

# Syllabus and Program of Robotics 2

[http://www.diag.uniroma1.it/~deluca/rob2\\_en.html](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**.

## 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 23, 2018*

Topics/Program	Textbook Ch.Sect.Par	Slides (with number of pages) + Related videos (and their number) or other course material
Program and information	---	00_Information.pdf (20) + sneak preview of 12 videos available later in the course material
Advanced kinematics		
Kinematic calibration	<b>2.11</b>	01_Calibration.pdf (13) + 01_Rob2_Videos.zip (2)
Redundant robots	<b>2.10.2</b> <b>3.4</b> <b>3.5</b> <b>App. A.7</b> <b>App. A.8</b>	02_KinematicRedundancy.pdf (85) + 02a_Rob2_Videos.zip (11) + 02b_Rob2_Videos.zip (1) + 02c_Rob2_Videos.zip (7)
Dynamic modeling of manipulators		
Euler-Lagrange dynamic model	<b>7.1</b> <b>7.3</b> <b>App. B</b>	03_LagrangianDynamics_1.pdf (28) 04_LagrangianDynamics_2.pdf (14)
Properties and use of dynamic models	<b>7.2</b> <b>7.4</b> <b>7.6</b> <b>7.7, 7.8</b>	05_LagrangianDynamics_3.pdf (50) + 05a_Rob2_Videos.zip (4+1 extra) + 05b_Rob2_Videos.zip (2)

Newton-Euler dynamic model	<b>7.5</b>	06_NewtonEulerDynamics.pdf (16)
<b>Robot control</b>		
Introductory topics	<b>8.1</b> <b>App. C.2</b> <b>App. C.3</b>	07_IntroControl.pdf (23) + 07a_Rob2_Videos.zip (3) + 07b_Rob2_Videos.zip (4)
Position regulation in joint space (free motion)	<b>8.2</b> <b>8.3 (parts)</b> <b>8.5 (intro)</b> <b>8.5.1</b>	08_Regulation.pdf (29) 09_IterativeLearning.pdf (16) + 09_Rob2_Videos.zip (2) PIDsaturated_Kelly.pdf AdaptivePDgravity_Tomei.pdf
Trajectory tracking in joint space (free motion)	<b>8.5.2</b> <b>8.5.3</b> <b>8.5.4</b> <b>8.7</b>	10_TrajectoryControl.pdf (22) 11_RobustControl.pdf (24) 12_AdaptiveControl.pdf (23)
Cartesian control (free motion)	<b>8.6</b>	13_CartesianControl.pdf (13)
Interaction modeling and control	<b>All Chap. 9</b> <b>except:</b> <b>9.4.3</b> <b>9.5.2</b> <b>9.7.1</b>	14_EnvironmentInteraction.pdf (40) + 14_Rob2_Videos.zip (4) 15_ImpedanceControl.pdf (16) 16_HybridControl.pdf (29) + 16_Rob2_Videos.zip (4) ForceControl_EppingerSeering.pdf
Visual servoing (kinematic approach)	<b>10.1</b> <b>10.2 (parts)</b> <b>10.3.2</b> <b>10.3.3</b> <b>10.5 (parts)</b> <b>10.6</b> <b>10.7.2</b> <b>10.8.2</b> <b>10.9</b>	17_VisualServoing.pdf (53) + 17a_Rob2_Videos.zip (11) + 17b_Rob2_Videos.zip (7) + 17c_Rob2_Videos.zip (5)
<b>Seminars</b>		
Robot actuators fault detection and isolation	---	18_ActuationFaults.pdf (28) + 18_Rob2_Videos.zip (1)
Collision detection and reaction	---	19_CollisionDetectionReaction.pdf (49) + 19a_Rob2_Videos.zip (9) + 19b_Rob2_Videos.zip (5)
Human-robot coexistence and collaboration		20_HR_CoexistenceCollaboration.pdf (34) + 20_Rob2_Videos.zip (14)
Model-based torque control in industrial robots	---	TorqueFeedIndRob_VerdonckSwevers.pdf