

Syllabus and Program of Robotics 2

http://www.diag.uniroma1.it/deluca/rob2_en.html

Prof. Alessandro De Luca

This document describes the links between the contents of the lecture slides used in the classroom and of other course material (all available as PDF files on the web site) and the course program and associated parts (chapters/sections) in the reference English textbook.

The name of the files with the lecture slides has the format "NN_filename.pdf". The number of slides in each file is given in parentheses. The presence of accompanying videos (available in zipped groups on the web) is also indicated.

The course program is intended for **6 credits**.

This updated version is the latest one and covers the program of the course in the **academic year 2024-25**.

Textbook:

B. Siciliano, L. Sciavicco, G. Villani, G. Oriolo: "Robotics: Modelling, Planning and Control", Springer, 2009 (3rd Edition)
(available also in Italian)

B. Siciliano, L. Sciavicco, G. Villani, G. Oriolo: "Robotica: Modellistica, pianificazione e controllo", McGraw-Hill, 2008 (3a Edizione)

Version: May 27, 2025

Topics/Program	Textbook Ch.Sect.Par	Block of slides (and their number) + Related videos (and their number) and other material
Program and information	---	00_Introduction.pdf (28), including a sneak preview of the course with videos (some repeated also later in the course material) + 00_Rob2_Videos.zip (17)
Advanced kinematics		
Kinematic calibration	2.11	01_Calibration.pdf (16) + 01_Rob2_Videos.zip (3)
Redundant robots	2.10.2 3.4 3.5 App. A.7 App. A.8	02_KinematicRedundancy_1.pdf (51) + 02_1_Rob2_Videos.zip (11) 02_KinematicRedundancy_2.pdf (39) + 02_2_Rob2_Videos.zip (9)

Dynamic modeling of manipulators		
Euler-Lagrange dynamic model	7.1 7.3 App. B	03_LagrangianDynamics_1.pdf (29) 04_LagrangianDynamics_2.pdf (15)
Properties, extensions, and uses of dynamic models	7.2 7.4 7.6 7.7, 7.8	05_LagrangianDynamics_3.pdf (38) 05b_LinearParametrizationIdentification.pdf (23) + 05_Rob2_Videos.zip (6)
Newton-Euler dynamic model	7.5	06_NewtonEulerDynamics.pdf (20)
Robot control		
Introductory topics	8.1 App. C.2 App. C.3	07_IntroControl.pdf (31) + 07_Rob2_Videos.zip (8)
Position regulation in joint space (free motion)	8.2 8.3 (parts) 8.5 (intro) 8.5.1	08_Regulation.pdf (40) 09_IterativeLearning.pdf (17) + 09_Rob2_Videos.zip (3) PIDsaturated_Kelly.pdf
Trajectory tracking in joint space (free motion)	8.5.2 8.5.3 8.5.4 8.7	10_TrajectoryControl.pdf (36) + 10_Rob2_Videos.zip (2) 11_RobustControl.pdf (24) – for personal reading 12_AdaptiveControl.pdf (22) AdaptivePDgravity_Tomei.pdf
Cartesian control (free motion)	8.6	13_CartesianControl.pdf (15)
Interaction modeling and control	All Chap. 9 except: 9.4.3 9.5.2 9.7.1	14_EnvironmentInteraction.pdf (46) + 14_Rob2_Videos.zip (7) 15_ImpedanceControl.pdf (21) + 15_Rob2_Videos.zip (3) 16_HybridControl.pdf (33) + 16_Rob2_Videos.zip (4) ForceControl_EppingerSeering.pdf
Visual servoing (kinematic approach)	10.1 10.2 (parts) 10.3.2 10.3.3 10.5 (parts) 10.6 10.7.2 10.8.2 10.9	17_VisualServoing.pdf (53) + 17_Rob2_Videos.zip (23)
Seminars		
Robot actuators fault detection and isolation	---	18_ActuationFaults.pdf (32) + 18_Rob2_Videos.zip (5)
Model-based torque control in industrial robots	---	TorqueFeedIndRob_VerdonckSwevers.pdf