City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester A 2024 / 25

Part I Course Overview

Course Title:	**Power Grid Management**
Course Code:	**SEE6127**
Course Duration:	**One semester**
Credit Units:	**3 credits**
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 introduce power grid management to students. The AC power grid concepts and key components, energy supply and utilization, energy saving control, grid management mechanisms, and automation and communication technologies will be covered. Topics on the future smart grid and vehicle-to-grid (V2G) management are included.

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.	Describe the operation of AC power grid.	30%		✓	
2.	Study the electricity supply, utilization, and loss.	30%	✓	✓	
3.	Describe different grid management mechanisms, including electricity market, grid planning, grid operation, and load forecasting.	20%	✓		✓
4.	Understand the development trend of future smart grid and V2G 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 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.

3. Learning and Teaching Activities (LTAs)

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

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Student will engage in lectures and learn key concepts and principles of power grid management.	✓	✓	✓	✓	2.5
Tutorial	Students will engage in lecture tutorials and learn how to formulate questions and solve problems.	✓	✓	✓	✓	0.5

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%						
In-clalss test. Students will complete a midterm test to demonstrate their understanding of the concepts and principles.	✓	✓			20%	
Assignments. Several assignments will be given throughout the semester. Students need to complete the assignments to demonstrate their ability to apply their knowledge in AC power grid, electricity supply and utilization, grid management mechanisms, and future power grids.	✓	✓	✓	✓	40%	
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 before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. In-class test	Ability to analyse and solve practical problems related to AC power grid, energy supply and utilization.	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 concepts and principles and show some attempt to solve a problem in the correct direction.	Only can marginally use some concepts and some attempt for some problem solving.	Not able to use the correct concept to solve a problem.
2. Assignment	Ability to analyse and solve practical problems related to power grid management, including AC power grid, electricity supply and utilization, electricity market, grid planning, grid operation, load forecasting, and future power grids.	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 concepts and principles and show some attempt to solve a problem in the correct direction.	Only can marginally use some concepts and some attempt for some problem solving.	Not able to use the correct concept to solve a problem.
3. Final exam	Ability to analyse and solve problems related to power balance, energy management, future development, and vehicle-to-grid 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 concepts and principles and show some attempt to solve a problem in the correct direction.	Only can marginally use some concepts and some attempt for some problem solving.	Not able to use the correct concept to solve a problem.

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Midterm test	Ability to analyse and solve practical problems related to AC power grid, energy supply	Able to solve problems without any errors.	Able to use the correct concepts for problem solving, but have errors	Can determine the relevant concepts and principles and show	Not able to use the correct concept to solve a problem.

	and utilization.		in calculation.	some attempt to solve a problem in the correct direction.	
2. Assignments	Ability to analyse and solve practical problems related to power grid management, including AC power grid, electricity supply and utilization, electricity market, grid planning, grid operation, load forecasting, and future power grids.	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 concepts and principles and show some attempt to solve a problem in the correct direction.	Not able to use the correct concept to solve a problem.
3. Final exam	Ability to analyse and solve problems related to power balance, energy management, future development, and vehicle-to-grid 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 concepts and principles 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 (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

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

- AC power grid
  - Generation
  - Transmission
  - Distribution
  - Utilization
- Power balance
- Electricity market
- Grid planning
- Grid operation
- Load forecasting
- Future power grid
- Vehicle-to-grid technologies

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.	Wang, R., Wang, P., & Xiao, G. (2017). Intelligent Microgrid Management and EV Control under Uncertainties in Smart Grid (1st ed. 2018 edition.). Springer Singapore Pte. Limited.
2.	Petrecca, Giovanni. (2014). Energy Conversion and Management Principles and Applications (1st ed. 2014.). Springer International Publishing.
3.	Vanek, F., Albright, L., & Angenent, L. (2008). Energy Systems Engineering. McGraw-Hill Professional Publishing.