

Engineering Program

Specialization	Energy Technology
Course Number	020304251
Course Title	Solar energy technology
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

. The basics of photovoltaic solar radiation, types of solar cells, the work and efficiency of solar cells, solar photovoltaic energy storage, direct power generation from sun.

The basics of solar thermal radiation, types of solar thermal collectors, work and efficiency of solar thermal collectors, solar thermal energy storage, solar thermal power plants.

Course Objectives:

The student should be able to:

Understand the fundamentals of solar energy and its conversion techniques for both thermal and electrical energy applications

□ Detailed Course Description:

Unit Number	Unit name	Unit Content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Solar angles – Sun path diagrams – Radiation - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces. 	
2.	The basics of photovoltaic solar radiation, types of solar cells, the work and efficiency of solar cells,	<ul style="list-style-type: none"> ▪ Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells – Solar thermo-photovoltaics 	
3	solar photovoltaic energy storage, direct power generation from sun	<ul style="list-style-type: none"> ▪ 	

4	The basics of solar thermal radiation, types of solar thermal collectors, work and efficiency of solar thermal collectors,	<ul style="list-style-type: none"> ▪ Principle of working, types, design and operation of - Solar heating and cooling systems - Thermal Energy storage systems – Solar Desalination – Solar cooker : domestic, community – Solar pond – Solar drying 	
5	solar thermal energy storage	<ul style="list-style-type: none"> ▪ 	
6	solar thermal power plants	<ul style="list-style-type: none"> ▪ 	

Evaluation Strategies:

		Percentage	Date
1. Exams	Midexam Exam	40%	--/--/----
	Assignments	10%	
	Final Exam	50%	--/--/----

Teaching Methodology:

1. Lecture

Textbook:

References:

- 1. Goswami, D.Y., Kreider, J. F. and Francis., Principles of Solar Engineering, Taylor and Francis, 2000

2. Chetan Singh Solanki, Solar Photovoltaics – Fundamentals, Technologies and Applications, PHI Learning Private limited, 2011
3. Sukhatme S P, J K Nayak, Solar Energy – Principle of Thermal Storage and collection, Tata McGraw Hill, 2008.
4. Solar Energy International, Photovoltaic – Design and Installation Manual – New Society Publishers, 2006
5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2010.