**Robotics & Automation**

* Automation: The technique of making an apparatus, process or system work or operate automatically with minimal human input.

**3 THINGS OR PROCESSES THAT CAN BE AUTOMATED**

1. **Discover at scale** through **process mining**
2. **Analyze** findings and onboard **documentation** and **modeling tools**
3. Adopt **DPA, RPA,** and **low code**

* Robotics: Is a branch of engineering that involves consumptions, design and manufacture and operations of robots.
* Robot:
  1. Repetitive tasks
  2. Dangerous tasks

Robotics combines the use:

1. Electronics
2. Mechanics
3. Software

to program robots to do particular jobs (repetitive, dangerous) tasks.

* **Benefits of robotics**

1. Improved productivity – robots do not get tired
2. Increased accuracy of productions – reduced human error.
3. Increased speed of production.
4. Increased safety of production – sharp objects, heavy machinery and high temperatures.

**Key Concepts and Components of Robotics Technology**

Robotics technology is a multidisciplinary field that involves the **design, construction, operation,** and **use of robots.**

The key components and concepts of robotics technology include:

1. **Hardware components:**

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

1. **Software components:**

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

1. **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.**

1. **Control and planning:**

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

1. **Human-robot interaction:**

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

1. **Artificial intelligence and machine learning:**

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

1. **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**.

**The Laws of Robotics:**

* **First law**

A robot cannot harm a human being or remaining passive, leave this human being exposed to danger.

* **Second Law**

A robot must obey the orders given by human beings, unless such orders contradict the first law.

* **Third Law**

A robot must protect its own existence to the extent that this protection is not in contradiction with the first or the second law.

1. **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.

* **Applications of Robotics**

1. Robot is Special Applications

* Quality Assurance, Inspection & Testing
* Maintenance & Repair
* Food Industry
* Clothing and Textile Industry
* Construction

1. Robot Master in Workcell

* Welding
* Painting, Coating & Sealing
* Machining
* Assembly

1. Robot Slave in Workcell

* Workpiece & Material Handling
* Palletizing & Partfeeding
* Die Casting
* Flexible Fixturing

**INTRODUCTION**

**Sensors, Detectors, and Transducers?**

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

**Material Design**