University Of California, Berkeley
Department of Mechanical Engineering

ME 119: Introduction to MEMS (Microelectromechanical Systems) (3 units)

Undergraduate Elective

Syllabus

CATALOG DESCRIPTION

Fundamentals of microelectromechanical systems including design, fabrication of microstructures; surface-micromachining, bulk-micromachining, LIGA, and other micro machining processes; fabrication principles of integrated circuit device and their applications for making MEMS devices; high-aspect-ratio microstructures; scaling issues in the micro scale (heat transfer, fluid mechanics and solid mechanics); device design, analysis, and mask layout.

COURSE PREREQUISITES

EE 16A or EE 40, and Physics 7B.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

R.C. Jaeger, "Introduction to Microelectronics Fabrication," 2nd edition, Addison-Wesley, 2000.

COURSE OBJECTIVES

The course aims to provide basic understanding of micromachining processes, including surface micromachining, bulk micromachining and LIGA. Students should learn the design and fabrication aspects of MEMS by using computer-aided-design tools to design and draw their own microstructures.

DESIRED COURSE OUTCOMES

Students should be able to design micro-machining process flows by using fundamental skills learned in the class and combine with knowledge from other courses to construct their own micro-machines. Students completing this course will have: The ability to identify, formulate, and solve problems relating to MEMs manufacturing; The ability to apply mathematics, basic science, and engineering science to the solution of MEMs manufacturing problems; The ability to design a component and select a fabrication process or sequence of processes suitable for production of a MEMs device; The ability to interpret the results of engineering investigations.

TOPICS COVERED

Lithography, oxidation, diffusion, thin-film deposition, ion implantation, surface micromachining, bulk micromachining, LIGA, wafer bonding, CAD tools.

CLASS/LABORATORY SCHEDULE

Three hours of lecture per week.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

The course provides basic overviews of IC manufacturing and MEMS fabrication. Students should be able to work in either IC or MEMS industry with basic knowledge after taking this course.

RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

An ability to apply knowledge of mathematics, science, and engineering; an ability to design a system, component, or process to meet desired needs; an ability to identify, formulate, and solve engineering problems; a recognition of the need for, and an ability to engage in life-long learning; a knowledge of contemporary issues; an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

The course requires a final design project in which students will need to demonstrate their knowledge and skills learned from this course.

PERSON(S) WHO PREPARED THIS DESCRIPTION: Liwei Lin