EE6624: ADVANCED TOPICS IN POWER AND ENERGY SYSTEMS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Advanced Topics in Power and Energy Systems

Subject Code
EE - Electrical Engineering
Course Number
6624

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

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 covers the latest development in power and energy systems, covering sustainable development goals perspective for the power sector, transition from traditional power systems into smart grid with renewable energy sources. It provides an overview of the electricity market development and opportunities for renewable energy sources. With increasing data availability, AI and data analytics are introduced for multiple services in todays energy systems. Other key topics include energy storage systems, microgrid, smart grid, DSO and peer to peer trading technologies.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Demonstrate an in-depth understanding of the power sector transition into smart grid and electricity market. Understand the driving factors and ultimate aims of SDG and ESG for sustainable development objectives	20	x	x	
2	Power system analysis, steady state and dynamic, balanced and unbalanced system analysis, fault analysis; understand basics in system planning	20	x	x	x
3	Renewable energy system modelling and analysis, wind power modelling, solar PV generation, microgrid and distribution network analysis	20	x	x	x
4	Introduction to electricity market, spot market, ancillary services market, generation planning in an electricity market	20	x	x	x
5	Analyse and evaluate the AI and data analytics based methods for smart gird and energy system analysis, basic functionalities such as demand forecast, pricing modelling and risk analysis for planning	20	x	x	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	The students will learn key concepts of sustainable energy systems	1, 2, 3, 4, 5	2 hrs/wk

2	Laboratory	The students will gain hands-on experience for power system analysis including renewable generation	2, 3	1 hrs/wk

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	2 x Projects	2, 3, 5	25	-	Yes
2	Quiz 1 & 2	1, 2, 3, 4	25	-	No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Remark:
To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

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

Criterion
Achievements in CILOs

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Achievements in CILOs

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Coursework (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Achievements in CILOs

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Additional Information for AR

Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1,2,3,4	The course requires the analysis and the design of power system components and systems and therefore provides many opportunities for students to solve engineering problems by applying knowledge of mathematics, science, and engineering.
3	Students are required to complete laboratory experiments to gain practical hands-on experience.

Part III Other Information

Keyword Syllabus

Power system analysis
AC power flow, DC power flow, steady state stability and dynamic stability, system fault analysis

1. Distribution network analysis
Distribution system configuration, balanced network analysis, unbalanced network analysis, distributed generation

2. Electricity market
Market structure, spot market, ancillary services market, risk management, renewable energy project planning in an electricity market

3. SDG and Carbon Markets
Understand SDG for sustainable development, study carbon trading and emission reduction mechanisms and emission assessment methods.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Nil