

22784 Modeling and fabrication of Micro Mechanical Systems

Credit points: 2.5

Hours: lecture: 2, tutorial: 1

Prerequisites: 22310 Solid mechanics 2, 11182 Physics 2

Corequisites: None

Course Objectives

The course is an introduction course to the field of micro mechanical systems (also known as Micro Electro Mechanical Systems-MEMS). The micro scale dimension (1 micron = 10^{-6} m) and the potential of fabricating mechanical and electronic components on the same substrate characterize micro systems. The aim of the course is to expose the student to the field of modeling and fabrication of micro mechanical systems (MEMS). The course deals with applying engineering principles in order to obtain the desired mechanical and other physical properties of micro systems. The Course will consider the following subjects: Int. to modeling and fabrication of micro systems. Micro beams and mechanical springs that determines the mechanical stiffness of micro systems. Electrostatic Micro sensors and micro actuators. Piezo-electric and Piezo-resistive micro sensors and actuators. Micro thermal sensors and actuators. Micro fabrications processes such as: lithography, Metal deposition and physical or chemical etching.

Course Structure

The student will be requested to carry out a literature survey on a certain micro system which has to do with one of the topics of the course. This literature survey will be presented at the class by the student in a twenty-minute talk as is customary in scientific conferences. The last two lectures will be dedicated to these seminars. Attendance at the seminars is mandatory.

Grading

Final Exam – 70%

Home works – 30%

Course Contents

1. Int. to modeling and fabrication of micro systems.
2. Micro beams and mechanical springs that determines the mechanical stiffness of micro systems.
3. Electrostatic Micro sensors and micro actuator.
4. Piezo-electric and Piezo-resistive micro sensors and actuator.
5. Micro thermal sensors and actuators.
6. Micro fabrications processes: Lithography, Metal deposition and etching.

Bibliography

Textbook:

1. Chang Liu, Foundations of MEMS, Second Edition, Pearson Education Limited, 2011.

Recommended texts:

1. Sergey Edward Lyshevski, Nano- and Micro- Electromechanical Systems, Second Edition, CRC Press, 2005.

After studying Advanced Materials Engineering, the student should be able to:

	Learning Objective
1	Recognize advanced topics of micro systems.
2	Apply engineering principles to the solution of engineering problems.
3	Estimate the influence of various geometry and material parameters on the mechanical properties of micro systems.
4	Review, inquire and interpret research techniques and operations while dealing with a research problem.
5	Present a research problem and its investigation process.

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