 IIPM SCHOOL OF ENGINEERIN AND TECHNOLOGY

**LESSON PLAN: 2023-24**

**MECHATRONICS**

**Branch : Mechanical Semester: 5TH**

**Duration : 60**

**Faculty name : Saritprava Sahoo**

**SYLLABUS**

|  |  |
| --- | --- |
| **Unit – I** | **INTRODUCTION TO MECHATRONICS**  1.1 Definition of Mechatronics  1.2 Advantages & disadvantages of Mechatronics  1.3 Application of Mechatronics  1.4 Scope of Mechatronics in Industrial Sector  1.5 Components of a Mechatronics System  1.6 Importance of mechatronics in automation |
| **Unit – II** | **SENSORS AND TRANSDUCERS**  2.1Defination of Transducers  2.2 Classification of Transducers  2.3 Electromechanical Transducers  2.4 Transducers Actuating Mechanisms  2.5 Displacement &Positions Sensors  2.6 Velocity, motion, force and pressure sensors.  2.7 Temperature and light sensors. |
| **Unit – III** | **ACTUATORS-MECHANICAL, ELECTRICAL**  3.1Mechanical Actuators  3.1.1 Machine, Kinematic Link, Kinematic Pair  3.1.2 Mechanism, Slider crank Mechanism  3.1.3 Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear  3.1.4 Belt & Belt drive  3.1.5 Bearings  3.2 Electrical Actuator  3.2.1 Switches and relay  3.2.2 Solenoid  3.2.3 D.C Motors  3.2.4 A.C Motors  3.2.5 Stepper Motors  3.2.6 Specification and control of stepper motors  3.2.7 Servo Motors D.C & A.C**.** |
| **Unit – IV** | **PROGRAMMABLE LOGIC CONTROLLERS(PLC)**  4.1 Introduction  4.2 Advantages of PLC  4.3 Selection and uses of PLC  4.4 Architecture basic internal structures  4.5 Input/output Processing and Programming  4.6 Mnemonics  4.7 Master and Jump Controllers |
| **Unit – V** | **ELEMENTS OF CNC MACHINES**  5.1 Introduction to Numerical Control of machines and CAD/CAM  5.1.1 NC machines  5.1.2 CNC machines  5.1.3.CAD/CAM  5.1.3.1 CAD  5.1.3.2 CAM  5.1.3.3 Software and hardware for CAD/CAM  5.1.3.4 Functioning of CAD/CAM system  5.1.3.4 Features and characteristics of CAD/CAM system  5.1.3.5 Application areas for CAD/CAM  5.2 elements of CNC machines  5.2.1 Introduction  5.2.2 Machine Structure  5.2.3 Guideways/Slide ways  5.2.3.1 Introduction and Types of Guideways  5.2.3.2 Factors of design of guideways  5.2.4 Drives  5.2.4.1 Spindle drives  5.2.4.2 Feed drive  5.2.5 Spindle and Spindle Bearings |
| **Unit – VI** | **ROBOTICS**  6.1 Definition, Function and laws of robotics  6.2Types of industrial robots  6.3 Robotic systems  6.4 Advantages and Disadvantages of robots |

**TEXT BOOKS& OTHER REFERENCES BOOKS**

|  |  |
| --- | --- |
| **Text Books** | |
| 1. | “Mechatronics”, W. Bolton, S.Chand. |
| 2. | “Text book of Mechatronics”, R.K Rajput, S. Chand. |
| **Suggested / Reference Books** | |
| 1. | “CAD/CAM/CIM” R. RADHAKRISHNA,S,SUBRAMANIAN, NEW AGE INTERNATIONAL PVT.LTD |
| 2. | “CAD/CAM”, MIKELL GROVER. |

**Objective :** Mechatronics plays a majorBrole in developing engineering and technology. It can be defined as the applications of electronics and computer technology to control the motions of mechanical systems. With the help of microelectronics and

sensor technology, mechatronics systems are providing high levels of precision

and reliability.

**Learning Outcome :** Understanding effectiveness of

* Definition and elements of mechatronics system.
* How to apply the principle of mechatronics for the development of productive systems and CNC technology and applications of mechatronics in manufacturing automation and concept of Mechanical actuation, Electrical actuation and solve the simple problems.
* Type of system and Sensors and solve the simple problems.
* Various types of System Models & Input /Output parts and solve the problems.
* programmable Logic Controller and develop programme in PLC and Industrial robotics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.No** | **Chapter** | **Proposed Week for Teaching** | **Period**  **No.** | **Subject Name** | **Important Teaching Points** | **Content Source** |
| 1 | **I** | 1st | 1 | Introduction to Mechatronics | * Definition of Mechatronics * Advantages & disadvantages of Mechatronics | **Text book of Mechatronics**. R.K Rajput S.Chand |
| 2 | 2 | * Application of Mechatronic * Importance of mechatronics in automation |
| 3 | 3 | * Scope of Mechatronics in Industrial Sector * Components of a Mechatronics System |
| 4 | 4 | * ASSIGNMENT |
| 5 | 2nd | 1 | * CLASS TEST |
| 6 | **II** |  | 2 | Sensors and Transducers | * Defination of Transducers | **Text book of Mechatronics**. R.K Rajput S.Chand |
| 7 | 3 | * Classification of Transducers |
| 8 | 4 | * Electromechanical Transducers |
| 9 | 3RD | 1 | * Transducers Actuating Mechanisms |
| 10 | 2 | * Displacement &Positions Sensors |
| 11 | 3 | * Velocity, motion, force and pressure sensors. |
| 12 | 4 | * Temperature and light sensors. |
| 13 | 4TH | 1 | * ASSIGNMENT |
| 14 | 2 | * CLASS TEST |
| 15 | **III** | 3 | **ACTUATORS-MECHANICAL, ELECTRICAL** | * Mechanical Actuators * Machine, Kinematic Link, Kinematic Pair |
| 16 | 4 | * Mechanism, Slider crank Mechanism * Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear | **Text book of Mechatronics**. R.K Rajput S.Chand |
| 17 | 5th | 1 | * Belt & Belt drive * Bearings |
| 18 | 2 | * Electrical Actuator * Switches and relay |
| 19 | 3 | * Solenoid * D.C Motors |
| 20 | 4 | * A.C Motors * Stepper Motors |
| 21 | 6th | 1 | * Specification and control of stepper motors |
| 22 | 2 | * Servo Motors D.C & A.C |
| 23 | 3 | * ASSIGNMENT |
| 24 | 4 | * CLASS TEST |
| 19 | **IV** |  | 1 | Programmable logic controllers | * Introduction * Advantages of PLC |
|  |
| 20 | 2 | * Selection and uses of PLC |
| 3 | * Architecture basic internal structures |
| 21 | 4 |
| 22 | 6th | 1 | * Input/output Processing and |
| 23 | 2 | * Input/output Programming |
| 24 | 3 | * Mnemonics |
| 25 | 4 | * Master Controllers |
| 26 | 7th | 1 | * Jump Controllers |
| 27 | 2 | * ASSIGNMENT |
| 28 | 3 | * CLASS TEST | **Text book of Mechatronics**. R.K Rajput S.Chand |
| 29 | **V** | 4 | ELEMENTS OF CNC MACHINES | * Introduction to Numerical Control of machines and CAD/CAM |
| 8th |
| 30 | 1 | * NC machines * CNC machines |
| 31 | 2 | * CAD/CAM * CAD |
| 32 | 3 | * CAM * Software and hardware for CAD/CAM |
| 33 | 4 | * Functioning of CAD/CAM system |
| 34 | 9th | 1 | * Features and characteristics of CAD/CAM system |
| 35 | 2 | * Application areas for CAD/CAM |
| 36 | 3 | * ASSIGNMENT |
| 37 | 4 | * CLASS TEST |
| 38 | 10th | 1 | * elements of CNC machines * Introduction | **Text book of Mechatronics**. R.K Rajput S.Chand |
| 39 | 2 | * Machine Structure |
| 40 | 3 | * Guideways/Slide ways |
| 41 | 4 | * Introduction and Types of Guideways |
| 42 | **11th** | 1 |
| 43 | 2 | * Factors of design of guideways |
| 44 | 3 | * Drives * Spindle drives |
| 45 | 4 | * Feed drive * Spindle and Spindle Bearings |
| 46 | **IV** | **12th** | 1 | ROBOTICS | * Definition, Function and laws of robotics |  |
| 47 | 2 |
| * Types of industrial robots |
| * Robotic systems |
| 48 | 3 | * Advantages and Disadvantages of robots |
| 49 | 4 | * ASSIGNMENT |
| 50 | **10th** | 1 | * Class Test |
|  |  |  |

Faculty Member HOD Principal/ Director