

MicroRobotics

Number of ECTS credits: 6

Coefficient: 3

Description :

- Recall of the effects of scale, specificities of the micro-world and main principles of actuation
- Study, modeling and control of piezoelectric systems and related integrated measurement (gauge, self sensing)
- Open loop control of the piezoelectric actuators: compensation of drift, oscillations and hysteresis
- Operating modes (stick slip, inchworm) and microRobotics architectures (digital robot, microRobotics station)
- Study of micromanipulation and micro-assembly
- Modeling of parallel microrobots
- MicroRobotics calibration and identification
- Robotics control techniques at small scales:
- Control referenced sensors (visual servo-control, hybrid force-position control)
 - Control for magnetic micromanipulation
- Prospects / research link: soft Robotics, distributed actuation, electro-active polymers, concentric tubes

Pedagogical objectives:

At the end of this course, the student must be able to:

- choose operating modes and measurements suited to the working environment and microRobotics tasks,
- implementing a control for piezoelectric systems,
- develop a strategy for micromanipulation or microassembly,
- to determine the geometrical and kinematic models of a microRobotics structure from the observation of the latter and to estimate experimentally and numerically the parameters of these models,
- implement the control of a microRobotics structure using a suitable sensor return,
- carry out the contactless manipulation of a magnetic microrobot.

Bibliography: Prerequisite:

Robotics, Micromechatronics

Lectures Hours: 27.5

Tutorials Hours: 13.5

Labs Hours: 16

Knowledge monitoring modalities: 100% continuous assessment

Assessment: exam, reports of labs, presentation of research papers

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