



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Solar Energy – ERE314

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Solar Energy				
Course Code (according to the bylaw)	ERE314				
Prerequisite:	Heat Transfer - GME221				
Department/s participating in delivery of the course	Electrical and Renewable Energy Engineering				
Number of credit hours/points of the course (according to the bylaw)	Credit Hours	Contact Hours			
		Lecture	Tutorial	Practical	Total
	3	2	1	2	5
Course Type	Compulsory - Minor Requirements of Electrical and Renewable Energy Engineering				
Academic level at which the course is taught	Fourth Level				
Academic Program	Bachelor of Engineering of Electrical and Renewable Energy				
Faculty/Institute	Faculty of Engineering				
University/Academy	Nahda University				
Name of Course Coordinator	Prof. Dr. Eng. Mohamed Ahmed Ebrahim				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Intensity of Solar Radiation within the Outer Space, Calculation of the Solar Intensity on the Earth, Availability and Usability of Solar Energy, Measurement of the Solar Intensity, Direct and Diffuse Radiation, Reflection from the Ground, Solar Angles, Shades, the Equation of Time, Incidence Angle on Horizontal and Inclined Surfaces, Theory of the Flat Plate Collector, Transmission through Glass, Heat Loss Calculations, Collector Performance, Solar Energy Concentrators, Point and Line Concentrators, Cylindrical Trough, Parabolic Trough, Parabolic Dish, Central Receiver, Heliostat, Heliostat Optimum Placement, Sun Beam Tracking, Shadowing and Blocking, Concentration Ratios, Fresnel Lens, Thermal performance, Heat Transfer Coefficients, Receiver Efficiency.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
A3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the Electrical and Renewable Energy Engineering Program and within the principles and contexts of sustainable design and development.	CLO6	Develop simulation to size solar thermal systems using any software packages.
D1	Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.	CLO3	Analyze performance of different types of solar energy concentrators.
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques.	CLO1	Recognize intensity of solar radiation within outer space, calculation of the solar intensity on the earth, availability



Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
			and usability of solar energy, measurement of the solar intensity, direct and diffuse radiation, reflection from the ground, solar angles, shades, the equation of time.
D3	Model, analyze, design, implement, test and operate renewable energy systems such as solar photovoltaics, solar thermal, wind, biomass and waste, hydro-tidal and wave, and other renewable energy applications.	CLO4	Design of line focusing solar thermal power generation.
		CLO5	Design of point focusing solar thermal power generation.
		CLO2	Perform calibration and testing of solar thermal power generation and maintaining major components of a solar thermal system.

4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Experimental Learning
4. Projects
5. Field Visits
6. Report and Research
7. Discussion

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours				
			Lecture Hours	Tutorial Hours	Practical Hours	Self-learning (Assignments/ Project)	Other
1	Intensity of Solar Radiation within the Outer Space, Calculation of the Solar Intensity on the Earth, Availability and Usability of Solar Energy	7	2	1	2	2	-
2	Intensity of Solar Radiation within the Outer Space, Calculation of the Solar Intensity on the Earth,	7	2	1	2	2	-



	Availability and Usability of Solar Energy						
3	Measurement of the Solar Intensity, Direct and Diffuse Radiation, Reflection from the Ground, Solar Angles, Shades, and Equation of Time.	7	2	1	2	2	-
4	Measurement of the Solar Intensity, Direct and Diffuse Radiation, Reflection from the Ground, Solar Angles, Shades, and Equation of Time.	7	2	1	2	2	-
5	Solar Incidence Angle on Horizontal and Inclined Surfaces	9	2	1	2	2	Quiz 1 (2 Hr)
6	Theory of the Flat Plate Collector, Transmission through Glass, Heat Loss Calculations, Collector Performance, Solar Energy Point and Line Concentrators.	7	2	1	2	2	-
7	Mid Term Exam						
8	Theory of the Flat Plate Collector, Transmission through Glass, Heat Loss Calculations, Collector Performance, Solar Energy Point and Line Concentrators.	7	2	1	2	2	-
9	Solar Energy Cylindrical and Parabolic Trough, Parabolic Dish, Solar Energy Central Receiver Concentrators	7	2	1	2	2	-
10	Solar Energy Cylindrical and Parabolic Trough, Parabolic Dish, Solar Energy Central Receiver Concentrators	9	2	1	2	2	Quiz 2 (2 Hr)
11	Heliostat, Heliostat Optimum Placement	7	2	1	2	2	-
12	Sun Beam Tracking, Shadowing and Blocking	7	2	1	2	2	-
13	Concentration Ratios, Fresnel Lens, Thermal performance, Heat Transfer Coefficients, Receiver Efficiency	7	2	1	2	2	
14	Concentration Ratios, Fresnel Lens, Thermal performance, Heat Transfer Coefficients, Receiver Efficiency	7	2	1	2	2	-
15	Revision	7	2	1	2	2	-



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Final Exam

5. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-term written Exam	7	20	20 %
2	Final Written Exam	16	40	40 %
3	Assignments	6	15	15 %
4	Quizzes	5, 10	15	15 %
5	Final Practical Exam	15	10	10%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course (must be written in full according to the scientific documentation method)	1) Platzer, W. and Stieglitz, R., 2024. Solar Thermal Energy Systems: Fundamentals, Technology, Applications. Springer Nature. 2) Sheikholeslami, M., 2024. Solar Thermal Systems and Applications: New Design Techniques for Improved Thermal Performance. Elsevier.
	Other References	1) Kalita, P. and Singh, P., 2026. Solar Energy Conversion Technologies: Fundamentals Design and Applications. CRC Press.
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data Show
	Supplies	White Board
	Electronic Programs	Homer and SAM Software Programs
	Skill Labs/ Simulators	—
	Virtual Labs	—
	Other	Lecture Hall and Laboratory Usage

Prof. Dr. Eng. Mohamed Ahmed Ebrahim
Course Coordinator

Dr. Mohamed Kourany Saad
Program Coordinator