SEE8126 Experimental Techniques in Energy and Environment

Course Title:	Experimental Techniques in Energy and Environment
Course Code:	SEE8126
Course Duration:	One semester
No. of Credit Units:	3
Level:	R8
Medium of Instruction:	English
Prerequisites:	N/A
Precursors:	SEE 6101: Energy Generation and Storage Systems SEE 6102: Energy Efficiency and Conservation Technologies
Equivalent Courses:	SEE6119 Experimental Techniques in Energy and Environment
Exclusive Courses:	Nil

Course Aims:

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.

Course Intended Learning Outcomes (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)

Upon successful completion of this course, students should be able to:

No	CILOs	Level of Importance
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.	1
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.	1
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.	1
4	Apply good practice in verbal presentation of experimental findings.	1

Teaching and Learning Activities (TLAs)

(designed to facilitate students' achievement of the CILOs)

CILO No.	TLAs	Hours/week (if applicable)
CILO 1	Lab-based experiment; Tutorials	3
CILO 2	Lab-based experiment; Tutorials	3
CILO 3	Lab-based experiment; Tutorials	3
CILO 4	Tutorials; oral presentation	3

Assessment Tasks/Activities
(designed to assess how well the students achieve the CILOs)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILO 1	Lab report, Lab quiz	25%	
CILO 2	Lab report, Lab quiz	25%	
CILO 3	Lab report, Lab quiz	25%	
CILO 4	Oral presentation	25%	

Coursework: 100%

Grading of Student Achievement:

Refer to Grading of Courses in the Academic Regulations (Attachment) and to the Explanatory Notes.

Grade A
The student completes all assigned experiments and demonstrates excellent understanding of the scientific principles and in conducting experiments. He/she can thoroughly identify and explain how the theories and principles are applied to practical systems. The student's work shows strong evidence of critical analysis of experimental data, supported by a variety of properly documented information sources. He/she is able to communicate ideas effectively and persuasively via written lab reports and oral presentation.

Grade B
The student completes all assigned experiments and demonstrates good understanding of the scientific principles and in conducting experiments. He/she provides a detailed evaluation of how the theories and principles are applied to practical systems. He/she demonstrates good ability in critical analysis of experimental data, supported by a variety of properly documented information sources. He/she is able to communicate ideas clearly via written lab reports and oral presentation.

Grade C
The student completes all assigned experiments and demonstrates reasonable understanding of the scientific principles and in conducting experiments. He/she provides a reasonable evaluation of how the theories and principles are applied to practical systems. He/she demonstrates some ability in critical analysis of experimental data, supported by a variety of properly documented information sources. He/she is able to communicate ideas via written lab reports and oral

presentation.

Grade D
The student completes all assigned experiments and demonstrates simple understanding of the scientific principles and in conducting experiments. He/she provides a simple evaluation of how the theories and principles are applied to practical systems. He/she demonstrates reasonable analysis of experimental data, supported by reasonable amount of documented information sources. He/she is able to communicate simple ideas via written lab reports and oral presentation.

Grade F
The student fails to complete all assigned experiments and/or unable to understand the scientific principles, whilst demonstrating poor ability in conducting experiments. He/she fails to provide evaluation of how the theories and principles are applied to practical systems. He/she fails to provide reasonable analysis of experimental data. He/she is unable to communicate simple ideas via written lab reports and oral presentation.

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
Automobile gas purification technologies

Recommended Reading:

Cengel, Y.A., Boles, M.A., Thermodynamics: An Engineering Approach, McGraw-Hill, 2006.

Incropera, F.P., DeWitt, D.P., Bergman, T.L., Lavine, A.S., Fundamentals of heat and mass trasnfer, John Wiley & Sons, New York, 2011.

Hagfeldt, A., Boschloo, G., Sun, L., Kloo, L., Pettersson, H., Dye-sensitized solar cells, Chem. Rev. 2010, 110, 6595.

O'Hayre, R., Cha, S.-W., Colella, W., Prinz, F.B., Fuel Cell Fundamentals, John Wiley and Sons, New York, 2006.

Tchobanoglous, G., Burton, F., David Stensel, H., Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw-Hill, 2002.

Burch, R., Knowledge and know-how in emission control for mobile applications, Catal. Rev.-Sci. Eng., 2004, 46, 271.