MNE6129: SUSTAINABLE ENGINEERING PRACTICE

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Sustainable Engineering Practice

Subject Code
MNE - Mechanical Engineering
Course Number
6129

Academic Unit
Mechanical Engineering (MNE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to equip students with the quintessential experimental skills and further practical appreciation on the various sustainable engineering technologies. Being an experimental-based course, the course will also impart key skills in data collection and critical analysis of experimental data to good practice in report writing. Through this course, students will grow appreciation in bridging theoretical knowledge with experimental practice.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply the theory of thermodynamics and heat transfer, to systems of energy efficiencies, for instance refrigeration cycle and heat exchanger design; collect and analyze relevant experimental data; apply good practice in report writing.			x	
2	Apply the theory of renewable energy conversion systems, such as photovoltaic solar cells, fuel cells and biofuel conversion; collect and analyze relevant experimental data; apply good practice in report writing.			x	
3	Apply the theory of environmental abatement techniques in air and wastewater purification; collect and analyze relevant experimental data; apply good practice in report writing.			x	
4	Apply good practice in verbal presentation of experimental findings.			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	Explain key concepts and principles behind each experimental module.	1, 2, 3	1 hr/week
2	Lab-based experiment and oral presentation	Hands-on lab session to acquire and analyze data; present experimental findings.	1, 2, 3, 4	2 hrs/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Lab report	1, 2, 3	85	
2	Oral presentation	4	15	

Continuous Assessment (%)

100

Additional Information for ATs

To pass a course, a student must do the following:
Obtain at least 30% of the total marks allocated to each coursework component of lab reports and oral presentation.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Ability to explain the methodology and procedure and analyze the experimental data and discuss the experimental findings.

Excellent

(A+, A, A-) Strong evidence of critical thinking; good organization, capacity to analyze and synthesize; superior grasp of subject matter; evidence of extensive knowledge of the experimental matters concerned.

Good

(B+, B, B-) Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with experiment.

Fair

(C+, C, C-) Student who is profiting from the laboratory class; understanding of the subject; ability to develop solutions to concerning the experiment.

Marginal

(D) Sufficient familiarity with the laboratory content to enable the student to move onto other laboratory materials.

Failure

(F) Little evidence of familiarity with the laboratory class materials; weakness in critical and analytic skills; limited, or irrelevant use of data.

Assessment Task

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

Criterion

Ability to orally present the key information related to the experiments.

Excellent

(A+, A, A-) Strong ability to orally present the key information related to the experiments.

Good

(B+, B, B-) Good ability to orally present the key information related to the experiments.

Fair

(C+, C, C-) Some ability to orally present the key information related to the experiments.

Marginal

(D) Marginal ability to orally present the key information related to the experiments.

Failure

(F) Not even reaching marginal levels.

Assessment Task

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

Criterion

Ability to explain the methodology and procedure and analyze the experimental data and discuss the experimental findings.

Excellent

(A+, A, A-) Strong evidence of critical thinking; good organization, capacity to analyze and synthesize; superior grasp of subject matter; evidence of extensive knowledge of the experimental matters concerned.

Good

(B+, B) Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with experiment.

Marginal

(B-, C+, C) Student who is profiting from the laboratory class; understanding of the subject; ability to develop solutions to concerning the experiment.

Failure

(F) Little evidence of familiarity with the laboratory class materials; weakness in critical and analytic skills; limited, or irrelevant use of data.

Assessment Task

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

Criterion

Ability to orally present the key information related to the experiments.

Excellent

(A+, A, A-) Strong ability to orally present the key information related to the experiments.

Good

(B+, B) Good ability to orally present the key information related to the experiments.

Marginal

(B-, C+, C) Some ability to orally present the key information related to the experiments.

Failure

(F) Not even reaching marginal levels.

Part III Other Information

Keyword Syllabus

Energy efficiency:
Refrigeration cycle
Heat exchanger design

Renewable energy conversion:
Solar cells assembly and assessment
Fuel cells assembly and assessment
Waste to biofuel conversion

Environmental abatement
Advanced oxidation techniques
Treatment of wastewater

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Cengel, Y.A., Boles, M.A., Thermodynamics: An Engineering Approach, McGraw-Hill, 2006.
2	Incropera, F.P., DeWitt, D.P., Bergman, T.L., Lavine, A.S., Fundamentals of heat and mass trasnfer, John Wiley & Sons, New York, 2011.
3	Hagfeldt, A., Boschloo, G., Sun, L., Kloo, L., Pettersson, H., Dye-sensitized solar cells, Chem. Rev. 2010, 110, 6595.
4	O' Hayre, R., Cha, S.-W., Colella, W., Prinz, F.B., Fuel Cell Fundamentals, John Wiley and Sons, New York 2006.
5	Tchobanoglous, G., Burton F., David Stensel, H., Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw-Hill, 2002.
6	Burch, R., Knowledge and know-how in emission control for mobile applications, Catal. Rev.-Sci. Eng. 2004, 46, 271.