Faculty: Engineering Technology	
Department: Energy	**Program: Bachelor Degree**
Academic year: 2022-2023	**Semester: 2^{nd} (Fall)**

Course Plan

First: Course Information

Course No.0906552	***Course Title:* Solar PV Energy Systems**	***Credit Hours:3***
Prerequisite: 0906353	***Section No.: 1***	***Lecture Time: 10-11,Sun,Tue,and Thu***
Type Of Course:	☐ ***Obligatory Faculty Requirement Elective*** ☐ ***University Requirement*** ☐ ***ObligatoryUniversity Requirement*** ☐ ***FacultyRequirement*** ☐ ***Course Elective SpecialtyRequirementObligatorySpecialization requirement***	
Type of Learning:	☒ ***Face-to-Face Learning*** ☐ ***BlendedLearning(2 Face-to-Face + 1Asynchronous)*** ☐ ***Online Learning (2 Synchronous+1 Asynchronous)***	

Second: Instructor's Information

***Name:* Dr. Mais Alzgool**		***Academic Rank:* Assistant Professor**		
Office Number:136 l		***Ext. Number:2039***	***E-mail:*** maisalzgool@yahoo.com	
Office Hours:	***Sunday 11-12***	***Monday 11-12:30***	***Tuesday 11-12***	***Wednesday 11-12:30***	***Thursday 11-12***

Third: Course Description

This course covers the fundamentals of Solar Radiation; sun energy, sun position, potential of solar radiation, Solar calculations of the global horizontal irradiation, determination of the solar angles, fundamentals of photovoltaic energy and its main components: (Semiconductor materials, pn-junction, pn junction solar cell under illumination, current voltage characteristics of solar cells, equivalent circuit of solar cells, electrical connection of PV modules (series, parallel), mismatch effect (mismatch losses), the effect of soft shading and hard shading on array performance, PV system components, Diodes in PV Systems, DC/AC inverter topologies, Maximum power point tracking, ON grid photovoltaic system connection, PV overcurrent protection, Module inter-row spacing.

Fourth: Learning Source

Main Reference:	**Principles of Solar Engineering**	
Author: **D.Yogi Goswami**	***Issue No.:*** **3rd**	***Publication Year:*** 2015
Additional Sources&Websites:	• •	
Teaching Type:	☒ ***Classroom*** ☐ ***Laboratory*** ☐ ***Workshop*** ☐ ***MS Teams*** ☐ ***Moodle***	

Fifth: Learning Outcomes

Course Code	***Course IntendedLearning Outcomes (CILOs)***	***Connection To Program ILOs Code***
Knowledge		
**K1	**Thorough** understanding of the fundamentals of solar radiation and the photovoltaic effect	*PK1
K2	**Explain** different phenomena regarding PV modules	PK2
K3	**Specify** the main I/V curve of the series and parallel connections of the PV modules	PK3
Skills		
***S1	**Calculate** the solar angles and the global horizontal irradiation	PS1
S2	**Analyze** the residential ON grid PV system components ratings.	PS2
Competencies		
****C1	**Apply** the design criteria of the residential ON grid PV system and determination of its annual energy production.	PC1

*** P: Program, **K: knowledge, ***S: skills, ****C: competencies.**

Sixth: Course Structure

Lecture Date	Intended Teaching Outcomes(ILOs)	Topics	Teaching Procedures*	TeachingMethods***	References***
5/3/2023	0	Fundamentals of solar radiation, electromagnetic spectrum, air mass, STCs and radiation types	General discussions	Discussion and problem Solving	Energy Engineering
7/3/2023	1	Fundamentals of solar radiation, electromagnetic spectrum, air mass, STCs and radiation types	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
9/3/2023	1	Fundamentals of solar radiation, electromagnetic spectrum, air mass, STCs and radiation types	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
12/3/2023	1	Identification and calculations of solar angles, isotropic sky model and radiation devices	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
14/3/2023	2	Identification and calculations of solar angles, isotropic sky model and radiation devices	At least one exam will be held suddenly during the semester	Discussion and problem Solving	Energy Engineering
16/3/2023	1 & 2	Identification and calculations of solar angles, isotropic sky model and radiation devices	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
19/3/2023	3	PV module layers, PV effect	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
21/3/2023	3	PV module layers, PV effect	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
23/3/2023	3	PV module layers, PV effect	General discussions	Discussion and problem Solving	Energy Engineering
26/3/2023	3	PV cell equivalent circuit, mathematical relations and design	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
28/3/2023	3	PV cell equivalent circuit, mathematical relations and design	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
30/3/2023	4	PV cell equivalent circuit, mathematical relations and design	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
2/4/2023	3 & 4	Series and parallel connections of PV modules	At least one exam will be held suddenly during the semester	Discussion and problem Solving	Energy Engineering
4/4/2023	3 & 4	Series and parallel connections of PV modules	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
6/4/2023	4	Series and parallel connections of PV modules	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
9/4/2023	5	Mismatch effect, soiling, hotspots and shading	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
11/4/2023	5	Mismatch effect, soiling, hotspots and shading	General discussions	Discussion and problem Solving	Energy Engineering
13/4/2023	5	Mismatch effect, soiling, hotspots and shading	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
16/4/2023	5	PV Diodes and solar module data sheet	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
18/4/2023	5	PV Diodes and solar module data sheet	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering

20/4/2023	4	PV Diodes and solar module data sheet	At least one exam will be held suddenly during the semester	Discussion and problem Solving	Energy Engineering
27/4/2023	3 & 4	Temperature coefficient effect	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
30/4/2023	6	Temperature coefficient effect	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
2/5/2023	4	Temperature coefficient effect	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
4/5/2023	3 & 4	PV inverters	General discussions	Discussion and problem Solving	Energy Engineering
7/5/2023	3 & 4	PV inverters	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
9/5/2023	4	PV inverters	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
11/5/2023	6	Solar radiation websites	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
14/5/2023	4	Solar radiation websites	At least one exam will be held suddenly during the semester	Discussion and problem Solving	Energy Engineering
16/5/2023	6	Solar radiation websites	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
18/5/2023	4	Design of on grid PV system	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
21/5/2023	7	Design of on grid PV system	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
23/5/2023	8 , 9 , 10	Design of PV system electrical parts	General discussions	Discussion and problem Solving	Energy Engineering
28/5/2023	8 , 9 , 10	Design of PV system electrical parts	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
30/5/2023	8 , 9 , 10	Online design of PV systems	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
1/6/2023	8 , 9 , 10	Online design of PV systems	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering
4/6/2023	10	Sun path diagram and row spacing	At least one exam will be held suddenly during the semester	Discussion and problem Solving	Energy Engineering
6/6/2023	10	Sun path diagram and row spacing	Review the previous lecture, then explain the current lecture	Discussion and problem Solving	Energy Engineering

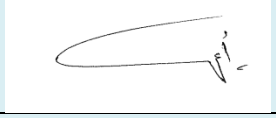
* Learning procedures: (Face-to-Face, synchronous, asynchronous). * * Teaching methods: (Lecture, video…..). ** * Reference: (Pages of the book, recorded lecture, video….).

Seventh: Assessment methods

Methods	Grade	Date	Platform	CLO'S
First Exam	20	Fixed by the Department	Classroom	K›K
Second Exam	20	Fixed by the Department	Classroom	K›S
Assign, Quizzes &Participation	10	During Semester	Classroom+Moodle	All CLO'S
Final Exam	50	Fixed by the Department	Classroom	All CLO'S

Eighth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).

Approved by:	Name	Date	Signature
Head of Department	Dr. Ayman Amer	2023/3/6	
Faculty Dean	Prof .Taiseer Alghanim	2023/3/6