



Course Specification

(Bachelor)

Course Title: Renewable Energy I

Course Code: PHYS 0261

Program: BSc in Physics and BSc in Physics of Renewable Energy and Environment

Department: Physics

College: Science

Institution: Majmaah University

Version: 3

Last Revision Date: 08/12/2024



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A. General information about the course:

1. Course Identification

1. Credit hours: 3 (3, 0, 0)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (3rd Level/ 2nd Year)

4. Course general Description:

An overview of renewable energy technologies, such as solar, wind, hydropower, biomass, and geothermal energy, is given in this course. The fundamental ideas underlying these technologies, their effects on the environment, and their economic feasibility will all be covered by students. The status of the renewable energy sector and the obstacles and possibilities for its future expansion will also be covered in the course.

5. Pre-requirements for this course (if any):

PHYS 0101 General Physics 1

6. Co-requisites for this course (if any):

Nil

7. Course Main Objective(s):

- To understand the environmental aspects of non-conventional energy resources such as solar, wind, and biomass.
- To compare various conventional and renewable energy systems, evaluating their prospects, limitations, and environmental impact.
- To explore the need for renewable energy resources, considering both historical advancements and the latest technological developments in solar, wind, and biomass energy.
- To examine the different applications of solar energy, including heating, cooling, desalination, and power generation.
- To understand the various components involved in renewable energy production, including solar panels, wind turbines, and biomass conversion technologies.
- To analyze the practical uses of renewable energy sources in diverse applications such as heating, cooling, desalination, power generation, agricultural drying, cooking, and water purification.
- To explore the concept of biomass energy resources, focusing on different types of biogas plants and their applications in energy production.

2. Teaching mode (mark all that apply)



No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Understand the environmental impact of non-conventional energy resources, with a focus on solar, wind, and biomass.	k1	Lectures Solved Problems Videos Group discussion	Homework Assignments Quizzes Exams
1.2	Analyze and compare various conventional and renewable energy systems, evaluating their prospects and limitations.	k2		
1.3	Assess the need for renewable energy resources, considering historical and current	K2		



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	developments in solar, wind, and biomass technologies.			
2.0	Skills			
2.1	Demonstrate practical knowledge of renewable energy applications, such as solar heating, cooling, and biomass-based power generation.	S2	Lectures Solved Problems Videos Presentations	Homework Assignments Quizzes Exams
2.2	Understand the principles and applications of biomass energy and biogas plants in energy production.	S2		
2.3	Apply knowledge of solar energy to design and evaluate solar energy systems for various applications.	S2		
3.0	Values, autonomy, and responsibility			
3.1	Collaborate effectively in group projects, demonstrating teamwork in energy solution design and analysis.	V1	Lectures Solved Problems Videos Presentations	Homework Assignments Quizzes Exams Presentations
3.2	Present technical content in both written and oral formats, using appropriate scientific language and data visualization tools.	V1		
3.3	Communicate and present energy-related research using modern communication technology, suitable for both academic and public audiences.	V1		



C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: Energy, its types, renewables, advantages, economics, and global warming.	3
2.	Growth, solutions to energy challenges, and the basics of thermodynamics.	4
3.	Energy and Power: Fossil Fuels (oil, natural gas, coal), Nuclear Energy, and Finite Resources.	4
4.	The Sun: Solar Power and the Electromagnetic Spectrum.	3
5.	Energy Balance of Earth, Earth-Sun Motion, and Insolation.	3
6.	Heat Transfer and Storage: Conduction, Convection, and Radiation.	3
7.	Heat Transfer and Storage: Thermal Mass, Seasonal Heating/Cooling, and Thermal Comfort.	3
8.	Solar Heating and Cooling: Passive and Active Systems, Windows, and Glazing.	4
9.	Solar Heating and Cooling: Daylighting, Hybrid Systems, and Agricultural Applications.	4
10.	Photovoltaics: Basics, Energy Bands, and Performance.	4
11.	Wind Energy: Resource Assessment, Turbines, and Farms.	4
12.	Bioenergy: Conversion, Heat and Power, and Biofuels (Ethanol, Biodiesel, Biogas, Microalgae).	3
13.	Geothermal Energy: Resource Types, Direct Use, Heat Pumps, and Electricity Generation.	3

Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-term Exam 1	6	20
2.	Mid-term Exam 2	12	20
3.	Assignment/Presentation	15	20
4.	End-term Exam	16	40
...			

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources





Essential References	Introduction to Renewable Energy (Energy and the Environment)/ Vaughn C. Nelson / CRC Press / 1st Edition -2011.
Supportive References	Fundamentals of Renewable Energy Processes / Aldo Vieira da Rosa, and Juan Carlos Ordonez / Academic Press Inc / 4 th Edition -2021
Electronic Materials	<ul style="list-style-type: none"> • Saudi Digital Library (SDL)
Other Learning Materials	<ul style="list-style-type: none"> • Excel software for drawing graphs.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> • Lecture room/ lab
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> • A smart board to write on a computer.
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> • Library, Seminar Room, and Wi-Fi internet connections.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	<ul style="list-style-type: none"> • Teachers 	Teacher self-assessments
Effectiveness of Students assessment	<ul style="list-style-type: none"> • Students 	Student surveys
Quality of learning resources	<ul style="list-style-type: none"> • Quality committee 	Alignment with learning outcomes
The extent to which CLOs have been achieved	<ul style="list-style-type: none"> • Administrators 	Student performance data
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	16
DATE	30/12/2024

