

**City University of Hong Kong
Course Syllabus**

**offered by School of Energy and Environment
with effect from Semester A 2023/24**

Part I Course Overview

Course Title: Energy Conservation and Audit

Course Code: SEE6104

Course Duration: One semester

Credit Units: 3

Level: P6

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) Nil

Exclusive Courses:
(Course Code and Title) Nil

Part II Course Details

1. Abstract

This course aims to provide students with basic knowledge of energy conservation principles and the essential practices of energy auditing. Students are expected to gain an understanding of the global and local energy landscape, with emphasis on the vital role of energy conservation in mitigating environmental impacts and enhancing sustainability. Students will learn the intricacies of energy auditing, covering its definition, methodologies, and instrumentation, and will be introduced to economic analysis techniques essential for evaluating the feasibility and impact of energy conservation measures. Energy audit procedures for various critical components and aspects, including boilers, steam-distribution systems, HVAC systems, lighting, electrical load management, buildings, and thermal considerations, are covered in the course. Renewable energy solutions are also introduced to equip students with the knowledge to integrate sustainable practices into energy conservation strategies.

2. Course Intended Learning Outcomes (CILOs)

(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.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Demonstrate a comprehensive understanding of energy conservation principles and their significance in achieving sustainability and reducing environmental impact	20%	√	√	
2.	Apply structured energy audit methodologies to analyze and evaluate energy consumption patterns in various industrial components and systems	30%		√	√
3.	Utilize economic and energetic analysis techniques to assess the feasibility and potential impact of energy conservation measures	30%		√	√
4.	Demonstrate the ability to integrate theoretical knowledge with practical applications by analyzing energy audit results and recommending appropriate energy conservation measures for specific industrial settings	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)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Lectures are used to describe and illustrate the basic concepts and state-of-the-art methodologies	√	√	√	√	2.5
Tutorial	Tutorials are used to solidify the concepts' understanding through examples, numerical exercises, case-studies, and discussions	√	√	√	√	0.5
Project	Class project is used to implement the theoretical knowledge gained through lectures and tutorials to practical problems and demonstrate students' critical thinking		√	√	√	1

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: 60%						
Assignments/Homework	√	√	√		10%	
Mid-term test	√	√	√		20%	
Project		√	√	√	30%	
Examination: 40% (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 Assessment Rubrics

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following 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. Assignments / Homework	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with few errors, indicating a strong grasp of the subject matter	Provide mostly correct answers, but considerable gaps are present in understanding or explanation	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension
2. Mid-term test	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with few errors, indicating a solid grasp of the subject matter	Provide mostly correct answers, but considerable gaps are present in understanding or explanation	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension
3. Project	Ability to apply energy auditing skills and analytical methods to real applications and propose practical energy conservation measures	Provide analysis that demonstrates a comprehensive understanding; Communicate findings and recommendations clearly and persuasively	Provide analysis that demonstrates a solid understanding; Communicate findings and recommendations clearly	Provide analysis that demonstrates a basic understanding; Communicate findings and recommendations adequately	Provide analysis that demonstrates a lack of understanding; Fails to communicate findings and recommendations effectively
4. Final examination	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with few errors, indicating a solid grasp of the subject matter	Provide mostly correct answers, but considerable gaps are present in understanding or explanation	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments / Homework	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with minimal errors, indicating a strong grasp of the subject matter	Provide generally correct answers, but existing gaps are present in understanding or explanation	Provide some correct answers and mostly incorrect or incomplete answers, indicating significant gaps in understanding	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension
2. Mid-term test	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with minimal errors, indicating a strong grasp of the subject matter	Provide generally correct answers, but existing gaps are present in understanding or explanation	Provide some correct answers and mostly incorrect or incomplete answers, indicating significant gaps in understanding	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension
3. Project	Ability to apply energy auditing skills and analytical methods to real applications and propose practical energy conservation measures	Provide analysis that demonstrates a comprehensive understanding; Communicate findings and recommendations clearly and persuasively	Provide analysis that demonstrates a solid understanding; Communicate findings and recommendations clearly	Provide analysis that demonstrates a basic understanding; Communicate findings and recommendations adequately	Provide analysis that demonstrates a limited understanding; Communicate findings and recommendations with limited effectiveness	Provide analysis that demonstrates a lack of understanding; Fails to communicate findings and recommendations effectively
4. Final examination	Ability to analyze, calculate and solve problems in energy conservation and audit	Provide precise and comprehensive answers, without any or with negligible errors, showcasing a deep understanding of the subject matter	Provide accurate and well-explained answers, albeit with minimal errors, indicating a strong grasp of the subject matter	Provide generally correct answers, but existing gaps are present in understanding or explanation	Provide some correct answers and mostly incorrect or incomplete answers, indicating significant gaps in understanding	Provide answers that are largely incorrect or entirely missing, indicating a significant lack of comprehension

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Energy conservation and effective energy management
- Energy audit: preliminary audit, detailed audit, audit instrumentation, industrial vs. commercial vs. residential audit
- Economic analysis
- Energy audit principles for various industrial components and systems: boilers, furnaces, steam-distribution, compressed air, HVAC, lighting, electrical load management, buildings, power plant
- Thermal energy management: waste heat recovery, insulation, storage
- Renewable energy solutions for energy conservation

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

Nil

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Stephen A. Roosa, Steve Doty and Wayne C. Turner, Energy Management Handbook, 9 th Edition, River Publishers, 2018.
2.	Frank Kreith and D. Yogi Goswami, Energy Management and Conservation Handbook, 2 nd Edition, CRC Press, 2017.
3.	Anil Kumar, Om Prakash, Prashant Singh Chauhan, and Samsher, Energy Management: Conservation and Audits, 1 st Edition, CRC Press, 2020.
4.	Albert Thumann and William J. Younger, Handbook of Energy Audits, 6 th Edition, The Fairmont Press, 2003.
5.	Clive Beggs, Energy Management, Supply and Conservation, 2 nd Edition, Elsevier, 2009.
6.	L. Ashok Kumar and Gokul Ganesan, Energy Audit and Management, 1 st Edition, CRC Press, 2023.
7.	EMSD. Code of Practice for Energy Efficiency of Air Conditioning Installations. (latest revision)
8.	EMSD. Code of Practice for Energy Efficiency of Electrical Installations. (latest revision)
9.	EMSD. Code of Practice for Energy Efficiency of Lighting Installations. (latest revision)
10.	EMSD. Energy Audit Code. (latest revision)
11.	EMSD. Building Energy Code. (latest revision)
12.	EMSD. Hong Kong Energy End-use Data (latest version)