



# Ph.D. Qualifying Exam: Micromaching

Department of Mechanical Engineering University of Utah

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## Exam Description:

This qualifying exam will test the student's graduate-level knowledge of Micromaching. 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:

J. D. Plummer and P. B. Griffin, *Integrated Circuit Fabrication*, 1st Edition, Cambridge University Press, Cambridge, UK, 2024.

Tai-Ran Hsu, *MEMS and Microsystems: Design and Manufacturer*, 2<sup>nd</sup> 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	Plummer & Griffin	Hsu, 2nd Ed.
Fundamental science for microfabrication	Ch. 1, 3-10	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