# RO6602 AUTOMATION SYSTEM DESIGN

## DETAILED SYLLABUS

### UNIT I FUNDAMENTAL CONCEPTS OF INDUSTRIAL AUTOMATION

Fundamental concepts in manufacturing and automation, definition of automation, reasons for automating. Types of production and types of automation, automation strategies, levels of automation.

### UNIT II TRANSFER LINES AND AUTOMATED ASSEMBLY

General terminology and analysis, analysis of transfer lines without storage, partial automation. Automated flow lines with storage buffers. Automated assembly-design for automated assembly, types of automated assembly systems, part feeding devices, analysis of multi-station assembly machines. AS/RS, RFID system, AGVs, modular fixturing. Flow line balancing.

### UNIT III PNEUMATIC CONTROL

Components, constructional details, filter, lubricator, regulator, constructional features, types of cylinders, control valves for direction, pressure and flow, air motors, air hydraulic equipments. PNEUMATIC CONTROL SYSTEM DESIGN: General approach to control system design, symbols and drawings, schematic layout, travel step diagram, circuit, control modes, program control, sequence control, cascade method, Karnaugh-Veitch mapping.

### UNIT IV PROGRAMMABLE AUTOMATION

Special design features of CNC systems and features for lathes and machining centers. Drive system for CNC machine tools. Introduction to CIM; condition monitoring of manufacturing systems. DESIGN FOR HIGH SPEED AUTOMATIC ASSEMBLY: Introduction, Design of parts for high speed feeding and orienting, high speed automatic insertion. Analysis of an assembly. General rules for product design for automation. DESIGN OF MECHATRONIC SYSTEMS: Stages in design, traditional and mechatronic design, possible design solutions. Case studies-pick and place robot, engine management system.

## UNIT V ELEMENTS OF HYDRAULIC SYSTEMS

Pumps and motors- types, characteristics. Cylinders, types, typical construction details. Valves for control of direction, flow and pressure, types, typical construction details. HYDRAULIC SYSTEM DESIGN: Power pack–elements, design. Pipes-material, pipe fittings. seals and packing. maintenance of hydraulic systems. Selection criteria for cylinders, valves, pipes. Heat generation in hydraulic system ADVANCED TOPICS IN HYDRAULICS AND PNEUMATICS: Electro pneumatics, ladder diagram. Servo and Proportional valves - types, operation, application. Hydro-Mechanical servo systems. PLC- construction, types, operation, programming

## TEXT BOOKS

1. Mikell P Groover, “Automation Production Systems and Computer- Integrated Manufacturing” Pearson Education, New Delhi, 2001.

2. Wemer Depper and Kurt Stoll, “Pneumatic Application”, Kemprath Reihe, Vogel Buch Verlag Wurzbutg, 1987.

3. Bolton W, “Mechatronics“, Pearson Education, 1999.

## REFERENCES

1. Mikell P Groover, "Industrial Robots – Technology Programmes and Applications” , McGraw Hill , New York, USA. 2000.

2. Wemer Deppert and Kurt Stoll, “Pneumatic Application”, Kemprath Reihe, Vovel Verlag, Wurzburg, 1976.

3. Steve F Krar, “Computer Numerical Control Simplified“, Industrial Press, 2001.

4. Joffrey Boothroyd, Peter Dewhurst and Winston A. Knight, “Product Design for manufacture and Assembly”, CRC Press, 2011.

## OBJECTIVES

To know about the pneumatic, electric, hydraulic and electronic systems in automation of mechanical operations.