

ROBOTICS I

1. KEY INDICATORS

CFU/ECTS: 6

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2. OBJECTIVE OF THE COURSE

This course provides the basic tools for the kinematic analysis, trajectory planning, and programming of motion tasks for robot manipulators in industrial and service environments.

3. ACQUIRED ABILITIES

The student will be able to develop kinematic models of robot manipulators, to program motion trajectories realizing the robotic task, and to design simple kinematic or decentralized control laws, and to verifying performance based on simulation tools.

4. PROGRAM

Typical robotic systems are illustrated through examples of manipulators and mobile-base robots in industrial and service applications. The basic functional components of a robot are presented: mechanics for manipulation, actuators, proprio- and extero-ceptive sensing devices, control architecture, and programming. Direct, inverse, and differential kinematic models of robot manipulators are analyzed. Trajectory planning methods both in the joint and in the task (Cartesian) space are then explored. Simple control schemes are introduced, including kinematic control for robot arms and decentralized dynamic control for the single axes of a manipulator. The course is self-contained and does not need special prerequisites. Still, elementary knowledge of kinematics (as given in an undergraduate Physics course) and some background in Automatic Control are useful.

5. REFERENCES

B. Siciliano, L. Sciavicco, L. Villani, G. Oriolo. "Robotics: Modelling, Planning and Control", 3rd Edition, Springer, 2009

6. COURSE WEBSITE

http://www.dis.uniroma1.it/~deluca/rob1_en.php