

**City University of Hong Kong  
Course Syllabus**

**offered by  
Department of Mechanical Engineering  
with effect from Semester A 2022 / 23**

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**Part I Course Overview**

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| <b>Course Title:</b>   | <u>Nano-manufacturing</u>                         |
| <b>Course Code:</b>  | <u>MNE6046</u>                                    |
| <b>Course Duration:</b>                                      | <u>1 semester</u>                                 |
| <b>Credit Units:</b>   | <u>3 credits</u>                                  |
| <b>Level:</b>  | <u>P6</u>   |
| <b>Medium of Instruction:</b>                                | <u>English</u>                                    |
| <b>Medium of Assessment:</b>                                 | <u>English</u>                                    |
| <b>Prerequisites:</b><br><i>(Course Code and Title)</i>      | <u>Nil</u>  |
| <b>Precursors:</b><br><i>(Course Code and Title)</i>         | <u>Nil</u>  |
| <b>Equivalent Courses:</b><br><i>(Course Code and Title)</i> | <u>MBE6046/MBE8104/MNE8104 Nano-manufacturing</u> |
| <b>Exclusive Courses:</b><br><i>(Course Code and Title)</i>  | <u>Nil</u>  |

## Part II Course Details

### 1. Abstract

More than \$2 trillion/year by 2020 in new technologies and products and 2 million jobs have been projected by nanotechnology. Nanomanufacturing is crucial to bring nanotechnology out of the laboratory into the factory for commercial scale-up and applications. This course aims to introduce the modern multidisciplinary nanomanufacturing to the students and get them prepared for the new industrial revolution led by rapid progresses in nanotechnology. It covers important topics in nanomanufacturing such as top-down and bottom-up manufacturing, reliability and defect control, and many key issues on how to conduct nanomanufacturing today and overcome its many technical barriers. Moreover, this course will also promote discovery learning through Web 2.0.

### 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

| No. | CILOs  | Weighting<br>(if applicable) | Discovery-enriched curriculum related learning outcomes (please tick where appropriate) |    |    |
|-----|--|------------------------------|---|----|----|
|     |  |                              | A1  | A2 | A3 |
| 1.  | <b>Describe</b> the basic knowledge of nanotechnology and nanomanufacturing.                           |                              |   | ✓  |    |
| 2.  | <b>Explain</b> the main techniques and processes of nanomanufacturing.                                 |                              |   | ✓  |    |
| 3.  | <b>Apply</b> nanomanufacturing techniques to perform synthesis and characterization of nanowires/rods. |                              |   | ✓  | ✓  |
| 4.  | <b>Discover</b> interesting application(s) of the synthesized nanowires/rods.                          |                              | ✓   | ✓  | ✓  |
|     |  | N.A.                         |   |    |    |

A1: Attitude

*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*

A2: Ability

*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.*

A3: Accomplishments

*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

| TLA                 | Brief Description   | CILO No. |   |   |   | Hours/week (if applicable) |
|---------------------|---|----------|---|---|---|----------------------------|
|                     |   | 1        | 2 | 3 | 4 |                            |
| Lecture             | Lectures on the topics of the keyword syllabus; promoting discovery learning through Web 2.0. | ✓        | ✓ | ✓ | ✓ | 26 hrs                     |
| Laboratory/Tutorial | Lab experiment projects and tutorial classes; promoting discovery learning through Web 2.0.   |          | ✓ | ✓ | ✓ | 13 hrs                     |

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

| Assessment Tasks/Activities          | CILO No. |   |   |   | Weighting | Remarks  |
|--------------------------------------|----------|---|---|---|-----------|--|
|                                      | 1        | 2 | 3 | 4 |           |  |
| Continuous Assessment: 50%           |          |   |   |   |           |  |
| Test                                 | ✓        | ✓ |   |   | 20%       | 20% Marks, 1 hour.   |
| Labs & Discovery Learning            |          |   | ✓ | ✓ | 30%       | 30% marks; students' performance in on hand lab experiments. |
| Examination: 50% (duration: 2 hours) |          |   |   |   |           | 50% Marks, 2 hours.  |
|                                      |          |   |   |   | 100%      |  |

**For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.**

## 5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

| Assessment Task              | Criterion  | Excellent<br>(A+, A, A-) | Good<br>(B+, B) | Marginal<br>(B-, C+, C) | Failure<br>(F)                    |
|------------------------------|--|--------------------------|-----------------|-------------------------|-----------------------------------|
| 1. Examination               | Answer the questions correctly and properly.                             | High                     | Significant     | Moderate                | Not even reaching marginal levels |
| 2. Test                      | Answer the questions correctly and properly.                             | High                     | Significant     | Moderate                | Not even reaching marginal levels |
| 3. Labs & Discovery Learning | Perform the labs successfully and demonstrate discovery during learning. | High                     | Significant     | Moderate                | Not even reaching marginal levels |

Applicable to students admitted before Semester A 2022/23

| Assessment Task              | Criterion  | Excellent<br>(A+, A, A-) | Good<br>(B+, B, B-) | Fair<br>(C+, C, C-) | Marginal<br>(D) | Failure<br>(F)                    |
|------------------------------|--|--------------------------|---------------------|---------------------|-----------------|-----------------------------------|
| 1. Examination               | Answer the questions correctly and properly.                             | High                     | Significant         | Moderate            | Basic           | Not even reaching marginal levels |
| 2. Test                      | Answer the questions correctly and properly.                             | High                     | Significant         | Moderate            | Basic           | Not even reaching marginal levels |
| 3. Labs & Discovery Learning | Perform the labs successfully and demonstrate discovery during learning. | High                     | Significant         | Moderate            | Basic           | Not even reaching marginal levels |

### **Part III Other Information** (more details can be provided separately in the teaching plan)

#### **1. Keyword Syllabus**

*(An indication of the key topics of the course.)*

Background to nanotechnology and nanomanufacturing, top-down approach, bottom-up approach, combined top-down and bottom-up nanomanufacturing approaches, registration and alignment, reliability and defect control, nanomanufacturing industry survey, leaving the laboratory: regulatory and societal issues confronting nanotechnology commercialization.

#### **2. Reading List**

##### **2.1 Compulsory Readings**

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

##### **2.2 Additional Readings**

*(Additional references for students to learn to expand their knowledge about the subject.)*

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| 1. | Editors: Zhaoying Zhou, Zhonglin Wang, Liwei Lin (Eds.), “Microsystems and Nanotechnology”, Springer, 2012, ISBN: 978-3-642-18293-8 |
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#### **Online Resources**

Online learning material is provided via University computer network.