**Key Concepts and Components of Robotics**

Hardware components:

* Physical components that make up a robot, such as **sensors, actuators, manipulators,** and **controllers.**

Software Components:

* The programming that controls a robot, includes the **operating system, middleware,** and **application software.**

Sensing and perception:

* The **ability of a robot to sense its environment through sensors** such as **cameras, lidar,** and **sonar**, and to **interpret that information to make decisions.**

Control and planning:

* The algorithms and techniques used to **control** the movements of a robot, plan its actions, and **optimize its performance**.

Human-robot interaction:

* The **design and implementation of interfaces** and interaction channels that enable human to **communicate** **with** and **control robots**.

Artificial intelligence and machine learning:

* The use of machine learning and other AI techniques to enable robots to **learn and adapt to new situations.**

Three laws of robotics:

1. No harm to humans.
2. Must obey the orders given.
3. Must be able to protect itself and the information collected.

Safety and reliability:

* The design and implementation of **safety features** and **redundancy** to ensure that robots **operate reliably** and **do not pose a danger to humans.**

Ethics and societal impact:

* The consideration of ethical and societal issues related to the use of robots, such as **privacy, security, job displacement,** and the **impact** on society as a whole.

Introduction to sensors

**Sensors, detectors, and transducers.**

* A sensor/ Detector/ Transducers are electrical, optic-electrical, or electrical devices composed of specialty electronics of otherwise sensitive materials, for determining if there is a presence of a particular entity or function.

Introduction to robotics – Assignment

1. What is the definition of a robot?

* A robot is a type of automated machine that can execute specific tasks with little or no human intervention and with speed and precision. The field of robotics, which deals with robot design, engineering and operation, has advanced remarkably in the last 50 years.

1. What are the three main components of a robot?

Parts of a Robot

* I. Sensors. Sensors are what allow a robot to gather information about its environment. ...
* II. Effectors. The effectors are the parts of the robot that actually do the work. ...
* III. Control Systems (the "brains") A robot's "control system" is that part of the robot that determines the robot's behavior.

1. What are the main types of robots based on their application?

**Types of Robots Based on their Application**

* Industrial Robots. ... An **industrial robot** is a robot system used for manufacturing. **Industrial robots** are automated, programmable and capable of movement on three or more axes.
* Domestic Robots. ... Domestic, or household, robots are autonomous robots used to make homelife run smoother by completing chores and other mundane tasks.
* Surgical Robots. ... Robotic surgery is currently carried out with the use of the da Vinci™ surgical system, a unique set of technologies that include specialized “arms” for holding instruments and a camera, as well as a magnified screen and a console.
* Commercial Entertainment Robots. ... Entertainment robots are machines that can perform various tasks, such as dancing, singing, playing games, or telling jokes, for the purpose of amusing or engaging human audiences. They can be found in theme parks, museums, theaters, homes, or online platforms.
* Army Robots. ... The majority of military robots are tele-operated and not equipped with weapons; they are used for reconnaissance, surveillance, sniper detection, neutralizing explosive devices, etc. Current robots that are equipped with weapons are tele-operated so they are not capable of taking lives autonomously.
* Service Robots. Service robots assist human workers in completing tasks in a variety of service-focused industries, including healthcare, hospitality, logistics, and retail.

1. Give 3 examples of sensors what help a robot understand the environment?

**Here are a few of the more common robot sensors:**

* Light sensors—to detect light.
* Cameras—to gather visual information.
* Sound sensors—to detect sound.
* Temperature sensors—to detect fluctuations in temperature.
* Contact sensors—to avoid obstacles.
* Proximity/Distance sensors—to detect distance of objects in relation to the robot.

“The term IoT refers to a system of computing devices in the physical world which have been connected to internet. These devices can either send or receive data from the internet.”

**Automation**

**IoT**

**Robotics**

**Components of IoT**

1. Sensors
2. Connectivity – WIFI(10meters), Bluetooth(4meters), cellular communication.
3. People or processes:
4. Customer relationship & support.
5. Analytics & cloud/API.
6. Upgrades & configurations.
7. Remote monitoring / maintenance.
8. Control & automation.
9. Supply chain management.
10. Security / energy.
11. Mobile devices & app.
12. Location & tracking.
13. Financial.

**IoT architecture**

Thing: - local network – the internet – end user devices.

Sensors & Actuator

Processing

communication