Master of Science in Mechanical Engineering

Micro and Nano Systems

CC5



Contacts



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Track description

Products and systems we deal with on a daily basis are becoming increasingly complex and smart. Think of the automobile industry, robotic applications, medical services, artificial intelligence, communications and the energy sector. The key to this development is miniaturization.

The track in Micro and Nano Systems offers a top-level, future-oriented, multidisciplinary education that builds upon the fundamentals of traditional science and engineering, from physics to materials science, and from mechanical to electronic engineering. The goal of the program is to provide foundations for exploring and developing future technologies through research in materials, processes, design methods, and technologies for micro- and nano-scaled systems. The master's thesis will be developed by making use of microfabrication and other experimental facilities of Polifab, the micro and nanotechnology center of Politecnico di Milano.

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Students will learn how to:

- design, model and control micro and nanosystems accounting for both the multi-physics as well as the coupled electronic circuit
- achieve the optimal trade-off between the electronic domain (power, noise) and the mechanical domain (dynamic range, linearity, bandwidth...)
- master the process technologies needed to produce a reliable micro and nano system
- test micro and nanosystems using the most advanced measuring techniques

CC5: Core Courses

Course Title

Measurements for Micro and Nano Systems

Control of Mechanical Systems

Dynamics of Mechanical Systems

Machine Design

Semiconductor Device Manufacturing

Production Planning and Control for Micro and Nano Production Systems

YEAR	SEM	ECTS	ECTS GROUP
1	1	10	10
1	2	5	5
1	1	5	5
1	2	5	5
1	1	5	5
1	2	5	5

CC5: Track Specific Courses

Course Title

Nonlinear Dynamics and Chaos

Fundamentals of Electronics

Elements of Modern Physics

Micro and Nano Robotics

Advanced Micro and Nanofabricarion Technologies

Elective courses

(Mechanics and Design of Micro Electro Mechanical Systems, Biochip, Analog Electronic Design, Digital Electronic Design, Micro Electronical Systems (electronics), Integrated Optics, Nano-optics, Physics of Semiconductors, Physics of Nanostructures, Mechan Small Scale, Surface Treatment for Engineering Applications, Materials for Electronics, Micromechanics, Multi-Physics Modelling ar ...)

Lab course

(Multi-Disciplinary Design Laboratory)

	YEAR	SEM	ECTS	ECTS GROUP
	1	2	5	5
	1	2	10	10
	1	1	10	10
	2	1	5	5
	2	1	5	5
ectro ical Testing at nd Simulation,	2	1-2	5	25
	2	2	5	5

CC5: Master's Thesis

Optimization of microgripper design Minimum quadrature MEMS gyroscopes



Compliant mechanisms for MEMS actuators



CC5: Master's Thesis

Nonlinear model order reduction techniques MEMS multiphysics topology optimization



Casimir effect