

COURSE CODE	SOLAR THERMAL TECHNOLOGY	L	T	P	C
1154ME113		3	0	0	3

1. Preamble

This course delivers a knowledge of thermal systems in the solar energy domain. Students may gain knowledge on various applications of solar energy such as solar panel cooling, water heating, space heating and cost and estimation of solar system economics.

2. Prerequisite

NIL

3. Links to other courses

1	Solar energy engineering	1152ME123
2	Renewable sources of energy	UEMEA46
3	Power plant engineering	U6MEA34
4	Engineering Chemistry	GEA004
5	Engineering Thermodynamics	1151ME102

4. Course Educational Objectives

Students undergoing this course are expected to:

- Understand the basic principles of thermal technology in various solar thermal systems.
- Understand the solar applications of various systems such as Hot water generation, space heating, distillation and other applications related to solar energy.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Understand the meaning and kinds of solar collectors, storage tank and collector heat exchange factor	K2
CO2	Understand the working principle of various solar water heating systems	K2
CO3	Understand the solar space conditioning systems, heat storage configurations and refrigeration systems	K2
CO4	Understand the other solar applications such as solar cooking, chimney and pumping systems and etc	K2
CO5	Understand the importance of cost and estimation of solar systems and its power generation	K2

(K2 - Understand)

6. Correlation of CO's with Programme Outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M						L					L	L	
CO2	M						L					L	L	
CO3	M						L					L	L	
CO4	M						L					L	L	
CO5	M						L					L	L	

H- High; M-Medium; L-Low

7. Course Content

UNIT I SOLAR COLLECTORS

L - 9

Introduction to Solar energy - Flat plate - Evacuated tube – Concentrated - Pool and Air collectors
Construction – Function - Suitability – Comparison - Storage Tank - Solar Fluids – Collector Heat
Exchanger Factor.

UNIT II SOLAR WATER HEATING SYSTEMS

L - 9

Natural, Forced circulation systems, Integral Collector Storage System - Thermosyphon System -
Open Loop, Drain Down, Drain Back, Antifreeze Systems - Refrigerant Solar Water Heaters - Solar
Heated Pools.

UNIT III SOLAR SPACE CONDITIONING SYSTEMS

L - 9

Liquid Type Solar Heating System With / Without Storage - Heat Storage Configurations – Heat
Delivery Methods - Air-Type Solar Heating Systems - Solar Refrigeration and Air Conditioning

UNIT IV OTHER SOLAR APPLICATIONS

L - 9

Solar Cooking – Distillation - Desalination - Solar Ponds – Solar Passive Architecture – Solar Drying –
Solar Chimney – Swimming Pool Heating – Retrofit Water Heaters – Low Flow Pumped systems –
Solar vehicles

UNIT V SOLAR ECONOMICS

L - 9

Application of economic methods to analyse the feasibility of solar systems to decide project / policy
alternatives - Net energy analysis - cost requirements for active and passive heating and cooling - for
electric power generation - and for industrial process-heating.

TOTAL: 45 PERIODS

8. Text Book

1. J.A. Duffie, W.A. Beckman, Solar Engineering of Thermal Processes, John Wiley Interscience, New
York, 2013.