

Robotic Systems

Course Introduction

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Robotic Systems

Course Objectives

- Understanding what a **robotic system** is
- Knowing the **basic principles** of robotic systems
- Understanding the **physical behaviour** of robotic systems
- Knowing the **roles and relationships** of all the hardware/software components of a robotic system
- Knowing the **techniques and software tools** to program a robotic system
- Obtaining the capability **to design and develop** some basic parts of a robotic system

- 1 **Robotics by Example:** Carts, Arms, Wheeled Robots, Flying Robots
- 2 **Physics in Robotics:** Cinematic and dynamic modeling and simulation of a cart, arm, wheeled robot, flying robot
- 3 **Controlling the Behaviour of a Robot:** controlling speed and position; understanding the principles of a control system
- 4 **Software Architectures:** model with periodic tasks, real-time kernels (NuttX, FreeRTOS), inter-task communication, publisher-subscriber model, ROS
- 5 **Motion Control:** Path Planning, Obstacle Avoidance
- 6 **Robot Intelligence:** Neural Models, Logic-based Models, Goal-based Models

Required Background

- **Physics:** cinematics, dynamics, electronics
- **Mathematics:** derivatives, integrals, differential equations, complex numbers
- **Computer Science:** computer architectures, operating systems, programming, programming in Python

- <http://www.dmi.unict.it/santoro> → Teaching → Informatica → Sistemi Robotici
- **Course Slides**
- **Book:** R. Siegwart, I. R. Nourbakhsh, *Introduction to Autonomous Mobile Robots*, The MIT Press
- **Book:** Peter Corke, *Robotics, Vision and Control: Fundamental Algorithms in MATLAB*, Springer
- **Papers provided by the teacher**
- **Internet resources**

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