

# NEMS 510000 Micro & Nano Technology

(微奈米科技)

Fall 2022

Assoc. Prof. Chihchen Chen, Office: Delta R311, TEL: 5162403, [chihchen@mx.nthu.edu.tw](mailto:chihchen@mx.nthu.edu.tw)

Prof. Mei-Feng Lai, Office: Eng. I R525, TEL: 5715131~33998, [mflai@mx.nthu.edu.tw](mailto:mflai@mx.nthu.edu.tw)

Assist. Prof. Kyojiro Morikawa, Office: Delta R316, TEL: 5715131~43052, [morikawa@pme.nthu.edu.tw](mailto:morikawa@pme.nthu.edu.tw)

**Credits:** 3 (MS requirement)

**Schedule:** F2, F3, and F4

**Office Hour:** Make an appointment

**Room:** [Eng. I, Room 201](#)

This course will teach all technology for microsystem and nanoengineering, including microfabrication, sensing and actuation technique, and MEMS packaging. The applications for MEMS, Optical MEMS, RF MEMS, and BioMEMS, will be introduced. The future hot research topics for nanotechnology will also be shown.

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|---|------------------|
| 1. Introduction (Ch1) HW1   | (09/16) Chen     |
| 2. Scaling Effect   | (09/23) Chen     |
| 3. Introduction to Microfabrication (Ch2, <a href="#">Video</a> ) HW2 | (09/30) Chen     |
| 4. Bulk Micromachining (Ch10) HW3                                     | (10/07) Lai      |
| 5. Surface Micromachining (Ch11)                                      | (10/14) Lai      |
| 6. CMOS MEMS and Magnetic MEMS  | (10/21) Lai      |
| 7. Sensors and Actuators (CH4-9) HW5                                  | (10/28) Lai      |
| 8. Polymer MEMS Fabrication HW4                                       | (11/04) Chen     |
| 9. BioMEMS  | (11/11) Chen     |
| 10. Optical MEMS (Ch 15)  | (11/18) Lai      |
| <b>Midterm</b>  | (11/25)          |
| 11. Introduction to Nanotechnologies                                  | (12/02) Morikawa |
| 12. Nanofluidics  | (12/09) Morikawa |
| 13. Nanoelectronics   | (12/16) Morikawa |
| 14. Nano-Mechanics and Nano-energy                                    | (12/23) Morikawa |
| 15. Bionanotechnology   | (12/30) Morikawa |
| 16. TBD/backup week   |                  |

**Final Written Report Due** (01/13)

**Grades:** Homework 30% (no late), Midterm 35%,

Term project 35% (Oral Presentation 15%/Written Report 10%/Contribution 10%)

**Text book:**

1. Course handout

**Reference Books:**

1. "Foundations of MEMS", Chang Liu, Pearson Education, Inc. 2006.

2. “MEMS and Microsystems: design, manufacture, and nanoscale engineering,” 2nd Edition, by Tai-Ran Hsu, John Wiley & Sons, Inc., Hoboken, New Jersey, 2008.
3. “Fundamentals of Microfabrication”, Marc Madou, 2nd edition, CRC press, 2001.

**Notes for the term project (35%; Oral 15%, Written 10%, Contribution 10%)**

1. Term project will be undergone with teamwork. Each team consists of 5-7 members.
2. **Each team will present a certain topic in class in English (Oral Presentation 15%).** Seven topics are listed as followings. The topic for each team is assigned by the instructor. Evaluation will be made by the whole class.
3. Each team is required to read, at least five journal references, for the final written report (10%).
4. The contribution (10%) includes asking questions, participating in discussion, giving comments, and rating the oral presentation, ... etc., but not limited to the above mentioned.
5. Please upload the final written report to the eclass platform before **01/13/2023** midnight (one team, one report). Regarding to the report format, **please follow IEEE MEMS conference format** with a four-page report. Copy/Paste from any other's works including published or non-published ones will be regarded as plagiarism, and may result in an extremely low grade.

Topics and contents for “Oral Presentation” in class are listed below:

1. Lecture 12: Nanofluidics for Group 1 and Group 2
2. Lecture 13: Nanoelectronics for Group 3 and Group 4
3. Lecture 14: Nanomechanics Group 5 and Group 6
4. Lecture 15: Bionanotechnology for Group7

**TA information**

Jeff Kung (孔則皓)

General Building II, Room 808 Ext:33977

Email: [je88ff23@gmail.com](mailto:je88ff23@gmail.com)