

Theory of Robotics and Mechatronics

Syllabus — Fall 2011

Course number:	151-0601-00
Lecture time:	Thursdays, 08:15/10:00, 15 min break around 09:00
Practice session:	Thursdays, 10:15/11:00
Location:	VAW B 1, Gloriastrasse 37/39, 8092 Zürich
Credit points:	4
Language:	English
Program:	Robotics, Systems, Control
Prerequisites:	None to sign up; interest, curiosity and some math skills helpful
Class web page:	http://www.iris.ethz.ch/msrl/education/iris_theory/

Instructors

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Course Description

Robotics is often viewed from three perspectives: perception (sensing), manipulation (affecting changes in the world), and cognition (intelligence). Robotic systems integrate aspects of all three of these areas. This course provides an introduction to the theory of robotics, and covers the fundamentals of the field, including rigid motions, homogeneous transformations, product of exponentials, forward and inverse kinematics of multiple degree of freedom manipulators, velocity kinematics, motion planning, trajectory generation, sensing, vision, and control.

Lecture Notes

Lecture notes can be bought for CHF 20. Reserve your copy using the Doodle poll found at the class web site by entering your name no later than this Sunday. The copies will be handed out next week.

Grading

Nine homework assignments will be handed out in class. Each one carries the same number of points. You will need more than half the points to be admitted to the exam.

You will be evaluated individually to determine your course grade. Academic discussions with others are encouraged, including about the assignments, but you are expected to turn in your own work for grading.

Assignments must be handed in to an instructor or assistant as a paper copy (not electronically) by the due date. Late assignments will only be accepted in cases of documented illness and emergencies.

Your course grade is based the results of the final exam only.

Expected Course Outline

The course material is partitioned into units. One or several units will be presented during a class session. Additionally researchers from IRIS will present current research during the Virtual Lab Tour.

Assignments are handed out at the end of sessions and they are related to that class. Practice sessions discuss problems similar to those found in the assignments. An assignment is due one week after it was given out.

Session	Lecture Units	Assignment Handout	Practice Session	Assignment Due
1	Introduction	-	Intro	-
2	Mechanical Designs	-	-	-
3	Spatial Descriptions 1	A	A	-
4	Spatial Descriptions 2	B	B	A
5	Forward Kinematics	-	-	-
6	Rigid Body Velocity	C	C	B
7	Jacobian	D	D	C
8	Inverse Kinematics Redundant & Parallel Robots Numerical Methods	E	E	D
9	<i>Virtual Lab Tour</i>	F	F	E
10	Trajectory Control	G	G	F
11	Force Control and Haptics Vision 1	H	H	G
12	Vision 2 Vision 3	I	I	H
13	Micro- and Nano-robotics Mobile Robots	-	Repetition	I
14	<i>Written Exam</i>	-	-	-