Ph.D. Qualifying Exam: Micromaching

Department of Mechanical Engineering University of Utah

Exam Description:

This qualifying exam will test the student's graduate-level knowledge of Micromaching. The reference textbooks and course material that serve as a basis for this exam are taken from ME EN 6050 and ME EN 6055. The exam is focused on testing the fundamental concepts appropriate to the field of Micromaching. Students may be asked to provide a physicochemical explanation of various micromachining techniques. Students are expected to be comfortable designing and fabricating classical microsensors and microactuators. Knowledge of working principle of basic semiconductor devices (e.g. pn-junction, MOSFET), and classical microsensors and actuators such as pressure sensors, accelerometers, and gyrosensors may also be tested. Basic concepts of sequential microfabrication processes will also be assumed.

Recommended References:

R. C. Jaeger, *Introduction to Microelectronic Fabrication*, 2nd Edition, Prentice Hall, New Jersey, 2002. ISBN 0-201-44494-7

Tai-Ran Hsu, *MEMS and Microsystems: Design and Manufacturer*, 2nd edition, ISBN: 978-0-470-08301-7

Exam Materials:

An equation sheet will be provided to students for their preparation before the exam. The same sheet will be provided with the exam. Students may bring a department issued calculator. No other materials will be allowed during the exam.

Topics:

The following table provides a list of topics that could be asked on the exam, along with the corresponding sections in the reference textbooks.

Subject	Jaeger, 2nd Ed.	Hsu, 2nd Ed.
Fundamental science for microfabrication	Ch. 2-6; 8, 11	Ch 3
Fundamental engineering for microfabrication		Ch 4,6
Microfabrication process		Ch 8
Working principle of MEMS		Ch2
Basic concept of microsystem design		Ch 4,10