DEPARTMENT OF MECHANICAL ENGINEERING

MASTER OF TECHNOLOGY

CBCS BASED

(Two Years Four Semesters Program)

(SEMESTER- I TO IV)

2016-17

FACULTY OF ENGINEERING & TECHNOLOGY

M. TECH (MECHANICAL ENGINEERING DEPARTMENT)

PRODUCTION ENGINEERING

CORE COURSE:

- Computer aided process planning (MTMEPE101)
- Quality Management Systems (MTMEPE102)
- Ergonomics and Work System Design (MTMEPE103)
- Enterprise Resource Planning (MTMEPE201)
- CNC Technology & Programming (MTMEPE202)
- Reliability, Maintenance Management & Safety (MTMEPE203)
- Automated material handling systems (MTMEPE301)
- Supply chain practice & procedure (MTMEPE302)
- Robotics (MTMEPE303)
- Seminar (MTMEPE305)
- Dissertation (MTMEPE401)

ELECTIVE COURSE

- Energy Management (MTMEPE104.A)
- Machine tool design (MTMEPE104.B)
- Lean Manufacturing (MTMEPE104.C)
- Product Engineering (MTMEPE204.A)
- Mechatronics (MTMEPE204.B)
- Cryogenic Systems (MTMEPE204.C)
- Inventory management (MTMEPE304.A)
- Cellular manufacturing systems (MTMEPE304.B)
- Concurrent Engineering (MTMEPE304.C)

M.Tech Program in Mechanical Engineering with Specialization in

Production Engineering

Choice Based Credit System (CBCS)

SEMESTER I

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTMEPE101	Computer aided process planning	3	0	1	50	100	150	4
MTMEPE102	Quality Management Systems	3	0	1	50	100	150	4
MTMEPE103	Ergonomics and Work System Design	3	0	1	50	100	150	4
Electives (Any One)								
MTMEPE104.A	Energy Management	3	0	1	50	100	150	4
MTMEPE104.B	Machine tool design	3	0	1	50	100	150	4
MTMEPE104.C	Lean Manufacturing,	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTMEPE105	Work System Design Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

SEMESTER II

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTMEPE201	Enterprise Resource Planning	3	0	1	50	100	150	4
MTMEPE202	CNC Technology & Programming	3	0	1	50	100	150	4
MTMEPE203	Reliability, Maintenance Management & Safety	3	0	1	50	100	150	4
Electives (Any One)								
MTMEPE204.A	Product Engineering	3	0	1	50	100	150	4
MTMEPE204.B	Mechatronics	3	0	1	50	100	150	4
MTMEPE204.C	Cryogenic Systems	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	**P**	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTMEPE 205	CNC Technology & Programming Lab	0	2	0	60	40	100	1
Total		**12**	**02**	**4**	**260**	**440**	**700**	**17**

SEMESTER III

Theory Papers

Code	Title Of Subject	L	P	T	IA	EA	Total	Credits
MTMEPE301	Automated material handling systems	3	0	1	50	100	150	4
MTMEPE302	Supply chain practice & procedure	3	0	1	50	100	150	4

MTMEPE303	Robotics	3	0	1	50	100	150	4
Electives (Any One)								
MTMEPE304.A	Inventory management	3	0	1	50	100	150	4
MTMEPE304.B	Cellular manufacturing systems	3	0	1	50	100	150	4
MTMEPE304.C	Concurrent Engineering	3	0	1	50	100	150	4
Practical/Viva Voce								
		L	P	**T**	**Sessional**	**Practical**	**Total**	**Credits**
MTMEPE305	Seminar	0	-	-	60	40	100	2
Total		**12**	**00**	**4**	**260**	**440**	**700**	**18**

SEMESTER IV

Code	Title Of Subject	L	T	P	IA	EA	Total	Credits
MTMEPE401	Dissertation	0	0	0	300	400	700	12
Total		**-**	**-**	**-**	**300**	**400**	**700**	**12**

Note-: The student will submit a synopsis in the III semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the dissertation should be delivered one after starting of IV semester. The progress will be monitored through seminars and progress reports.

- The Total Number of credits of the M-Tech(Production Engineering) program=64
- The award of the degree a student shall be required to earn the minimum of 60 credits.

COMPUTER AIDED PROCESS PLANNING (MTMEPE101)

UNIT 1

Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.

UNIT 2

Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

UNIT 3

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.

UNIT 4

Selection of manufacturing sequence: Significance, alternative manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

UNIT 5

Determination of manufacturing tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.

Reference books:

1.Automation , Production systems and Computer Integrated Manufacturing System –
Mikell P.Groover
2.Computer Aided Design and Manufacturing – Dr.Sadhu Singh.
3.Computer Aided Engineering – David Bedworth

QUALITY MANAGEMENT SYSTEMS (MTMEPE102)

UNIT 1
Review of Quality Control: Quality assurance, Total Quality Management (TQM), Core concepts, Quality gurus and their contribution, Quality costs and measurement.

UNIT 2
Total Quality Control (TQC): TQC concepts, Responsibility, Learning from the west, TQC concepts categorized, Goals, Process control, Easy to see quality control as facilitator, Small lot sizes, Housekeeping, daily machine checking, Full proof devices, Tools of analysis, QC circles, TQC in Japanese-owned US electronics plant, TQC in Japanese-owned automotive plants.

UNIT 3
Taguchi Methods: Review of design of experiments, Process optimization and robust product design using orthogonal arrays, Taguchi loss functions quality level, Taguchi online feed back quality control, Manufacturing tolerance design course will include software applications and industry case studies.

UNIT 4
Total Quality Management (TQM): philosophy of TQM, Customer focus, Organization, Top management commitment, Teamwork, Goal setting and bench marking, TQM systems-Quality policy deployment, Quality function deployment, Standardization, Designing for quality, manufacturing for quality, implementation-KAIZEN, POKA YOKE, Six sigma etc

UNIT 5
Quality System and Standards: ISO 9000 system QS 9000, ISO 14000-need, Advantages, Clauses, Implementation, Quality auditing, Case studies,

Reference Books :

1. Total Quality Control A.V. Feigenbaum McGraw Hill
2. Total Quality Management-A Practical Approach H. All Wiley eastern

ERGONOMICS AND WORK SYSTEM DESIGN (MTMEPE103)

UNIT 1
Method Study: Process Analysis, Process and Activity Charts, Operation Analysis, Basic procedure, Micro Motion Study, Principles of Motion Economy. Work Measurement: Purposes and uses, Basic procedure, Techniques

UNIT 2
Procedures for work sampling study; Random, systematic, stratified and zone sampling techniques; Practical applications, Evaluation and improvements; Performance sampling.
Motion pattern used in MTM; MTM data and its installation.

UNIT 3
Ergonomics and Production: Ergonomics and product design, ergonomics in automated systems; Expert systems for ergonomic design; Anthropometrics data and its applications in ergonomic design; Limitations of anthropometric data, Use of computerized database; Case study.

UNIT 4
Man Machine Systems: Human factors affecting work, energy requirements for men; Effects of noise, light, heat and humidity, Monotony and fatigue on operator performance Case studies, man machine system characteristics; system components and its reliability, Man machine communication, design and arrangements of controls and displays,

UNIT 5
Control and Displays: Shapes and sizes of various controls and displays-Multiple displays and control situations; design of major controls in automobiles, machine tools. Visual Effects of Line and Colour: The mechanics of seeing; Psychology of seeing.

Reference Books:
1. Engineering Work Measurement Karger & Bayha Industrial Press
2. Work Sampling Barnes John Wiley
3. Methods Engineering Krick John Wiley
4. Human Factors Engineering Mc Cormic McGraw Hill
5. Ergonomics Murrel Chapman & Hall

ENERGY MANAGEMENT (MTMEPE104.A)

UNIT 1

Introduction: Energy sources; Instrumentation and measurements. Principles of Energy Management and Energy Audit: General principles, planning and program; Introduction to energy audit; General methodology; Site surveys; Energy systems survey, energy audit; Instrumentation.

UNIT 2

Heating and Cooling Management: General principles of energy managements in HVAC systems; Human comforts and health requirements; HVAC systems; Boiler and heat sources; Chillers, fans, pumps, cooling towers, Energy management opportunities; Modeling of heating and cooling loads in buildings.

UNIT 3

Electrical Load and Lighting Management: General principles; Illumination and human comfort; Lighting systems; Electrical load analysis; Peak load controls. Steam generation and distribution, Hot water and pumping, Compressed air; Energy storage for process industries.

UNIT 4

Integrated Building systems: General principles; Environment conformation; Passive design considerations; Building envelope design consideration, Integration of building system, Energy storage-cold storage techniques, Economic analysis.

UNIT 5

Economic Aspects of Energy Management: General considerations; Economic analysis methods; Life-cycle costing, Break even analysis, benefit cost analysis, payback period analysis, present worth analysis, equivalent annual cost analysis.

Reference Books:

1. Rural Energy Management S Kaushik, T Verma ,Deep and Deep Publs.
2. Energy Management W R Murphy; G Mckay, B.S. Publications
3. Renewable Energy and Energy Management S C Patra; B C Kurse; R Kataki, International Book Co.
4. Operations and Maintenance Manual for Energy Management J Piper, Standard

MACHINE TOOL DESIGN (MTMEPE104.B)

UNIT 1
Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.

UNIT 2
Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.

UNIT 3
Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.

UNIT 4
Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws. Design of Spindles and Spindle Supports**:** Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.

UNIT 5
Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.

Reference books:
1. Machine Tool Design N.K. Mehta Tata McGraw Hill
2. Machine Tool design Handbook - CMTI Banglore

LEAN MANUFACTURING (MTMEPE104.C)

UNIT 1
Just In Time Production System: JIT Logic -Pull system, Japanese approach to production elimination of waste, JIT implementation requirements, JIT application for job shops

UNIT 2

Kanban System: Kanban rules supplier Kanban and sequence schedule used by supplier, Monthly information & daily information, Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table -problems & counter measures in applying Kanban system to subcontractors - Supplier Kanban circulation in the paternal manufacturer - structure of supplier Kanban sorting office.

UNIT 3

The Rise & Fall Of Mass Production: Mass production, work force, organization, tools, product –logical limits of mass production, Sloan as a necessary compliment to Ford

UNIT 4

The Rise Of Lean Production: Birthplace, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer, future of lean production.

UNIT 5

Shortening Of Production Lead Times: Reduction of setup times, practical procedures for reducing setup time. Standardization of operations, Machine layout, multi function workers and job rotation, Improvement activities to reduce work force and increase worker morale, foundation for improvements.

Reference Books:

1. Chasel Aquilino, “Productions and Operations Management”
2. Yasuhiro Monden, “Toyoto Production System -An integrated approach to Just in Time”,Engineering and Management Press, Institute of Industrial Engineers, Norcross Georgia.
3. James P Womack, Daniel T Jones, and Daniel Roos, “The Machine that changed the World. The Story of Lean Production”, Harper Perennial edition, 1991.
4. James Womack, “Lean Thinking”.

ERGONOMICS AND WORK SYSTEM DESIGN LAB (MTMEPE 105)

LIST OF EXPERIMENTS:

1. TO STUDY THE ACTIVITIES OF THE MACHINE AND THE OPERATOR BY MICRO MOTION TECHNIQUE
2. TO PREPARE THE LAYOUT OF SHOP FLOOR AND WORKING AREAS OR WORK STATIONS BY METHOD STUDY
3. TO STUDY HOW PRINCIPLES OF MOTION ECONOMY WORK TO MINIMIZING THE PHYSICAL AND PERCEPTUAL LOADS IMPOSED ON PEOPLE ENGAGED IN ANY TYPE OF WORK.
4. TO STUDY HOW WORK PERFORMANCE AND MACHINE UTILIZATION BY DIRECT OBSERVATION TAKES PLACE BY WORK SAMPLING
5. TO STUDY THE VARIOUS WORK SAMPLING PRACTICAL APPLICATIONS
6. TO STUDY HOW TO OPTIMIZE THE INTEGRATION OF MAN AND MACHINE SO AS TO IMPROVE THE WORK RATE AND ACCURACY
7. TO STUDY VARIOUS ERGONOMICS ASPECTS IN AUTOMATED SYSTEMS
8. TO STUDY HOW THE VARIOUS HUMAN FACTORS AFFECTING WORK
9. TO STUDY HOW THE NOISE, LIGHT, HEAT AND HUMIDITY AFFECT THE HUMAN PERFORMANCE
10. TO STUDY SHAPES AND SIZES OF VARIOUS CONTROLS AND DISPLAYS IN ANY WORK STATION FOR BETTER PERFORMANCE
11. TO STUDY ERGONOMICALLY DESIGN OF MAJOR CONTROLS IN AUTOMOBILES

ENTERPRISE RESOURCE PLANNING (MTMEPE201)

UNIT 1

Introduction to ERP: Introduction, Evolution of ERP, Reasons for growth of ERP, Advantages /disadvantages of ERP, Evaluation of ERP, Various Modules in ERP

UNIT 2
Modules in ERP: Finance and Controlling, Sales and Distribution, Materials Management, Production Planning and Control, Quality Management, Planet Maintenance, Human Resource

UNIT 3
Business Processes: Order To Cash, Procure To Pay, Plan To Produce, Make To Stock, Make To Order and Assemble To Order, Difference in Discrete and Process industries

UNIT 4
Manufacturing Process Knowledge: Auto Industry, Hi Tech, FMCG, Pharma and Chemical.

UNIT 5
ERP Projects: Project types, Implementation methodology, Various steps in the project Implementation, Project Preparation, Business Blueprinting, As Is – To Be Study, Gap Analysis, Realization, Final Preparation, Go Live and Support, User Training, Issues during implementation

Reference Books:
1. Alexis Leon, Enterprise Resource Planning
2. V.K. Garg & N.K. Venkitakrishnan, ERP Ware: ERP Implementation framework
3. V.K. Garg & N.K. Venkitakrishnan, ERP Concepts and Planning
4. APIC's material on ERP

CNC TECHNOLOGY & PROGRAMMING (MTMEPE202)

UNIT 1
Introduction to CNC Machine tools: Evolution of Computerized control in manufacturing,
Components, Working principle of CNC, DNC and Machining centers.

UNIT 2
Feedback devices: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.

UNIT 3

APT programming: APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, control commands, Macro subroutines, Part programming preparation for typical examples.

UNIT 4

Economics and Maintenance of CNC machine tools: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.

UNIT 5

Control Systems and interface: Open and closed loop systems, Micro processor based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.

Reference Books:

1. Computer Numerical Control Machines – Dr.Radha Krishnanan, New Central Book Agency
2. Computer Numerical Control Machines – Hans B.Keif and T. Frederick Waters
   Macmillan/McGraw Hill
3. CNC Machines – B.S. Aditahn and Pabla
4. CNC Machining technology– Verlag , – Springer
5 Computer Numerical Machine tools - G.E. Thyer, NEWNES

RELIABILITY, MAINTENANCE MANAGEMENT & SAFETY (MTMEPE203)

UNIT 1

Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability, Method of improving reliability during design, different techniques available to improve reliability.

UNIT 2

Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve maintainability & availability, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.

UNIT 3

Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference, Optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown, Fixed time maintenance, Total productive maintenance.

UNIT 4

Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies.

UNIT 5

Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of coMTMErcial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.

Reference Books:

1. Concepts in Reliability Engineering L.S. Srinath, Affiliated East West Press
2. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F.
   Coombs, McGraw Hill Inc.
3. Failure Diagnosis and Performance Monitoring L.F. Pau, Marcel Dekker
4. Industrial Maintenance Management S.K. Srivastava, S. Chand & Co Ltd.

PRODUCT ENGINEERING (MTMEPE204.A)

UNIT 1

Product Design Process: Design Process Steps, Morphology of Design. Problem Solving and Decision Making: Problem-Solving Process, Creative Problem Solving, Invention, Brainstorming, Morphological Analysis,

Behavioral Aspects of Decision Making, Decision Theory, Decision Matrix, Decision Trees.

UNIT 2

Materials Selection: Problem of Materials Selection, Performance Characteristics of Materials, Materials Selection Process, Sources of Information on Materials, Economics of Materials, Evaluation Methods for Materials Selection, Cost versus Performance Relations, Weighted Property Index, Cost Comparison, Value Analysis, Materials Systems, Materials Substitution

UNIT 3

Interaction of Materials, Processing, and Design: Role of Processing in Design, Classification of Manufacturing Processes, Economics of Manufacturing, Design for Castings, Forgings, Sheet-Metal Forming, Machining, Powder Metallurgy, Welding. Residual Stresses in Design, Design for Heat Treatment, Design for Assembly.

UNIT 4

Transport Documentation and Transport Functionality – Bill of Lading, Freight Bill, Shipping Manifest. Responsibilities of Traffic Department. Product Movement, Product Storage, Participants in Transportation Decision – Shippers, Carriers, Government, Public.

UNIT 5

Materials Handling, Packaging and Warehouse Functionality: Fork Lift Trucks, Pallet Trucks, Tow Tractor, Conveyors, Carousels. Automated & Semi Automated Handling Procedure. Consumer Packaging, Industrial Packaging, Importance of Packaging, Function of Packaging. Warehouse Operating Principles, Classification – (1) Private, (2) Public, (3) Contract Warehouse, Planning the distribution warehouse.

Reference Books :

1 Engineering Design , George E. Dieter, McGRAW-HILL
2. Product Integrity and Reliability in Design, John W. Evans and Jillian Y. Evans, Springer Verlag
3. The Product Management Handbook, Richard S. Handscombe, McGRAW-HILL

MECHATRONICS (MTMEPE204.B)

UNIT 1

Introduction: Definition of Mechatronics products, design considerations and trade offs. Overview of Mechtronic products. Intelligent machine Vs Automatic machine economic and social justification.

UNIT 2

Actuators and drive systems: Mechanical, Electrical, hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations.

UNIT 3

Architecture of intelligent machines: Introduction to Microprocessor and Microcontrollers. Programmable logic controls and identification of systems. System design classification, motion control aspects in design.

UNIT 4

Machine vision: Feature and pattern recognition methods, concepts of perception and cognition in decision-making.

UNIT 5

Sensor interfacing and Machine vision: Analog and digital sensors for motion measurement, digital transducers, human-Machine and machine-Machine inter facing devices and strategy.

Reference Books :

1. Kuo. B.C. D.C. Motors and Control systems; S.R.I., Publishing Co., 1979
2. Kuo. B.C. Step Motors and Control systems; S.R.I., Publishing Co., 1979
3. C.W. De Silva, Mechatronics: An Integrated Approach by Publisher: CRC;

CRYOGENIC SYSTEMS (MTMEPE204.C)

UNIT 1

Introduction & Low Temperature properties of Engineering Materials: Historical background, Present area involving cryogenics, Mechanical properties; Thermal properties; Electrical and Magnetic properties; properties of Cryogenic fluids.

UNIT 2

Gas Liquefaction System: Joule Thompson effect; Adiabatic expansion; Simple Linde-Hampson, Precooled Linde- Hampson system; Liquid dual pressure system; Cascaded system; Claude system, Kapitza system, Collins helium liquefaction system.

UNIT 3

Critical Component of Liquefaction System: Effect of heat exchanger; Effectiveness of system performance, Effect of compressor and expander efficiency on system performance; effect of heat transfer to the system.

UNIT 4

Cryogenic Refrigeration System: Phillips refrigerator, Importance refrigerator, effectiveness for Phillips refrigerator, Gifford-McMahan refrigerator. Measurement System of Low Temperature: Temperature measurement, Flow rate measurement, Liquid level measurement.

UNIT 5

Cryogenic Storage & Transfer System: Cryogenic fluid storage vessels, Insulation, Cryogenic transfer system. Vacuum Technology: Importance of Vacuum technology in cryogenics, Calculation of pump down time for a vacuum system, Components of vacuum systems, Mechanical vacuum pumps, Vacuum gauges & valves.

Reference Books:

1. Cryogenic Systems Barron Randall F Oxford University
2. A Text Book of Cryogenics Valery V Kostiouk Discovery Publishing House
3. Cryogenic Technology and Applications A R Jha -
4. Thermodynamic Properties of Cryogenic Fluids R T Jacobsen Plenum Publishing Corpn.

CNC TECHNOLOGY LAB (MTMEPE 205)

List of experiments:

1. Study of different feedback devices used in cnc systems.
2. Study of nc, cnc & dnc hardware systems
3. Study of apt programming language structure.
4. Write an apt program for lathe machine operation.

5. Write an apt program for milling operation.
6. Study of vertical machining center.
7. Study of horizontal machining center.
8. Study of maintenance methods required for cnc machines

AUTOMATED MATERIAL HANDLING SYSTEMS (MTMEPE301)

UNIT 1
Introduction to Material Handing - Overview of material handing equipment, considerations in material handing system design, the ten principles of material handing

UNIT 2
Material Transport Systems - Industrial trucks, automated guided vehicle systems (AGVS), vehicle guidance technology, vehicle management and safety, monorails and other rail guided vehicles, conveyor systems, types of conveyors, conveyor operations and features, cranes and hoists, analysis of material transfer systems.

UNIT 3
Storage Systems - Storage system performance, storage location strategies, conventional storage methods and equipment, automated storage systems, automated storage/retrieval systems (AS/RS), types of AS/RS and applications, carousel storage systems, engineering analysis of storage systems

UNIT 4
Material Handing and Storage System in FMS/CIM - Functions of the handing system, FMS layout configurations material handing equipment

UNIT 5
Robot Technology - Robot anatomy, need, purpose and motives for robot use in industry, elements of a robotic system, need for using robots, robot physical configurations, robot motions, motion planning, trajectory planning, technical features, drive systems.

Reference Books:
1. Mikell P. Grover “Automation, Production Systems and Computer-Integrated Manufacturing”,
Pearson Education, New Delhi
2. P. Radhakrishnan & S. Subramanyan “ CAD/CAM/CIM” Willey Eastern Limited New Delhi
3. Mikell P. Grover and Enory W. ZiMTMErs Jr. “ CAD/CAM”, Pearson Education, New Delhi.
4. Mikell P. Grover “Industrial Robotics”

SUPPLY CHAIN PRACTICE & PROCEDURE (MTMEPE302)

UNIT 1
Concept of supply chain, Integrated supply chain, Growth of Supply chain, Strategic decision in supply chain.

UNIT 2
Definition of Supply Chain Management, Scope, Supply Chain Management as a
Management Philosophy, Function of SCM, Why Supply Chain Management, Value chain for Supply Chain Management.

UNIT 3
Customer focus in Supply Chain Management, Buyers Perspective, Suppliers Perspective, Stages of Development in Supplier Relations.

UNIT 4
Supply Chain Strategies – (i) Cycle View (ii) Push & Pull View.
Achievement of strategic fit through different steps, Obstacles to achieving Strategic Fit.

UNIT 5
Role of Forecasting in a supply chain, Factors of Demand Forecast, Basic approach to Demand Forecasting, Role of Aggregate Planning in a Supply Chain, Problems, Planning
Strategies.

Reference books:
1. Supply Chain Management – Sunil Chapra & Peter Meindl, PHI
2. Essentials of Supply Chain Management – Dr. R.P. Mohanty & Dr. S.G. Deshmukh, Jaico Publishing House

3. Designing & Managing The Supply Chain
David Simchi-Levi , Philip Kamiusky, Edith Simchi-Levi, TATA Mc-Graw Hill

ROBOTICS (MTMEPE303)

UNIT I

Fundamentals of Robots: Introduction, definition of robot, classification of robots, History of robotics, robot components, degree of freedom, robot joints, robot coordinates, reference frames, programming modes, robot characteristics, robot work space, robot languages, advantages, disadvantages and applications of robots.

UNIT 2

Dynamic analysis and forces: Introduction, Lagrangian mechanics, Effective moments of inertia, dynamic equations for multi-degree of freedom robots-kinetic energy, potential energy, the Lagrangian, robot's equations of motion, static force analysis of robots.

UNIT 3

Trajectory planning: Introduction, path Vs trajectory, basics of trajectory planning, joint space trajectory planning-third order polynomial trajectory planning, fifth order polynomial trajectory planning, Cartesian-space trajectories.

UNIT 4

Robot Actuators: Introduction, characteristic of Actuating systems-weight, power to weight ratio, operating pressure, stiffness Vs compliance,comparision of actuating systems, hydraulic devices, pneumatic devices, servomotors, stepped motors.

UNIT 5

Robot sensors: Introduction, sensor characteristics, LVDT, Velocity sensors-Encoders, Tachometers, Accelerating sensors, strain gauges, Torque sensors, light and infrared sensors, touch and tactile sensors, optical proximity sensors, Ultrasonic proximity sensors.

Reference books:

1. Introduction to Robotics – Analysis, System, Applications by Saeed B. Niku, PHI
Publications

2. Industrial Robotics – Mikell P. Groover & Mitchell Weiss, Roger N. Nagel,Nicholas
G.Odrey – Mc Graw Hill, 1986

INVENTORY MANAGEMENT (MTMEPE304.A)

UNIT 1
Definition, Importance, Function, Classification of Inventory, Inventory related Cost, Objectives of Inventory Control, Planning for Inventory Control, Types of Inventory Situations .

UNIT 2
Selective Inventory Control Model- ABC Analysis, VED, XYZ, FSN, SOS, GOLF, EOQ Model, P & Q System, Concept of JIT.

UNIT 3
Inventory Control Process – Perpetual Review, Periodic Review, Modified Control,Distribution Requirement Planning (DRP), Process of DRP, Benefits & limitation of DRP.

UNIT 4:
Classification of W.I.P Inventories, Factors influencing, W.I.P inventory, Problems,Controlling Method.

UNIT 5
Factors influencing Finished Goods inventory, Requirement of inventory control Systems, Multi echelon Inventory Model, Use of Information Technology in Inventory Management.

Reference books:
1. Inventory Management – K. Shridhara Bhat, Himalaya Publishing House
2. Logistical Management-The integrated Supply Chain Process –Donald. J. Bowersox &
Donald. J. Claoss, TATA Mc-Graw Hill
3. Inventory Management – L.C. Jhamb, Himalaya Publishing House

CELLULAR MANUFACTURING SYSTEMS (MTMEPE304.B)

UNIT 1

Cellular manufacturing: Introduction, Group machining Concept, Principle, Terminology,
characteristics, Perspectives, Objectives, Techniques, Applications, Factors to be considered for implementation, factors influencing the success of cellular manufacturing.

UNIT 2

Cell formation techniques: Design and Manufacturing Attributes, Cell Design and Representation of the Problem. Cell Formation Techniques – Traditional methods, Similarity coefficient methods, Array based methods. Cell Design Considerations, Data Structure and Influence on the Solution.

UNIT 3

Processing the Exceptional Components: Introduction, Processing Exceptional Components, Models for Eliminating Exceptional Components.

UNIT 4

Evaluation of Cellular Manufacturing Solutions: Introduction, Static Evaluation of Cells, Measure of flexibility (MF), Selection of Solution, VEDO Analysis, Comparison of Different Methods.

UNIT 5

Line Balancing in Cellular manufacturing: Line balancing for cells, Design Factor in Line Balancing, Bowl Phenomena in Cellular Manufacturing environment, effect on production rates.

Reference books:

1. B S Nagendra Parashar, “Cellular Manufacturing systems” PHI Learning Pvt Ltd, 2009
2. Andrew Kusaik, “Intelligent Manufacturing System”
3. MP Groover, “Automation, Production Systems, CIM”
4. Irani SA, “Cellular Manufacturing systems”
5. Kamrani AK, Parsaei HR and Liles DH, “Planning, Design and Analysis of Cellular
Manufacturing systems”

CONCURRENT ENGINEERING AND PRODUCT LIFECYCLE MANAGEMENT (MTMEMT304.C)

UNIT 1

Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.

UNIT 2

Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product coMTMErce, Artificial Intelligence, expert systems, Software hardware component design.

UNIT 3

Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.

UNIT 4

Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.

UNIT 5

Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.

Reference Books:

1. Integrated Product Development M.M. Anderson and L Hein, IFS Publications
2. Design for Concurrent Engineering J. Cleetus CE Research Centre, Morgantown

3. Concurrent Engineering Fundamentals: Integrated Product Developmen Prasad, Prentice hall India
4. Concurrent Engineering in Product Design and Development Moustapha ,New Age International.