MNE8104: NANO-MANUFACTURING

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Nano-manufacturing

Subject Code
MNE - Mechanical Engineering
Course Number
8104

Academic Unit
Mechanical Engineering (MNE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
MNE6046 Nano-manufacturing

Exclusive Courses
Nil

Part II Course Details

Abstract
More than $2 trillion/year by 2030 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.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic knowledge of nanotechnology and nanomanufacturing.	10		x	x
2	Explain the main techniques and processes of nanomanufacturing.	40		x	x
3	Apply nanomanufacturing techniques to perform synthesis and characterization of nanowires/rods.	25		x	x
4	Discover interesting application(s) of the synthesized nanowires/rods.	25	x	x	x

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 real-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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures on the topics of the keyword syllabus and promote discovery learning through Web 2.0.	1, 2, 3, 4	26 hours
2	Laboratory/ Tutorial	Students will engage in lab experiment projects and tutorial classes and promote discovery learning through Web 2.0.	2, 3, 4	13 hours

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Test	1, 2	20	20% marks, 1.5 hours.	No

2	Labs & Discovery Learning	3, 4	30	30% marks; students' performance in on hand lab experiments and group presentation.	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

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

Assessment Rubrics (AR)

Assessment Task

Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Apply the concepts of nano-manufacturing to solve problems and answer the questions correctly and properly.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Labs & Discovery Learning (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to explain the methodology and procedure analyse the experimental data, discuss the experimental findings, and demonstrate discovery during learning.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Describe the fundamental concepts of nano-manufacturing, and apply them to solve the problems and answer the questions correctly and properly.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Apply the concepts of nano-manufacturing to solve problems and answer the questions correctly and properly.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Labs & Discovery Learning (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to explain the methodology and procedure, analyse the experimental data, discuss the experimental findings, and demonstrate discovery during learning.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Describe the fundamental concepts of nano-manufacturing, and apply them to solve the problems and answer the questions correctly and properly.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Background to nanotechnology and nanomanufacturing, top-down and bottom-up approaches, self-assembly, soft and nanoimprint lithography technologies, reliability and defect control, leaving the laboratory: regulatory and societal issues confronting nanotechnology commercialization.

Reading List

Compulsory Readings

	Title
1	N.A.

Additional Readings

	Title
1	Editors: Zhaoying Zhou, Zhonglin Wang, Liwei Lin (Eds), “Microsystems and Nanotechnology”, Springer, 2012, ISBN: 978-3-642-18293-8