

Course Syllabus

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

Part I Course Overview

Course Title: Energy Efficiency and Conservation Technologies

Course Code: SEE8112

Course Duration: One semester

Credit Units: 3

Level: R8

Medium of Instruction: English

Medium of Assessment: English

Prerequisites: Nil

Precursors: Nil

Equivalent Courses: SEE6102 Energy Efficiency and Conservation Technologies

Exclusive Courses: Nil

Part II Course Details

1. Abstract

This course aims to teach students the physics and engineering knowledge on energy usage and energy efficiency, especially for building and transportation systems. Operating principles of power transmission and distribution, motors, heating, ventilation and air-conditioning (HVAC), lighting, humidity control, transportation etc. will be taught in class. Advanced energy efficient systems and technologies will be described. Methods to reduce energy consumption will be introduced.

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.	Solve problems on power transmission, lighting, heat transfer and humidity control	30	√	√	√
2.	Analyze energy use in building systems	40		√	√
3.	Analyze energy use in transportation systems	10		√	
4.	Explore and evaluate advanced and innovative energy-efficient systems and technologies	20	√	√	√
		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	5	
1	Lectures to explain key concepts and theories related to energy usage and conservation technologies including thermodynamics, heat transfer, psychrometrics, motors, etc.	√	√	√	√		2 hrs/wk
2	In-class demonstrations of systems such as air-conditioner, dehumidifier, lighting etc. to show the students how the principles are applied in real life and to solidify students' concepts with practice	√	√	√	√		0.5 hr/wk

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: <u>70%</u>							
Assignment Homework with both technical and open-ended problems will be given regularly to help the students consolidate the concepts learned in class and also to explore how the principles are applied in our daily life	√	√	√	√		30%	
In-class test/quiz Problems are given to students to solve to demonstrate their understanding of the concepts	√	√		√		25%	
Class project A hands-on project on energy usage where the students will be asked to design based on the concepts learned in class to demonstrate their understanding	√	√				15%	
Examination: <u>30%</u> (duration: 2 hours , 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. Assignment	Ability to analyse and solve practical problems related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem
2. In-class test/quiz	Ability to analyse and solve questions related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem
3. Class project	Ability to formulate, implement and analyze hands-on experiments to demonstrate energy use	Good design of experiments with careful implementation and analyses to demonstrate energy use	Some parts of the experiments require more careful planning and implementation	Some attempts to carry out some tests, with errors in data analysis	Minimal attempt to design and implement project
4. Final exam	Ability to analyse and solve practical problems related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem

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. Assignment	Ability to analyse and solve practical problems related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can apply some of the concepts correctly to partially solve the problems	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem
2. In-class test/quiz	Ability to analyse and solve questions related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can apply some of the concepts correctly to partially solve the problems	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem
3. Class project	Ability to formulate, implement and analyze hands-on experiments to demonstrate energy use	Good design of experiments with careful implementation and analyses to demonstrate energy use	Some parts of the experiments require more careful planning and implementation	Incomplete experimental plans and data analysis	Some attempts to carry out some tests, with errors in data analysis	Minimal attempt to design and implement project
4. Final exam	Ability to analyse and solve practical problems related to energy usage and conservation technologies	Able to solve problems without any errors	Able to use the correct concepts for problem solving, but have errors in calculation	Can apply some of the concepts correctly to partially solve the problems	Can determine the relevant equations and show some attempt to solve a problem in the correct direction	Not able to use the correct concept to solve a problem

Part III Other Information

1. Keyword Syllabus

- Introduction to efficiency
- Power transmission, distribution and quality
- Heating and air-conditioning
- Heat transfer and heat exchange, waste heat recovery
- Humidity and ventilation systems
- Lighting equipments; electronic ballasts
- Electrical appliances; motors
- Energy use in transportation systems

2. Reading List

2.1 Compulsory Readings

Nil

2.2 Additional Readings

1.	ASHRAE, ASHRAE Handbooks, US:Atlanta. (latest revision)
2.	Mitchell, J.W., Braun, J.E., Principles of Heating, Ventilation, and Air Conditioning in Buildings, Wileys & Sons, 2013.
3.	Pita, E.G., Refrigeration Principles and Systems, Business News Publishing Company, 1991.
4.	Szokolay, S.V., Introduction to Architectural Science: the Basis of Sustainable Design, Routledge, 2014.
5.	Hundy, G.F., Trott, A.R., Welch, T.C. Refrigeration and Air-conditioning, 4 th edition, Elsevier, 2008.
6.	Çengel, Y.A., Turner, R.H., Cimbala J. M., Fundamentals of Thermal-Fluid Sciences, Third edition, McGraw Hill, 2008.
7.	Thumann, A., Mehta, D. P., Handbook of Energy Engineering, 7 th edition, CRC Press, 2013.
8.	CIBSE (Chartered Institution of Building Services Engineers). CIBSE guides. (latest revision).
9.	EMSD. Code of Practice for Energy Efficiency of Air Conditioning Installations. (latest revision)
10.	EMSD. Code of Practice for Energy Efficiency of Electrical Installations. (latest revision)
11.	EMSD. Code of Practice for Energy Efficiency of Escalator Installations. (latest revision)
12.	EMSD. Code of Practice for Energy Efficiency of Lighting Installations. (latest revision)
13.	EMSD. Hong Kong Energy End-use Data (latest version)
14.	EMSD. Performance-based Building Energy Code. (latest revision)

15.	EMSD. Voluntary Energy Efficiency Labelling Scheme (EELS) (latest revision)
16.	<ol style="list-style-type: none">1. Hong Kong Government Architecture Services Department website: http://www.archsd.gov.hk/2. Hong Kong Government Electrical & Mechanical Services Department website: http://www.emsd.gov.hk/3. Sustainable Development Unit website: http://www.susdev.gov.hk/html/en/index.htm4. Energy Design Information website: http://www.energydesignresources.com