MECH9650

Introduction to Micro Electromechanical Systems (MEMS)

Contents

1.

Contact details for course convener

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All consultations are by appointment only

2.

Location and Times

- Thursday 1800-2100, Ainsworth Building 102 (K-J17-102)

Credit Points:

This is a 6 unit-of-credit (UoC) course, and involves 3 hours per week (h/w) of face-to-face contact.

The UNSW website states “The normal workload expectations of a student are

Aims of the Course

This course introduces the fundamentals of Micro Electromechanical systems (MEMS) and its applications in a wide range of devices and systems, as well as the design and simulation of these systems. MEMS is an enabling technology which has been penetrated into and begun to change the way major discipline do things, including biotechnology, storage technology, instrumentation, optical communications, telecommunications, MEMS device

3. [illegible]

Ideas and skills are first introduced and demonstrated in lectures, and then students develop these skills by applying them to specific tasks through various assignments.

The lectures, delivered in class, will cover a range of Micro and Nano engineering topics. We will discuss about various techniques and approaches for fabrication of micro and nano systems (e.g., surface/bulk micromachining, MEMS materials, bonding processes, packaging, advanced wet/dry etching process, etc.). Computing skills are developed and practiced in regular computer laboratory sessions. This will give students proficiency in using the commercial packages such as ANSYS, COMSOL and FLUENT.

This course has a major focus on research, inquiry and analytical thinking as well as information literacy. We will also explore capacity and motivation for intellectual development through the solution of both simple and complex mathematical models of problems arising in engineering, and the interpretation and communication of the results.

4. [illegible]

MECH9650 Introduction to Micro Electromechanical Systems (MEMS)		
Week	Lecture (2 Hr.)	Problem solving (1 Hr.)
1	Introduction to MEMS/NEMS, BioMEMS and Biotechnology	-
2	Fundamental of MEMS fabrication **I** (Surface/Bulk micromachining, Soft-lithography, Process integration, LIGA, etc.)	Case studies
3	Fundamental of MEMS fabrication **II** (Packaging, characterization, Automation, etc.)	*Homework # 1 to be released*

8	Mechanics properties of materials and 3D Printing	
9	Micro and Biosensors (Basics and applications)	-
10	BioMEMS	Case studies (submission of group project #1 report, Wednesday 14 Oct 2015)
11	Group project presentation # 1	
12	Group project presentation # 2	
13	Q&A (before final exam)	Feedback on Group assignments *Group project# 2 submission due on Friday, 29 Oct 2015*

5.

General

Many practical problems in Engineering require use of a computer software package, and student skills in software use applied to relevant problems are rewarded by the laboratory participation component of the overall grade. The final exam will assess student mastery of the material covered in the lectures and laboratory classes.

Final grades may be adjusted by scaling with the approval of the appropriate departmental meeting.

Assessment task	**Weight**	**Due date and time**	**Learning outcomes assessed**
Homework # 1	5%	due Week 4 (Friday, 21 August) in email	1,2
Homework # 2	5%	due Week 9 (Friday, 25 September) in email	1,2

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Project Presentation

All submissions should have a standard School cover sheet available on the School website at www.engineering.unsw.edu.au/mechanical

Examination

There will be one two-hour examination at the end of the session.

You will need to provide your own calculator, of a make and model approved by UNSW, for the examination. The list of approved calculators is shown at https://student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an "Approved" sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

6. [illegible]

Main Text **:**

Lecture notes will be provided via Moodle

Additional Reading:

- SD Senturia, Microsystems Design Book
- Marc Madou, Fundamentals of Microfabrication: The Science of Book Miniturization.
- Nguyen N.T., Wereley S., 2006, Fundamentals and Applications of Microfluidics, Second Edition, Artech House, Boston, London.

7. [illegible]

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at*

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge within the discipline