560211: Automation & Robotics

Category	Title	Code	Credit-3			Theory Paper
Departmental core-DC	Automation & Robotics	560211/690211	L	T	P	Max. marks: 70 Min. Marks: 28 Duration: 3 hrs
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Course objectives: To make the student to understand:

1. The automation and brief history of robot and applications
2. About robot end effectors, Robot Programming methods & Languages of robot.
3. Various sensors and fundamentals of vision systems.
4. The latest material handling system used in manufacturing industry and the concept of Automated Guided Vehicle System.
5. The basics of CAD/CAM integration and concept of the group technology

Syllabus

Unit-I Automation: - Definition, Reasons for automating, Types of production Automation Strategies, Detroit type Automation - Automated flow lines, Method for work part Transport, Transfer mechanism, Buffer storage, control functions, automation for Machining operations, design and fabrication considerations

Unit-II Automated Inspection & Testing: - Inspection and testing, SQC, automated inspection - Principles and methods, Sensor technologies for automated inspection, coordinate Measuring machine, other contact inspection method, machine vision, optical inspection methods, and non-contact inspection methods.

Unit-III Introduction to Robotics: - Historical development, specification, Configuration Drive and Precision of Industrial Robots, Robot end- effecters. Robots Kinematics, Direct and Inverse, Robot trajectories, Control of Robots Manipulators. Sensing: Range proximity, Touch, Force , Torque, Surface texture and vision.

Robot Programming: - Robot languages, Robot teaching. Robot level languages, Task level languages and offline programming, concept of AI in Robotics.

Unit-IV Robot Application Planning: - Product design and production planning, principles of Robot's motion economy, design of robotic workstations Performance analysis. Justification of industrial robots.

Unit-V Industrial Application of Robots: - Selection and use of Robots for foundry and casting, welding materials handling, machining inspection, assembly and painting.

Course outcomes: After successful completion of this course students will be able to**:**

1. **State** the concepts/components of computer integrated manufacturing and integrate them in a coordinated fashion
2. **Identify** the main elements in computer integrated manufacturing systems.
3. **Apply** computer aided process planning, feature and group technology, and data exchange in manufacturing processes.
4. **Analyze** product models with CAM tools and CNC machines.
5. **Select** the standard machining codes of programming for different materials
6. **Design** Flexible manufacturing cell after carrying out Group technology study and finally creating FMS.

Text & References Books:

1. Robotics, Controlling, Sensing, Vision & Intelligence by FU K.S. Gonzalez & Lee; McGraw Hill Book Co.
2. Robotics for Engineers, by Yoren Koren, McGraw Hill Book Co. New York.
3. Groover, M.P., "Automation, Production System and CIM", Prentice-Hall of India.
4. Principles of computer integrated manufacturing- S, Kant Vajpayee, PHI Learning Private Limited,New Delhi.
5. David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi
6. Yorem Koren, "Computer control Manufacturing Systems", McGraw Hill.
7. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International.

560212: Production Engineering-II

Category	Title	Code	Credit-3			Theory Paper
Departmental core-DC	Production Engineering-II	560212	L	T	P	Max. marks: 70 Min. Marks: 28 Duration: 3 hrs
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Course objectives: To make the student to understand:

1. The basic understanding of unconventional machining processes
2. The principle, mechanism of metal removal of various unconventional Machining processes
3. 3D laser forming, parametric analysis for performance evaluation
4. Concept of MRR, feed rate and new hybrid non-traditional processes
5. The various process parameters and their effect on the component machined on unconventional machining processes

Syllabus

Unit-I Modern Manufacturing Methods: -Introduction: Shape building processes & overview of new manufacturing processes. Laser bending and 3D laser forming. Brief description of High-Energy Rate Forming (HERF) processes. Thermal Metal Removal Processes: -

Unit-II Electric Discharge Machining: - Principal of EDM, Spark generators, Dielectrics and Flushing, Tool feeding system. Performance Evaluation- MRR, Surface finish & Accuracy. Tool Designs: EWR, Over cut Tapers, Performance Improvement Techniques, Principles of Working and Application of EDD, TW-EDM, EDS, EDO, CNC-EDM, AC-EDM, HEDM and Pocket EDM.

Unit-III Laser Beam Machining: - Principal of laser production, Working principles of laser beam machining. Types of Lasers, Working of Ruby and Co-laser process characteristics, Advantages, Limitations and Applications of Electron Beam Machining (EBM), Ion Beam Machining (IBM) and Plasma Beam Machining (PBM).Mechanical Processes: -

Unit-IV Ultrasonic Machining: Principle of working, USM System, Mechanics of Cutting, Parametric Analysis, Process capabilities, Advantages, Limitations and Applications.

Abrasive Jet Machining: Principle of Working, AJM setup, Gas propulsion, Abrasive Feeder, Machining chamber and nozzle, Parameter analysis for performance evaluation, Process capabilities, advantages, Limitations and Applications. Working principle and applications of Abrasive Flow Machining (AFM), Magnetic Abrasive Machining (MAM), Water Jet Cutting (WJC), and Abrasive Water Jet Machining (AWJM), Abrasive Polishing and Hydraulic Jet Cutting.

Unit-V Electro Chemical Machining: Electrolysis, Theory and Working principle of ECM, Composition, Properties and selection of electrolyte ECM machine, tool-power source, Electrolyte supply and cleaning system, tool feed system, work holding systems. Material removal rate in ECM, Dynamics and Kinematics, Smoothing of an irregular anode surface, tool design for ECM. Limitations of ECM, Principles, applications of ECG, Electro-stream drilling (BSD), ECDE, shaped-tube Electrolytic machining (STEM). Basic Techniques of CHM, Maskants, CH Milling, CHB and Petrochemical Discharge Machining (PCDM). Comparison of new methods of machining. Introduction to Electro Chemical discharge Machining and other new hybrid non-traditional Processes. Micro-machining techniques and their applications.

Course outcomes: After successful completion of this course students will be able to:

1. **Define** the basic techniques of advance machining processes.

2. **Identify** the process parameters and their effects.
3. **Demonstrate** different unconventional machining processes and the influence of difference process parameters on the performance and their applications.
4. **Compare** the machining response of different unconventional machining process.
5. **Recommend** the best machining process for different materials of various applications.
6. **Improve** the machining response using optimization techniques

Text & References Books:

1. Advance Methods of Machining by M G Gough, J.A, Chapmanand Hal London.
2. Non-traditional Manufacturing Process Engineering by Gray F. Bendictm, MARCAL, DEKK.ER Inc.
3. Modern Manufacturing Process Engineering by Niebe, Mc.Graw-Hill Int. Ed.
4. New Technology by Bhattacharya, A.IE (I) Calcutta.
5. Non-conventional Machining by Mishra, PK Narosa Publishing House, New Delhi.
6. Modern Machining Methods by Adithan, S.Chand & Co. New Delhi.
7. Modern Machining process by Pandey, PC and Shan, HS Tata Me Graw Hill, New Delhi.
8. Manufacturing Science by Ghose, A & Malik, AK, EWP.
9. Production Technology by HMT.
10. Fundamentals of Machining and Machine Tools by Boothroyed Marcel, Dekker, Inc.
11. ASM Metals Handbook, Vol. Number Machining.
12. Production Technology by PC Sharma, S. Chand & Company Ltd.

560213: Logistics and supply chain management

Category	Title	Code	Credit-3			Theory Paper
Departmental core-DC	Logistics and supply chain management	560213	L	T	P	Max. marks: 70 Min. Marks: 28 Duration: 3 hrs
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Course objectives: To make the student to understand:

1. The consumer demand for guaranteed delivery of high quality and low cost with minimal lead time
2. How to optimize pre and post production inventory levels
3. How to maintain transparency in operations
4. How to minimize variance by means of activities like standardization, variety reduction
5. How to achieve maximum efficiency in using labour, capital and plant through the company

Syllabus

Unit-I Introduction to Logistics: - Scope of Logistics, Elements of Logistics, Logistics in the system Life Cycle, Need for Logistics Engineering, Related Terms and Definitions.

Unit-II Measures of Logistics: - Reliability, Maintainability, Availability factors, Supply supports, Facility and Software Factors. System Engineering Process: - Definition of Problem and Need analysis, System Feasibility Analysis, System Operational Requirements, Functional Analysis.
Supportability Analysis: - Processes, Methods, Tools and Applications.

Unit-III Logistics in The Design and Development Phase: - Design Process, Related Design Discipline, Supplier Design Activities, Design Integration and Reviews, Test and Evaluation.
Logistics in The Production /Construction Phase: - Production/ Construction Requirements, Industrial Engineering and Operations Analysis, Quality Control, Production Operation, Transition from Production to user operation. Logistic in The Utilization and Support Phase: - System/ Product Support, TPM, Data collection, Analysis and System Evaluation, Evaluation of Logistic Support Elements, System Modification.

Unit-IV Logistics in the System Requirement, Material Recycling and Disposal Logistic Management: -Logistic Planning, Development of a Work Breakdown Structure, Scheduling of Logistics Tasks, Cost Estimation and control, Organization for Logistics, Management and control.
Unit-V Supply Chain Management: - Overview, Managing the customer interface. Managing the supplier interface. Measures of Supply chain performance, Supply Chain links to operations strategy, Supply Chain Dynamics, Supply Chain Software, Supply chain management across the organization

Course outcomes: After successful completion of this course students will be able to:

1. Apply sales and operation planning, MRP and Lean manufacturing concepts
2. Familiarized with managing the supplier interface
3. Analyze the manufacturing operations of a firm
4. Apply quality management tools or process improvement
5. Apply logistics and purchasing concepts to improve supply chain operations

Text & References Books:

1. Logistics Engineering and Management-Benjamin S. Blanchard.
2. Operation Manasement-Lee J Kraiewski & Larry P. Ritzman
3. Essentials of supply chain management by Michael H. Hugos
4. Logistics and supply chain management by Martin christopher
5. Supply chain management: strategy, planning and operation by sunil chopra and Peter Meindl