COURSE DESCRIPTION / SYLLABUS

Faculty	Engineering				
Department	Renewable Energy Engineering			**NQF level**	7
Course Title	Design of Renewable Energy Systems	**Code**	703437	**Prerequisite**	
Credit Hours	3 credits	**Theory**	3	**Practical**	0
Course Leader	Dr. Amer Al-Canaan	**Email**	Email: a.alcanaan@jadara.edu.jo		
Lecturers	Dr. Amer Al-Canaan	**Emails**	Email: a.alcanaan@jadara.edu.jo		
Lecture time	11:30- 13:00 Monday, wednesday	**Classroom**	D 310		
Semester	First semester 2022/2023	**Production**	March 2022	**Updated**	October 2022

Short Description

This course equips students with the information and abilities needed to design renewable energy systems, such as photovoltaic systems (grid-connected and off-grid). Students will apply the fundamentals of electric and renewable energies, such as the science of solar radiation and solar movement. The course will also introduce students to perform engineering design and select different renewable energy components. The students will also gain knowledge through working on various simulation software allowing them to calculate and estimate the solar irradiance, tilt angle, electrical loads and capacity of photovoltaic systems, as well as identify the energy units.

Course Objectives

1. Understand the principles of design and operation of various photovoltaic systems and perform engineering calculations related to these systems.
2. Learn about the methods of installing solar panels.
3. Study the various factors that affect the productivity of the PV panels.
4. The ability to design all types and sizes of on-grid and off-grid systems using manual calculations and various programs related to renewable energy.
5. The ability to calculate the quantities and economic feasibility of projects and prepare financial and technical reports
6. The ability to understand the most important pros and cons and the importance of the field visit and the requirements to fullfil the customer needs.

Course Intended Learning Outcomes (CILOs)

A. Knowledge - Theoretical Understanding

a.1 Understand the principles of design and operation of various photovoltaic systems and perform

engineering calculations related to these systems. (K1)
B. Knowledge – Practical Applications
a.2 The ability to design on-grid and off-grid PV systems using manual calculations and various simulation software related to renewable energy. (K2)
C. Skills - Generic Problem Solving and Analytical Skills
b.1 The ability to calculate the PV quantities (voltage, power, number of panels, cable size, battery ratings, etc.). (S1)
D. Skills - Communication, ICT, and Numeracy
b.3 Work in groups and **Write** technical **report** and perform **oral presentations** related to designing solar energy systems and economic feasibility of projects. (S3)
Teaching and Learning Methods
E-learning, Engaged learning, Problem-based learning (PBL), and Project-based learning:
Assessment Methods
Class Participation and Assignments
Term Project/Presentation
HW
Quizzes
Midterm Exam
Final Exam

Course Contents					
Week	**Hours**	**CLOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1 16-19 Oct.	3	a1	Introduction		
2 23-26 Oct.	3	a1	Sources and mechanisms of generating electric energy 2. Types of renewable energy and their sources 3. The principle of energy conservation and the law of energy, power and peak power		

3 30 Oct.-2 Nov.		a2	About solar energy in Jordan Types of solar energy and their applications The sun and the earth and their movement Longitude and latitude Solar radiation		
4 **6-9 Nov.**	3	a1, a2	Sun Position Diagram Load estimation		Quiz #1
5 13-16 Nov.	3	a1, b1, b3	Types and components of photovoltaic systems .Electric bills and price .The equivalent circuit of a solar cell .Solar panel data sheet .Solar panel protections Factors affecting solar panels		Group work #1
6 20-23 Nov.		a1, b1, b3	The latest technology in the manufacture of solar panels Introduction to solar inverters		Quiz #2
7 27-30 Nov.		a1, a2, b1	**MID term Exam**		
8 4-7 Dec.	3	a1, a2, b1	Cables and circuit breakers Working on PVsyst software		
9 11-14 Dec.	3	a2	Solving problems		Quiz #3
10 18-21 Dec.	3	a1, a2, b1			
11 25-28 Dec.	3	a1, a2, b1, b3	Cables and circuit breakers Working on PVsyst software		Group work #2
12 1-4 Jan.	3	a1, a2, b1	Practical application in the laboratory (installing solar panels with steel structures, calculating the angle of inclination and angle of orientation, and identifying electrical installations) Working on Sketchup software		
13 8-11 Jan.	3	a1, a2, b1	Practical application in the laboratory (installing solar panels with steel structures, calculating the angle of inclination and angle of orientation, and identifying electrical installations) Working on Sketchup software		Quiz #4
14 15-18 Jan.	3	a1, a2, b1	Practical application in the laboratory (installing solar panels with steel structures, calculating the angle of inclination and angle of orientation, and identifying electrical installations) Working on Sketchup software		

15, 16 21 Jan.- 02 Feb.	3	a1, a2, b1	Review, **Final Exam (50 % of assessment)**		

Infrastructure	
Textbook	1.Solar electricity design , simple practical guide to design the PV system, Michael Boxwell, 2017
References	Introducing Renewable Energy by Paul Matthews, published by Greenstream Publishing
Required reading	
Electronic materials	Ppt, book, lectures, charts, tables

Course Assessment Plan

Assessment Method		**Grade**	**CLOs**			
			a1	**a2**	**b1**	**b3**
First (Midterm)		**30%**	12	7	11	
Second (if applicable)						
Final Exam		**50%**	20	15	15	
Coursework		**20%**				
Coursework assessment methods	Assignments					
	Case study					
	Discussion and interaction/participation					
	Group work activities					10
	Lab tests and assignments					
	Presentations/attendance					
	Quizzes			5	5	
Total		**100%**	32	27	31	10

Plagiarism
Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code).

Plagiarism is different from group work in which several individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. To allow proper assessment that this is indeed the case, you must adhere strictly to the coursework requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.