## SEMESTER S6

# ADVANCED AUTOMATION

| Course Code | OEMRT832 | CIE Marks | 40 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:0:0:0 | ESE Marks | 60 |
| Credits | 3 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | None/ (Course code) | Course Type | Theory |

**Course Objectives:**

1. Make students familiar with automation and control technologies in modern manufacturing.
2. Determine the modern application of automation systems in manufacturing industry.
3. Provide knowledge on the elements of modern manufacturing systems.
4. Examine the mechanisms of CMM and FMS.

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## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | Production system facilities-Manufacturing support systems - Automation in production systems-manual labor in production systems - automation principles and strategies USA principle-ten strategies of Automation and Production Systems - Automation Migration strategy-manufacturing industries and products-manufacturing operations-processing and assembly operations-product / production relationships. Classification of manufacturing systems | 9 |
| 2 | Elements of an automated system-advanced automation functions - safety monitoring-maintenance and repair diagnostics - capabilities of computer control and levels of industrial process control-computer process monitoring-direct digital control-numerical control and robotics-PLC. Components of a manufacturing system - production machines - material handling system. | 9 |
| 3 | Automation levels - part or product variety - Type I type II and type III | 9 |

| | | |
|---|---|---|
| | manufacturing systems. Part families - parts classification and coding-features and examples of part classification and coding systems - production flow analysis-cellular manufacturing - application of group technology. Inspection metrology-coordinate measuring machines - CMM construction - CMM operation and planning - CMM applications and benefits. | |
| **4** | Machine vision - image acquisition and digitizing - machine vision applications. Flexible manufacturing systems - types of FMS - FMS components - workstations - material handling and storage systems - computer control systems - human resources - FMS applications and benefits - FMS planning and implementation issues - FMS planning and design issues - FMS operational issues. Comparison of lean and agile manufacturing. | **9** |

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

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**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (Written) | Total |
|---|---|---|---|---|
| **5** | **15** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

**Course Outcomes (COs)**

At the end of the course students should be able to:

| | Course Outcome | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Understand the principles of automation systems and to determine the relationship between product and production. | **K2** |
| **CO2** | Analyse the different elements of automation system and to find the importance of control systems in automation. | **K3** |
| **CO3** | Classify the manufacturing systems, what are the components of manufacturing systems and understand about CMM. | **K2** |
| **CO4** | Explain about Machine vision in manufacturing system and FMS. | **K2** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

**CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | | 1 | | | | | | | | |
| **CO2** | 3 | 2 | 1 | 2 | | | | | | | | 2 |
| **CO3** | 3 | 3 | | | | | | | | | | |
| **CO4** | 3 | 2 | 3 | 2 | | | | | | | | 2 |

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Automation, Production Systems and Computer – Integrated Manufacturing | Mikell P Groover, | Pearson Education | 2001 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | CAD/CAM and CIM | Radhakrishnan, P Subramanian | Wiley Eastern | 2003 |
| 2 | Advamced Automation Techniques in Adaptive material processing | XiaoQi Chen, Rajagopalan Devanathan, Aik Meng Fong | World Scientific, first edition | 2002 |
| 3 | Principles of automation and Advanced Manufacturing System | Dr. KC Jain, Sanjay Jain | Khanna Publishers | 2004 |

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