Ministry Of Higher Education and Scientific Research
Mustansiriyah University/College of Science/Dept. of Atmospheric Sciences

(الخطة الدراسية للمساق)
Course Plan

Course No.:M.Sc– Postgraduate stage
Course Name: Solar Energy Meteorology
Course Website: https://uomustansiriyah.edu.iq/e-learn/profile.php?id=274

Time Division: 2 hours
Semester & Year: 1 , **2022-2023**

Course Description

This course deals with the subjects that take the physical and applied side of the solar energy, especially the relationship between the atmosphere and solar radiation by using the mathematical models that control the angle of solar radiation fall on different surfaces and the methods of solar radiation measurement.

Course Intended Outcomes:

At the end of the course, students expected to learn:
The definition, classification, and diagnosis of solar energy meteorology and its applications in atmospheric sciences in all aspects related to radiation, its transmission and its arrival to the earth's surface, and the physical and atmospheric conditions and factors that control the applications of solar energy.

Course Outline:

Week	Topics Covered
1	**The Sun as a Radiation Source** : Radiation Laws , Radiant Flux Emitted by the Sun, Solar Constant, Total Solar Radiant Flux Received by the Earth , Extraterrestrial Radiation
2	**Solar Radiation:** the physics of solar Radiation, Radiant Flux Emitted by the Sun, Solar Constant, Total Solar Radiant Flux Received by the Earth, Extraterrestrial Radiation.
3	**Solar Geometry**: Solar Time, Position of the Sun, Example: Extraterrestrial Radiation on a Horizontal Surface
4	**Interaction of Solar Radiation with Atmosphere**: Relative Air Mass, Spectral Irradiance, Clearness Index ,Clear Sky Irradiance, Cloudy Sky Irradiance, Radiance Distribution on the Sky Hemisphere
5	**Radiation Climatology**: Global mean energy budget of the earth-atmosphere system, Global distribution of annual average solar radiation, Average daily extraterrestrial radiation on a horizontal surface as function of season and latitude
6	**Solar Irradiance Modeling**: Direct Radiation Component, Ground-Reflected Radiation Component.: Diffuse Radiation Component, Diffuse Irradiance Models for Tilted Surfaces, Diffuse Fraction Models.
7	**Statistical Properties of Solar Radiation**: Statistical Variables, Generation of Synthetic Radiation Sequences
8	**First Exam**

9	**Solar Radiation Measurements:** Radiation Detectors, Field Instruments:(Global Radiation, Direct Radiation, Diffuse Radiation)**.**
10	**Solar Radiation Measurements:** Special Measurements:(Ultraviolet Radiation, Infrared Radiation, Spectral Radiation,Sunshine Duration, Atmospheric Turbidity, Surface Albedo).
11	**Satellite Data for Solar Resource Assessment**
12	**Solar energy applications:** Passive Solar Energy systems, active Solar Energy systems.
13	**Major Uses of Solar Energy I:** Daylight, Space Heating, Heating Water, water desalination, Drying Agricultural Products.
14	**Major Uses of Solar Energy II:** Generating Electrical Power: (Concentrating Solar Power, Photovoltaic panels).
15	**Second Exam**

Textbooks:

1- Solar Energy: Fundamentals, Technology, and Systems, Klaus Jäger, et al, University of Technology, Netherlands, 2014.

Suggested references:

1- Principles of Solar Engineering; Third Edition, D. Yogi Goswami, Taylor & Francis Group,2015. https://www.advan-kt.com/principlesofsolarengi.pdf

2- Handbook of renewable energy technology, Ahmed F. Zobaa, Ramesh C. Bansal, World Scientific Publishing, Singapore, 2011.

3- 1987 ،مبادى الطاقة الشمسية وتطبيقاتها، د.الياس كبة، د.سهيل فاضل، دار الحداثة للطباعة والنشر والتوزيع، بيروت، الطبعة الثالثة

4- The passive solar energy book, Edward mazria, Emmaus, PA: Rodale Press, 1979. https://archive.org/details/fe_The_Passive_Solar_Energy_Book/page/n3

Marking:

Course					Final Exam	Final Mark
1st exam	2nd exam	Practical	Activity	Total		
10	10	5	5	30	70	100

Assignments and/ or Projects:

Assignment/ Project	Description	Due Date	Marking

Instructor(s) information

Section: Atmospheric Sciences Building **Lecture Room:** [Postgraduate room] **Office No.: 5**

Instructor's Name: prof. dr. Hazim H. Hussain **E-Mail**: dr.hazim@uomustansiriyah.edu.iq

Office Hours: 1 day : (08:30-10:30)

Lecturer Signature **Chairman Signature**

Prof. Dr. Hazim H. Hussain