SYLLABUS

# Biorobotics 7.5 credits R7017E

## Biorobotik

**Course syllabus admitted: Spring 2024 Sp 3 - Present**

DECISION DATE
**2023-02-15**

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LULEÅ TEKNISKA UNIVERSITET

# Biorobotics 7.5 credits R7017E

## Biorobotik

## Second cycle, R7017E

| Education level | Grade scale | Subject | Subject group (SCB) |
| --- | --- | --- | --- |
| Second cycle | G U 3 4 5 | Reglerteknik | Automation Technology |

### Main field of study

Engineering Physics and Electrical Engineering

# Entry requirements

Knowledge in the subject of Automatic Control, specifically regarding modeling, dynamics, state-space analysis and system control design. Basic knowledge in programming, particularly with MATLAB and Simulink. These prerequisites correspond to the courses Automatic Control (R7003E) and Introduction to Programming (D0009E) or Programming and electronics for cybernetics (D0031E). Mechanical assembly skills is an advantage.
Good knowledge in English equivalent to English 6.
More information about the English language requirements [http://www.ltu.se/edu/bli-student/Application-process/English-language-requirements-1.109316?l=en]

# Selection

The selection is based on 30-285 credits

# Course Aim

By the end of the course, the student should be able to:

- Identify the different levels of bioinspiration in robotics
- Recognize the fundamental principles of walking, flying and swimming robots
- Model and analyse multi-joint systems from a forward and inverse kinematic perspective
- Demonstrate the ability to, in a group, implement and evaluate motion of bioinspired robotic systems

# Contents

This course provides an overview of the area of biorobotics, from a modeling, control, and application perspective. From walking, flying and swimming robots inspired by biology and nature, to humanoid robots and medical robotics for assistance, this course will provide an overview on the various motion and locomotion classifications, while analyzing bioinspired methods for motion control of multi-joint robot mechanisms. '

- Introduction to bio-inspired robotics (walking, climbing, flying robots, bionics, medical robotics etc.).
- Motion analysis and homogeneous transformations.
- Forward and inverse kinematic analysis of multi-joint robots.
- Manipulator Jacobian and velocity kinematics.
- Motion control of bio-inspired robots.

To confirm the theoretical knowledge obtained during the course, project work is performed on simulated or experimental setups.

# Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.

The course will be realized via lectures, tutorials, and project work. The acquired knowledge will be directly applied through simulation or experimental studies on bio-inspired robotic systems. Project tasks will be performed in groups of two students and accounted for with a final written report, accompanied by a demonstration/presentation as stated in the examination.

# Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

The students' progress will be assessed via an examination at the end of the course, which will involve a verbal presentation of the work in its entirety, accompanied by a real-time demonstration of the acquired results. Finally, the students will compile and submit all work performed during the course, including codes, acquired data, data analysis, evaluation results, etc., in the form of multimedia files and a written report.

# Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term “unauthorized aids” refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

# Course offered by

Department of Computer Science, Electrical and Space Engineering

# Modules

| Code | Description | Grade scale | Cr | Status | From period | Title |
| --- | --- | --- | --- | --- | --- | --- |
| 0001 | Project | G U 3 4 5 | 7.5 | Mandatory | S21 | |

# Last revised

by Robert Brännström 2023-02-15

# Syllabus established

by Jonny Johansson, HUL SRT 2020-02-21