

# SEE6127: POWER GRID MANAGEMENT

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## Effective Term

Semester A 2025/26

## Part I Course Overview

### Course Title

Power Grid Management

### Subject Code

SEE - School of Energy and Environment

### Course Number

6127

### Academic Unit

School of Energy and Environment (E2)

### College/School

School of Energy and Environment (E2)

### Course Duration

One Semester

### Credit Units

3

### Level

P5, P6 - Postgraduate Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### 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.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1 Describe the operation of AC power grid.	30		x	
2 Study the electricity supply, utilization, and loss.	30	x	x	
3 Describe different grid management mechanisms, including electricity market, grid planning, grid operation, and load forecasting.	20	x		x
4 Understand the development trend of future smart grid and V2G technologies.	20	x		

#### 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.

### Learning and Teaching Activities (LTAs)

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

### Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks ("- for nil entry)	Allow Use of GenAI?
1 In-clalss test Students will complete a midterm test to demonstrate their understanding of the concepts and principles.	1, 2	20	-	No

2	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.	1, 2, 3, 4	40	-	Yes
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**Continuous Assessment (%)**

60

**Examination (%)**

40

**Examination Duration (Hours)**

2

**Minimum Continuous Assessment Passing Requirement (%)**

30

**Minimum Examination Passing Requirement (%)**

30

**Additional Information for ATs**

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.

**Assessment Rubrics (AR)****Assessment Task**

In-class test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Ability to analyse and solve practical problems related to AC power grid, energy supply and utilization.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

**Good**

(B+, B, B-) Able to use the correct concepts for problem solving, but have errors in calculation.

**Fair**

(C+, C, C-) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

**Marginal**

(D) Only can marginally use some concepts and some attempt for some problem solving.

**Failure**

(F) Not able to use the correct concept to solve a problem.

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**Assessment Task**

Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

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.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

**Good**

(B+, B, B-) Able to use the correct concepts for problem solving, but have errors in calculation.

**Fair**

(C+, C, C-) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

**Marginal**

(D) Only can marginally use some concepts and some attempt for some problem solving.

**Failure**

(F) Not able to use the correct concept to solve a problem.

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**Assessment Task**

Final exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Ability to analyse and solve problems related to power balance, energy management, future development, and vehicle-to-grid technologies.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

**Good**

(B+, B, B-) Able to use the correct concepts for problem solving, but have errors in calculation.

**Fair**

(C+, C, C-) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

**Marginal**

(D) Only can marginally use some concepts and some attempt for some problem solving.

**Failure**

(F) Not able to use the correct concept to solve a problem.

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**Assessment Task**

Midterm test (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Ability to analyse and solve practical problems related to AC power grid, energy supply and utilization.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

**Good**

(B+, B) Able to use the correct concepts for problem solving, but have errors in calculation.

**Marginal**

(B-, C+, C) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

**Failure**

(F) Not able to use the correct concept to solve a problem.

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**Assessment Task**

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

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.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

**Good**

(B+, B) Able to use the correct concepts for problem solving, but have errors in calculation.

**Marginal**

(B-, C+, C) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

**Failure**

(F) Not able to use the correct concept to solve a problem.

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**Assessment Task**

Final exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Ability to analyse and solve problems related to power balance, energy management, future development, and vehicle-to-grid technologies.

**Excellent**

(A+, A, A-) Able to solve problems without any errors.

### Good

(B+, B) Able to use the correct concepts for problem solving, but have errors in calculation.

### Marginal

(B-, C+, C) Can determine the relevant concepts and principles and show some attempt to solve a problem in the correct direction.

### Failure

(F) Not able to use the correct concept to solve a problem.

## Part III Other Information

### Keyword Syllabus

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

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
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.