

# Computational Robot Dynamics

**Unit code:** (filled by Unige administrative office)

**Scientific Disciplinary Sector:** ING-INF/04

**Number of hours:** 12

**Credits:** 4

## AIMS AND CONTENT

### Learning Outcomes (short)

The course covers the fundamentals of computational robot dynamics: dynamic models of robots; inverse, forward and hybrid dynamics; and the process of dynamics simulation.

### Learning Outcomes (further info)

Most dynamics simulation today is performed by specialized 'black-box' simulators that hide the details from the user. Unfortunately, many of these simulators are inaccurate, buggy, or suffer from a variety of limitations. This course provides students with the necessary knowledge to become competent users (and producers) of dynamics software. Topics range from equations of motion through to model-based dynamics algorithms and techniques for accurate and reliable simulation.

### Syllabus/Content

- basic equations of motion
- inverse dynamics, and the idea of a recursive algorithm
- efficient implementation of spatial vector arithmetic
- forward and hybrid dynamics
- dynamic models of robots
- the integration process

**Prerequisites:** It is desirable, but not necessary, that students take the preceding course on spatial vectors. Students who have not taken this course should nevertheless have a basic knowledge of classical Newtonian dynamics (i.e., dynamics using 3D vectors).

## WHO

**Teacher:** Roy Featherstone, roy.featherstone@iit.it

## How

**Teaching Methods**

The course will be taught by means of lectures, class exercises and practical exercises using the software package *spatial\_v2*. Students will need access to Matlab and Simulink in order to run this software. Lecture notes will be provided.

### **Exam Description**

There will be an oral exam based on the lecture material and exercises.

### **Assessment Methods**

The course will be assessed by oral exam only. Students wishing to take the exam must make an appointment with the teacher.

## **WHERE AND WHEN**

### **Lesson Location**

IIT (via Morego).

### **Lesson Schedule**

Four 3-hour sessions in the afternoon from Monday 23rd to Thursday 26th March inclusive.

### **Office hours for students**

The teacher is available at most times and on most days to answer students' questions face-to-face or by email. No appointment is required.

## **CONTACTS**

The teacher's office is located on the 4th floor, IIT Morego, near the toilets. Students can contact him via email: [roy.featherstone@iit.it](mailto:roy.featherstone@iit.it)