

**BTME 3072**  
**Robotics and Automation**  
**Lecture 1**

2<sup>nd</sup> Year

III Semester

Galgotias University

2020-21

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## Unit I: Introduction to Robotics

- **Definition of a Robot –**
- Basic Concepts – Robot configurations –
- Types of Robot drives –
- Basic robot motions –
- Point to point control –
- Continuous path control.

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## Objectives of the lecture

- Definition of robotics
- laws of robotics

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## Introduction to Robotics

- Robotics is an interdisciplinary research area at the interface of computer science and engineering.
- Robotics involves design, construction, operation, and use of robots.
- The goal of robotics is to design intelligent machines that can help and assist humans in their day-to-day lives and keep everyone safe.
- Robotics draws on the achievement of information engineering, computer engineering, mechanical engineering, electronic engineering and others.

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## History

- In 1948, Norbert Wiener formulated the principles of cybernetics, the basis of practical robotics.
- Fully autonomous robots only appeared in the second half of the 20th century.
- The first digitally operated and programmable robot, the Unimate, was installed in 1961 to lift hot pieces of metal from a die casting machine and stack them.
- Commercial and industrial robots are widespread today and used to perform jobs more cheaply, more accurately and more reliably, than humans.

## Robotic aspects

- Robots all have some kind of mechanical construction, a frame, form or shape designed to achieve a particular task.
  - For example, a robot designed to travel across heavy dirt or mud, might use caterpillar tracks.
- Robots have electrical components which power and control the machinery.
  - For example, the robot with caterpillar tracks would need some kind of power to move the tracker treads.
- All robots contain some level of computer programming code.
  - In the caterpillar track example, a robot that needs to move across a muddy road may have the correct mechanical construction and receive the correct amount of power from its battery, but would not go anywhere without a program telling it to move.
  - Programs are the core essence of a robot, it could have excellent mechanical and electrical construction

## Definition of robotics

- Robot, any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner. By extension, robotics is the engineering discipline dealing with the design, construction, and operation of robots.

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## Robotics components-

- Power source
  - At present, mostly (lead–acid) batteries are used as a power source.
  - some type of internal combustion engine, can also be used.
- Potential power sources could be:
  - pneumatic (compressed gases)
  - Solar power (using the sun's energy and converting it into electrical power)
  - hydraulics (liquids)
  - flywheel energy storage
  - organic garbage (through anaerobic digestion)
  - nuclear



## Actuation

- Actuators are the "muscles" of a robot, the parts which convert stored energy into movement.
- By far the most popular actuators are electric motors that rotate a wheel or gear, and linear actuators that control industrial robots in factories.
- There are some recent advances in alternative types of actuators, powered by electricity, chemicals, or compressed air.

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## Electric motors

- The vast majority of robots use electric motors, often brushed and brushless DC motors in portable robots or AC motors in industrial robots and CNC machines.
- These motors are often preferred in systems with lighter loads, and where the predominant form of motion is rotational.

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## Three Laws of Robotics-Asimov's Laws

- Zeroth Law
  - A robot may not harm humanity, or, by inaction, allow humanity to come to harm.
  
- 1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
  
- 2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
  
- 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law

## Summery

- The robotics definition are understood well
- The laws of the robotics are explained

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## Questions

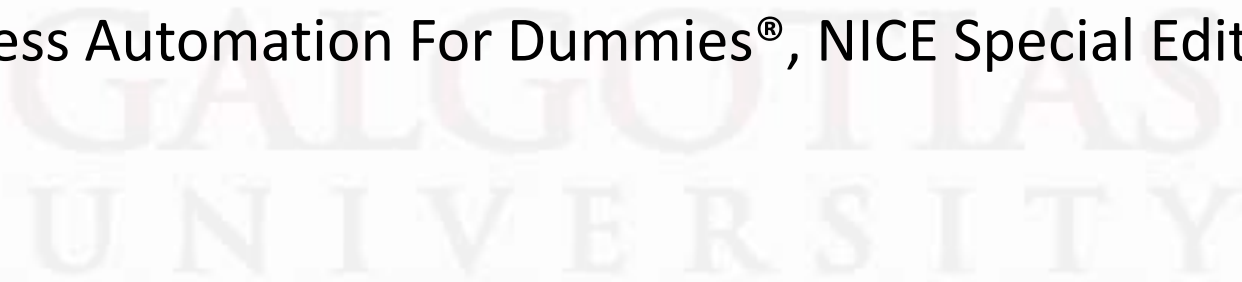
- Define the robotics
- Write the laws of robotcs

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## Text books

- Introduction to robotics mechanics and control by John J Craig
- Fundamentals of Robotic Mechanical Systems by Jorge Angeles
- Robot Operating System for Absolute Beginners: Robotics Programming Made Easy by Lentin Joseph
- Reference book
  - Robotic process automation
  - Robotic Process Automation For Dummies®, NICE Special Edition



# School of Mechanical Engineering

Course Code : BTME 3072

Course Name: Robotics nad Automation

Thank You !