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

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	Explain the fundamentals of solar radiation and the photovoltaic effect.	*PK1
K2	Design and derive relations of the equivalent circuit of PV cells.	PK2
K3	Explain the series and parallel connections of PV modules.	PK3
Skills		
***S1	Analyze the main components of photovoltaic cells and its principle of formulation	PS1
S2	Analyze the electrical equivalent circuit of solar cells.	PS2
S3	Understand the effect of temperature, irradiation and shading on the performance of PV cells.	PS3
S4	Understand the concept of maximum power point tracking.	PS4
S5	Analyze the main components of the ON grid PV system**.**	PS5
Competencies		
****C1	Define the solar radiation; sun energy and sun position. Understand the potential of solar radiation.	PC1
C2	Calculation of the global horizontal irradiation, and determination of the solar angles.	PC2

*** 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

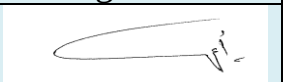
* Learning procedures: (Face-to-Face, synchronous, asynchronous). * * Teaching methods: (Lecture, video…..). ** * Reference: (Pages of the book, recorded lecture, video….).

Seventh: Assessment methods

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

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	5/3/2023	
Faculty Dean	Prof .Taiseer Alghanim	5/3/2023