



Course Specifications

Course Title:	Renewable Energy
Course Code:	PHY4705
Program:	Physics
Department:	Physics
College:	Applied Sciences
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification	3	
6. Mode of Instruction (mark all that apply)		3
B. Course Objectives and Learning Outcomes	3	
1. Course Description		3
2. Course Main Objective		4
3. Course Learning Outcomes		4
C. Course Content	5	
D. Teaching and Assessment	6	
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods		6
2. Assessment Tasks for Students		7
E. Student Academic Counseling and Support	7	
F. Learning Resources and Facilities	7	
1. Learning Resources		7
2. Facilities Required		7
G. Course Quality Evaluation	8	
H. Specification Approval Data	8	



A. Course Identification

1. Credit hours:
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input type="checkbox"/> Elective <input checked="" type="checkbox"/>
3. Level/year at which this course is offered: 4th year
4. Pre-requisites for this course (if any):
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

The main purpose of this course is to introduce students to the main renewable energy resources. Advantages, disadvantages and current challenges of these energy resources are covered in this course.



2. Course Main Objective

This course discusses the world's present needs of energy and future demands, as well as the limitations and issues of natural resources. This course gives an overview of the main scientific principles and technologies related to harnessing and conversion of the renewable energy resources, including solar, wind, hydroelectric, geothermal. Also, energy storage technology is covered in this course.

When students successfully complete this course, they will be to:

- Identify the effects that conventional energy systems based on fossil fuels have over the environment and the society.
- Understand the fundamental physical principles underlying energy processes.
- Describe the various renewable energy sources and the possible conversion paths to a useful form of energy.
- Understand concepts of Solar energy
- Understand concepts of Wind energy
- Understand concepts of Hydroelectric energy
- Understand concepts of Geothermal energy
- Compare different renewable energy technologies and choose the most appropriate based on local conditions.
- Identify and compare the types of energy storage

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Discuss the advantages and disadvantages of conventional and renewable energy.	K1(M)
1.2	Demonstrate the fundamentals and principles of renewable energies and its application.	K1(M)
1.3	Differentiate between different types of renewable energies.	K1(M)
1.4		K1(M)
2	Skills :	
2.1	Solve physical problems in the field of renewable energy.	S1(M)
3	Values:	



C. Course Content

No	List of Topics	Contact Hours
1	Course Introduction (Energy Sources and Environmental Effects) A brief history of energy consumption: Global energy needs Fossil Fuels The role of fossil fuel consumption in climate change The greenhouse effect and climate change	3
2	Basic physics of energy: Non-renewable and renewable sources of energy Laws of Thermodynamics Energy Efficiency Units of Energy	3
3	Solar energy Insolation Solar Collectors solar radiation Measurement Solar Thermal Energy photovoltaic materials photovoltaic principles power output and conversion efficiency From Cells to Module to Arrays	6
4	Wind energy Basic physics of wind power Types of Wind Turbines Power in the Wind Average Power in the Wind Environmental Impacts of Wind Turbines	6
5	Hydropower Hydropower resources Hydropower technologies Environmental impact of hydro power sources.	3
6	Geothermal energy Geothermal Resources Geothermal Technologies	3
7	Other form of renewable energy Wave Energy Tidal Energy Energy from Currents Hydrogen fuel	3
8	Energy storage Energy Storage types Performance Criteria for Energy Storage	3
Total		30



D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Discuss the advantage and disadvantage of conventional and renewable energy.	<ol style="list-style-type: none"> Lecture method: Board and PowerPoint. Begin the lecture with a brief idea of the topic. Demonstrate the basic principles. Discussing phenomena with illustrating pictures and diagrams. Solve problem Brain storming 	<ol style="list-style-type: none"> Midterm exams. Final exam. Homework. Oral Questions.
1.2	Demonstrate the fundamentals and principles of renewable energies and its application.		
1.3	Differentiate between different types of renewable energies.		
1.4	Define and explain solar, wind, hydroelectric, and geothermal energies.		
2.0	Skills		
2.1	Solve physical problems in the field of renewable energy.	<ol style="list-style-type: none"> Lecture method: Board and PowerPoint. Begin the lecture with a brief idea of the topic. Demonstrate the basic principles. Discussing phenomena with illustrating pictures and diagrams. Solve problem Brain storming 	<ol style="list-style-type: none"> Midterm exams. Final exam. Homework. Oral Questions.
3.0	Values		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments: Problem sets are given during the semester		10%
2	Quizzes		10%
3	Midterm Exam		30%
4	Final exam		50%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)



E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ol style="list-style-type: none">1. Fundamentals of Renewable Energy Processes, by Da Rosa, Aldo Vieira and Ordonez, Juan Carlos. Publisher : Academic Press, 4th edition (April 2, 2021)2. Physics of energy sources, by King, George C. Publisher : Wiley, 1st edition (June 12, 2017)
Essential References Materials	<ol style="list-style-type: none">1. Introduction to Renewable Energy (Energy and the Environment) by Vaughn C. Nelson and Kenneth L. Starcher. Publisher : CRC Press; 2nd edition (November 23, 2015)2. Renewable Energy Resources by John Twidell. Publisher: Routledge; 4th edition (November 24, 2021)3. Renewable and Efficient Electric Power Systems by Gilbert M. Masters. Publisher : Wiley-IEEE Press; 2nd edition (June 24, 2013)
Electronic Materials	https://www.energy.gov/eere/education/education-resources
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching Strategies	Students	Questionnaire



Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of student assessment	Instructor	Exams
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

