AU Course Outline Template

College of Engineering

ELEC442/Renewable Energy and Smart Grid

ELEC22/Bachelor of Technology in Electrical and Electronics Engineering

- Prerequisites: ELEC340, Completion of 90 credit hours
- Co-Requisites: None
- Credit Hours: 3 credits
- Course Coordinator:
- Instructor's Information:
- Classroom Location and timings[1]:

This course is part of the mentioned above program which is accredited by Engineers Australia.

Catalog Description

This course covers the renewable energy resources models, the main challenges due to smart grid implementation, and the main components of electrical smart grids. It provides students with an overview of distributed energy systems and renewable energy resources such as solar and wind energy, with an emphasis on alternative energy sources, their technology and applications. The course also covers the fundamentals, design, analysis, and development of smart off- and on-grid systems.

Course Objectives and Student Learning Outcomes

LO1 Understand fundamental principles and technologies behind renewable energy sources.

LO2 Explain smart grid technologies, including advanced metering infrastructure, grid automation, and demand response systems.

LO3 Analyze the impact of renewable energy sources on power grid stability and reliability.

LO4 Evaluate various renewable energy policies and smart grid technologies using criteria such as efficiency, sustainability, cost-effectiveness, and environmental impact.

LO5 Design solutions for integration of renewable energy into smart grids, considering factors like energy storage, grid resilience, and adaptive control strategies.

[1] Classroom timings and location are tentative, please refer to ATS for the up-to-date information.

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Engineers Australia Stage 1 Competencies

Achieving the student learning outcomes of this course partially fulfills the following EA Stage 1 Competencies for an Engineering Technologist.

Knowledge and Skills	1.1 Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain.
	1.2 Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain.
	1.3 In-depth understanding of specialist bodies of knowledge within the technology domain.
	1.4 Discernment of knowledge development within the technology domain.
	1.5 Knowledge of engineering design practice and contextual factors impacting the technology domain.
	1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the technology domain.
Engineering Application Ability	2.1 Application of established engineering methods to broadly-defined problem solving within the technology domain.
	2.2 Application of engineering techniques, tools and resources within the technology domain.
	2.3 Application of systematic synthesis and design processes within the technology domain.
	2.4 Application of systematic approaches to the conduct and management of projects within the technology domain.
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.
	3.2 Effective oral and written communication in professional and lay domains.
	3.3 Creative, innovative and pro-active demeanor.
	3.4 Professional use and management of information.
	3.5 Orderly management of self, and professional conduct.
	3.6 Effective team membership and team leadership.

Course Content

The course material will be delivered to the student as a mix of power point presentation, handwritten notes and handouts.

Below are the topics that will be covered during this course. Please note that topics are tentative to change.

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Week	Topic	Resources	Learning Outcomes
1	Introduction to Renewable Energy and Smart Grids	Chapter 1	LO1
2-4	Renewable Energy Sources and Technologies	Chapter 2	LO1
5	Fundamentals of Power Grid and Grid Stability	Chapter 3	LO3
6-7	Smart Grid Technologies and Components	Chapter 4	LO2
8	Energy Storage Systems for Smart Grids	Chapter 5	LO5
9-11	Power Electronics and Control Strategies for Smart Grids	Chapter 6	LO5
12	Renewable Energy Policies and Regulations	Chapter 7	LO4
13-14	Economic and Environmental Aspects of Smart Grids	Chapter 8	LO4

Methods of Delivery

This course will be delivered on-campus face to face delivery method. Students are expected to attend designated live lectures on campus. Any updates about the method of delivery will be communicated with the students via the official communication platforms.

Extent and Nature of Use of Technology

All the lectures' slides and other learning material for this course are available online on the webpage on EduLearn. Students are required to visit this page regularly to check for any update. Course related announcements are sent by email. Students are required to check their email daily.

Textbook/s

The students can refer to the following textbooks:

- Peake, S 2018, Renewable energy : power for a sustainable future, Fourth Edition, Oxford University Press, Oxford.
- Ehrlich, R 2022, RENEWABLE ENERGY : a first course., Crc Press, S.L.

Momoh, JA 2012, Smart grid : fundamentals of design and analysis, Wiley, Hoboken, N.J.

Attendance

The student is required to attend designated live sessions on campus. A student who fails to do so will be marked as absent from that class. Please refer to the AU Student Attendance Policy and Procedure on the AU portal.

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Submission of Work

Please refer to the AU Code of Academic Integrity on the AU Portal.

Assessment Plan

The assessments' dates are subject to change according to the material coverage pace.

#	Assessment Title	Method of Assessment	Learning Outcomes Covered	Week	Weight
1	Midterm	Written Exam	LO1-3	Midterm Exams Period	25%
2	Continuous Assessment*	Quizzes & Assignment	LO1-3	2-14	25%
3	Attendance/ Participation	In Class Participation/Attendance	LO1-5	1-14	10%
4	Final Exam	Written Exam	LO1-5	Final Exam Period	40%

* Late Assignments submissions will be penalized by 10%-mark deduction for each day of late submission. No submissions are allowed after three days of the assignment deadline. Each submission might be subject to one-to-one or group discussions as part of its grade.

* A student who misses an in-class assessment (quiz, in-class group work, in-class assignment, etc.) of a weight of 10% or less will not be eligible for makeup and will be automatically awarded a zero mark.

Students must refer to the AU Student Assessment Policy on the AU Portal with regards to assessments and re-assessment.

Grading Scale

Please refer to the AU Grading Policy on the AU Portal.