

Robotics1: Technical and Mathematical Foundations 2018 Winter

Organizer	Prof. Dr. Jochen Steil
Lecturer	Dr. Bertold Bongardt
Exercises	Pouya Mohammadi, Heiko Donat

Format	2 SWS (L) + 2 SWS (E)
Times	Mon, 11:30 – 13:00 (L) + Wed, 09:45 – 11:15 (E)
Rooms	PK-4.3 (L) + SN-19.3 (E)

Credit points	5
Examinations	– tba –

Content

A thorough presentation of theoretical and practical foundations of robotics is provided in this introductory masters course. This includes the ‘usual’ topics *coordinate transforms, translations and rotations, finite kinematics, instantaneous kinematics*, and *dynamics*. Beyond these, the lecture integrates the themes *topologic modeling, dual numbers, Sheth–Uicker parameters*, and *screw theory* into the proceeding. Next to the introduction of algebraic concepts, ‘geometric perspectives’ are emphasized in each of the presentations.

Audience

Students of Computer Science and STEM (Science, Technology, Engineering and Mathematics)

Literatur

Relevant reading material will be announced in the lecture.

Overview

Block	Monday	Topics
01	10-15	Introduction
02	10-22	Structures and Sensors
03	10-29	Actuators, Joints, and Displacements
04	11-05	Kinematics and Displacement Chains
05	11-12	Conventions for Geometry and Kinematics
06	11-19	Representations of Rotations
07	11-26	Mechanisms and Graph Theory
08	12-03	Line Geometry and Screw Theory
09	12-10	Instantaneous Kinematics and Statics
10	12-17	Inverse Kinematics

11	01-07	System Control and Robotics Software
12	01-14	Introduction to Dynamics
13	01-21	Trajectory Generation and Optimal Control
14	01-28	Review
