacobian matrices and transformations - Basics of two dimensional axi symmetric analysis.

## **UNIT - 6**

FE analysis of metal casting - Special considerations, latent heat incorporation. gap element - Time stepping procedures - crank - Nicholson ,algorithm - Prediction of grain structure - Basic concepts of plasticity - Solid and flow formulation - Small incremental deformation formulation - FE analysis of metal cutting. chip separation criteria, incorporation of strain rate dependency

## **REFERENCE BOOKS:**

1. Vajpayee, Principles of CIM, PHI
2. Seshu, Text book of Finite Element Analysis, PHI

# **MMCM 203 OPERATION MANAGEMENT**

## **UNIT 1**

Operations Management: Introduction, Systems concept, Decisions, Organization, Objectives and Evolution of Operations Management, comparing production of tangible goods and services, Operations Strategy, Type of Production Systems, Role of Production Manager.

## **UNIT 2**

Facilities Planning & Production Planning Control: Plant location, Plant layout and Material

Handling, Layout analysis, Procedures such as CORELAP, CRAFT etc. Organization & Functions of PPC CAPP, Make or Buy Decision, Forecasting Methods & its relationship with Product Life Cycle, Case Studies.

## **UNIT 3**

Aggregate Planning and Master Scheduling: Strategies of Aggregate Planning, Graphic & and Charting methods, Application of LP, Master Scheduling, Job Shop Scheduling and Sequencing Algorithms Gantt Chart, Line Balancing, LOB, Case Studies.

## **UNIT 4**

Maintenance Management: Types of maintenance strategies, Breakdown, Preventive and Predictive maintenance, Individual and Group Replacement Policies, Case Studies.

## **UNIT 5**

Materials Management as part of supply chain, Purchasing, stores and vendor selection,

Inventory Models, Selective Inventory Control, MRP, MRP-II, Lot size Techniques, Just - In - Time system of manufacturing, Kaizen, Total Productive Maintenance (TPM), BPR, SCM, ERP etc.& Case Studies.

## **REFERENCES:**

1. Hop W, Spearman M; Factory Physics; TMH
2. Charry S.N.; Production & Operations Management; TMH.
3. Chase, Aquilino, Production & Operations Management, TMH.
4. Eilon S. Production Planning and Control, McMillon Pub.
5. Vollmann; Mfg planning and control for SCM; TMH
6. Nahmias Steven; Production and Operations analysis; TMH
7. Bedi Kaniska; Production and Operations Management; Oxford Pub
8. Dobler & Lee, Purchasing & Materials Management, PHI.
9. Chitle A.K., Gupta R.C. Materials Management, PHI.
10. Monk Joseph; Schaum's outline of Operations Management; McGraw Hill.

## **MMCM 204 ROBOTICS AND AUTOMATED MATERIAL HANDLING**

1. **INTRODUCTION:** Basic concepts - Robot anatomy - Robot configurations - Basic robot motions - Types of drives - Applications - Material handling - processing - Assembly and Inspection - safety considerations.
2. **TRANSFORMATIONS AND KINEMATICS:** Vector operations - Translational transformations and Rotational transformations - Properties of transformation matrices- Homogeneous transformations and Manipulator - Forward solution - Inverse solution.
3. **CONTROLS AND END EFFECTORS:** Control system concepts - Analysis - control of joints - Adaptive and optimal control - End effectors - Classification - Mechanical - Magnetic - Vacuum - Adhesive - Drive systems - Force analysis and Gripper design.
4. **ROBOT PROGRAMMING:** Methods - Languages -Computer control and Robot Software -V AL system and Language.
5. **SENSORY DEVICES:** Non optical and optical position sensors - Velocity and Acceleration - Range - Proximity - touch - Slip - Force - Torque - Machine vision - Image components - Representation - Hardware - Picture coding - Object recognition and categorization - Software consideration.
6. **Automated Material Handling and Storage:** Functions types and analysis of material handling equipment, Design of conveyor and AGV system, Storage system performance, AS/RS, Carovsel storage system, WIP storage system, Interfacing handling, Storage with manufacturing

### **REFERENCE BOOKS:**

1. Fu KS., GonzalezR.C., and Lee C.S.G., "Robotics control, sensing, vision, and intelligence McGraw-Hill Book Co., 1987.
2. Klafter R.D., Chmielewski TA. and Negm IV. .. Rohot Engineering An Intergrated approach Prentice Hall of India, New Delhi, 1994
3. Deb S.R., " Robotics Technology and Fle.rihle Auto"w(i{'fl ", Tata McGraw-Hill Publishing Co., Ltd.. 1994.
4. Craig J.J. " Introduction to Robotic.s Mechanics and Control ". Addison-Wesley, 1999.
5. Groover MP.. "/ndu.slruiul roholic.s Technol()g}'. programming and applicution. McGraw-Hill Book Co., /995.

# MMCM 205 RELIABILITY AND TOTAL PRODUCTIVE MAINTENANCE

## UNIT 1

**INTRODUCTION:** Reliability function - MTBF - MTTF - mortality curve - availability - Maintainability.

## UNIT 2

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

## UNIT 3

**RELIABILITY PREDICTION:** Failure rate estimates - Effect of environment and stress - Series and Parallel systems - RDB analysis - Standby Systems - Complex Systems.

## UNIT 4

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

## UNIT 5

**TOTAL PRODUCTIVE MAINTENANCE:** Causes of Machine Failures - Downtime

-Maintenance policies - Restorability predictions - Replacement models - Spares provisioning - Maintenance management - Cleanliness and House Keeping.

## REFERENCE BOOKS:

1. Paul Kales, Reliability for technology, "Engineering and Management", Prentice Hall, New Jersey, 1998.
2. Modarres, "Reliability and Risk Analysis", Marcel Dekker Inc., 1993.
3. Gopalakrishnan.P, and Banerji A.K., "Maintenance and Spare Parts Management", Prentice Hall of India, New Delhi, 1996.