Course Syllabus

offered by School of Energy and Environment
with effect from Semester B 2022/23

Part I Course Overview

Course Title:	Experimental Techniques in Energy and Environment
Course Code:	SEE8126
Course Duration:	One semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites:	Nil
Precursors:	SEE 6101 Energy Generation and Storage Systems
Equivalent Courses:	SEE6119 Experimental Techniques in Energy and Environment
Exclusive Courses:	Nil

Part II Course Details

1. Abstract

The course aims to equip students with the experimental skills and further practical appreciation on the various energy and environmental technologies. Being an experimental-based course, the course will also impart essential skills in data collection, 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.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*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 analyse relevant experimental data; apply good practice in report writing.	25%		✓	
2.	Apply the theory of renewable energy conversion systems, such as photovoltaic solar cells, fuel cells and biofuel conversion; collect and analyse relevant experimental data; apply good practice in report writing.	25%		✓	
3.	Apply the theory of environmental abatement techniques in air and wastewater purification; collect and analyse relevant experimental data; apply good practice in report writing.	25%		✓	
4.	Apply good practice in verbal presentation of experimental findings.	25%		✓	
		100%			

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)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Explain key concepts and principles behind each experimental module	✓	✓	✓		0.5 hr/week
Lab-based experiment and oral presentation	Hands-on lab session to acquire and analyze data; present experimental findings	✓	✓	✓	✓	2.5 hr/week

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: 100%						
Lab report, lab quiz	✓	✓	✓		85%	
Oral presentation				✓	15%	
Examination: 0% (duration: N/A , if applicable)						
					100%	

To pass a course, a student must do ALL of the following:

1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Grading of Student Achievement.

5. Assessment Rubrics

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

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Lab report, lab quiz	Ability to understand the objectives of the experiments, set up the experiments, acquire and analyze data, and draw conclusions based on the findings	High	Significant	Moderate to Basic	Not even reaching marginal levels
2. Oral presentation	Ability to orally present the key information related to the experiments	High	Significant	Moderate to Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Adequate (C+, C, C-)	Marginal (D)	Failure (F)
1. Lab report, lab quiz	Ability to understand the objectives of the experiments, set up the experiments, acquire and analyze data, and draw conclusions based on the findings	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Oral presentation	Ability to orally present the key information related to the experiments	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information

1. Keyword Syllabus

Energy efficiencies:
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 in wastewater treatment
Treatment of wastewater

2. Reading List

2.1 Compulsory Readings

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.

2.2 Additional Readings

Nil