

AU Course Outline Template

College of Engineering

Mechanical Engineering Department

MECH431 – Renewable Energy

MECH22

Bachelor of Engineering Technology - Mechanical

- Prerequisites: MECH331
- Co-Requisites: None
- Credit Hours: 3 credits
- Course Coordinator:
- Instructor's Information:
- Classroom Location and timings¹:

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

Catalog Description

This course covers the fundamental aspects of thermodynamics, fluid mechanics, and heat transfer of renewable energy systems and applications. It provides an overview of common systems and applications for renewable energy sources where systems are described, and their fundamental analyses are provided. Topics include solar energy systems and applications, wind, hydro, geothermal, biomass, and ocean energies, and engineering economic analyses of renewable energy projects.

Course Objectives and Student Learning Outcomes

- LO1** Recall the fundamental principles of thermodynamics, fluid mechanics, and heat transfer applied to renewable energy systems.
- LO2** Explain the principles of various renewable energy systems such as solar, wind, hydro, geothermal, biomass, and ocean energies.
- LO3** Apply thermodynamic and fluid mechanics principles to analyze and predict the performance of renewable energy systems.
- LO4** Evaluate the performance and efficiency of different renewable energy systems in specific applications.

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

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- LO5** Analyze the engineering economic aspects of renewable energy projects, including cost-benefit analyses and feasibility studies.
- LO6** Use software tools to simulate and model the performance of renewable energy systems and interpret results to optimize system design and operation.

Engineers Australia Stage 1 Competencies

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

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 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.

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	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.

Week	Topic	Resources	Learning Outcomes /Performance Criteria
1	Introduction to Renewable Energy	Chap 1,2	LO1, LO2
2	Fundamental of Solar Energy	Chap 3	LO1, LO2
3	Flat Plate Solar Collector	Chap 4	LO1, LO2, LO3, LO6
4	Concentrating Solar Collector	Chap 4	LO1, LO2, LO3, LO6
5	Photovoltaic Cell	Chap 4	LO2, LO3, LO6
6	Wind Energy	Chap 5	LO1, LO2, LO3, LO6
7	<i>Midterm Exams</i>		
8	Geothermal Energy	Chap 7	LO1, LO2, LO3, LO6
9-10	Hydrogen and Fuel Cells	Chap 10	LO1, LO2, LO3, LO6
11	Economics of Renewable Energy	Chap 11	LO1, LO2, LO5, LO6
12-14	<i>Final Exams</i>		

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.

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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

Kanoğlu, Mehmet, Yunus A. Çengel, and John M. Cimbala. *Fundamentals and applications of renewable energy*. McGraw-Hill Education, 2020.

Additional Supplemental Materials

N/A

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](#).

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 page.

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

*Assignments will be followed by group presentations delivered by the students. Late submissions will be penalized by 25% mark deduction up to three-day late.

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* 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](#).