COMPUTER ENGINEERING (LM55)

(Lecce - Università degli Studi)

Teaching ROBOTICS

GenCod A003152

Owner professor GIANFRANCO PARLANGELI

Teaching in italian ROBOTICS

Teaching ROBOTICS

SSD code ING-INF/04

Reference course COMPUTER ENGINEERING

Course type Laurea Magistrale

Credits 9.0

Teaching hours Front activity hours: 81.0

For enrolled in 2019/2020

Taught in 2020/2021

Course year 2

Language ENGLISH

Curriculum PERCORSO COMUNE

Location Lecce

Semester First Semester

Exam type Oral

Assessment Final grade

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION

This course offers a broad overview of fundamental topics in the area of robotics, mobile robotics and multi-robotic systems. It is aimed at providing principles and tools to state and solve the design problems for industrial robots and mobile devices, and the solution is numerically sought with the aid of a suitable software (Mathworks Matlab is used in the course).

REQUIREMENTS

Sufficiency in calculus, mechanics, control theory and linear algebra

COURSE AIMS

Ability to apply knowledge and understanding) Describe and explain the main peculiarities (both advantages and disadvantages) of each facet of the design of a robotic, mobile robotic and multi-robotic systems. (Ability to apply knowledge and understanding) + (Communication skills) + (Autonomy of judgment) Be aware, describe and explain the practical problems of controlling complex systems and how to overcome these drawbacks using modern approaches. (Ability to apply knowledge and understanding) + (Learning ability) + (Autonomy of judgment) Starting from a practical problem, the student must be able to formalize an adequate theoretical formulation, and also should be able to build a framework of simulation to find a computer solution of the mathematical problem with the use of a suitable software. (Communication skills) + (Learning skills) Students can develop a project on an application of interest in which to apply the methodologies developed along the course.

TEACHING METHODOLOGY

Lezioni frontali svolte in aula dal docente tramite l'ausilio di gesso e lavagna. Nel corso delle lezioni saranno occasionalmente illustrati e discussi software commerciali.

ASSESSMENT TYPE

The exam is an oral discussion (including possibly one written exercise) and it is aimed to determine to what extent the student has: 1) the ability to identify and use data to formulate responses to well-defined problems, 2) problem solving abilities to seek a solution through an algorithm.

FULL SYLLABUS	Introduction to Robotics. Robot Mechanical Structures. Robot Manipulators, Mobile Robots, Industrial robotics. Advanced Robotics, Field Robots, Service Robots. Robot Modelling, Planning and Control. Mathematical background and connections with other courses. Kinematics. Euler Angles. Denavit–Hartenberg Convention.Kinematics of Typical Manipulator Structures. The Inverse Kinematics Problem. Dierential Kinematics and Statics. Geometric Jacobian. Kinematic Singularities. Analysis of Redundancy.Statics. Kineto-Statics Duality. Trajectory Planning. Joint Space Trajectories. Dynamics. Lagrange Formulation. Newton–Euler Formulation. Dynamic Manipulability Ellipsoid. Motion Control. Force Control. Mobile Robots. Nonholonomic Constraints. Kinematic Model, Dynamic Model. Planning, Motion Control.
REFERENCE TEXT BOOKS	Title: Robotics: Modelling, Planning and Control Authors: Siciliano, B., Sciavicco, L., Villani, L., Oriolo, G. Publisher: Springer-Verlag London Copyright Year: 2009