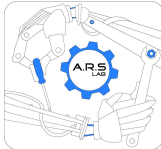# Robotic Systems
Course Introduction

Corrado Santoro

ARSLAB - Autonomous and Robotic Systems Laboratory
Dipartimento di Matematica e Informatica - Università di Catania, Italy
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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

Course Topics

1. **Dynamic Systems:** Definition, Symbolism, Block Schematics, Analytic Simulation, Physics Engines, Integrators, Derivators

2. **Physics in Robotics:** Cinematic and dynamic modeling and simulation

3. **Controlling the Behaviour of a Robot:** controlling speed and position; understanding the principles of a control system

4. **Robotics by Example:** Carts, Arms, Wheeled Robots, Flying Robots

5. **Software Architectures:** model with periodic tasks, real-time kernels (NuttX, FreeRTOS), inter-task communication, publisher-subscriber model, ROS

6. **Motion Control:** Path Planning, Obstacle Avoidance Goal-based Models

- 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 $\rightarrow$ Teaching $\rightarrow$ Informatica $\rightarrow$ 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

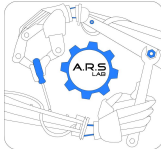- Group Project or Practical Exam
- Oral Exam

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