

## Department of Mechanical Engineering

- I. Course Title** : **Mechatronics and Robotics in Agriculture**  
**II. Course Code** : **ME 501**  
**III. Credit Hours** : **2+0**

### **IV. Aim of the course**

To introduce the fundamentals of mechatronics and the concepts behind designing mechatronic systems and their subsystems and its application in automation in agriculture.

### **V. Theory**

#### **Unit I**

Introduction to mechatronics: Basic definitions, key elements of mechatronics, historical perspective, the development of the automobile as a mechatronic system. Mechatronic design approach, functions of mechatronic systems, ways of integration, information processing systems, concurrent design procedure for mechatronic systems.

#### **Unit II**

System interfacing, instrumentation, and control systems. Input/output signals of a mechatronic system, signal conditioning, microprocessor control, microprocessor numerical control, microprocessor input/output control.

#### **Unit III**

Microprocessor based controllers and microelectronics: Introduction to microelectronics, digital logic, overview of control computers, microprocessors and microcontrollers, programmable logic controllers, digital communications.

#### **Unit IV**

Technologies of robot: Sub systems, transmission system (Mechanics), power generation and storage system, sensors, electronics, algorithms and software. Servo motor drives types and applications. Stepper motor and its concept. Industrial robots: Classification and sub systems. Defining work space area.

#### **Unit V**

Application of robots in agriculture: Harvesting and picking, weed control, autonomous mowing, pruning, seeding, spraying and thinning, phenotyping, sorting and packing. Utility platforms. Use of different agrobots in agriculture.

### **VI. Learning outcome**

Ability to understand agricultural machinery that is built on concepts of mechatronics and ability to use robotic machinery in agriculture.



## VII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Introduction to Mechatronics: Basic definitions, key elements of mechatronics,	2
2.	Historical perspective, the development of the automobile as a mechatronic system	1
3.	Mechatronic design approach, functions of mechatronic systems, ways of integration, information processing systems, concurrent design procedure for mechatronic systems.	3
4.	System interfacing, Instrumentation, and control systems	2
5.	Input/output signals of a mechatronic system, signal conditioning	2
6.	Microprocessor control, microprocessor numerical control, microprocessor input/output control	2
7.	Microprocessor based controllers and microelectronics	2
8.	Introduction to microelectronics, digital logic, overview of control computers	2
9.	Microprocessors and microcontrollers, programmable logic controllers, digital communications.	3
10.	Technologies of robot: Sub systems, transmission system (Mechanics), power generation and storage system	2
11.	sensors, electronics, algorithms and software. Servo motor drives types and applications	2
12.	Stepper motor and its concept. Industrial robots: Classification and sub systems. Defining work space area.	2
13.	Application of robots in agriculture: Harvesting and picking, weed control	2
14.	autonomous mowing, pruning, seeding, spraying and thinning	2
15.	phenotyping, sorting and packing. Utility platforms. Use of different agrobots in agriculture.	3
	<b>Total</b>	<b>32</b>

## VIII. Suggested Reading

- Alciatore DG and Hstand MB. 2002. *Introduction to Mechatronics and Measurement System*. McGraw Hill Pvt Limited, New Delhi.
- Robert HB. 2002. *Mechatronic Hand Book*. CRC Press.
- Shakhathreh and Fareed. 2011. *The Basics of Robotics*. Lahti University of Applied Sciences Machine and Production Technology.

**I. Course Title : Refrigeration Systems**

**II. Course Code : ME 502**

**III. Credit Hours : 2+1**

### IV. Aim of the course

To acquire the skills required to model, analyse and design different refrigeration processes and components.

### V. Theory

#### Unit I

Reversed Carnot cycle, Carnot, Brayton and aircraft refrigeration systems.

#### Unit II

Vapour compression refrigeration systems: Use of p-h chart, effect of pressure