NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	SOLAR ENERGY UTILIZATION		
Course Code	EN605	**No. of Credits**	03
Department	Department of Energy and Environment	**Faculty**	Dr.M.Premalatha/ Dr.C.Naveen
Pre-requisites Course Code			
Course Coordinator(s) (if, applicable)			
Other Course Teacher(s)/Tutor(s) E-mail	leonaveen173@gmail.com latha@nitt.edu	**Telephone No.**	9894600407
Course Type	**Core course**		

COURSE OVERVIEW

This course is designed for the post graduate students of Energy Engineering disciplines and it is intended to familiarize the students with the fundamentals of solar energy conversion , design and analyze the solar thermal and photovoltaic systems for heating and power generation applications respectively. In addition cost and life cycle analysis of solar systems will be discussed.

COURSE OBJECTIVES

The objective of the course will focus on the following points

1. To explain the fundamentals of characteristics of solar radiation and various methods & calculations of solar radiation measurement.

2. To introduce the interdisciplinary approach in designing, performance analysis and cost analysis of solar thermal and solar PV systems performance.

3. To provide knowledge to improve the currently available technology of the solar energy systems for making the process sustainable, economical and environmentally safe.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Determine the available radiation intensity on tilted surface using basic angles and derived angles. (K2) 2. Calculate the optical efficiency and heat transfer efficiency of thermal (flat plate and concentrating) collectors and design the collector for the given applications. (K3) 3. Design of various solar thermal systems and describing the performance of the same. (K5) 4.Design a solar PV system for given electrical load and to calculate energy, economical payback period. (K5) 5.Explain the performance of PV cells as a function of radiation intensity, temperature and materials of construction. (K2)	

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Topic	No of Hours	Mode of Delivery
1.	Introduction	02	BB/PR
2.	Solar radiation measurements and Modeling	02	BB/PR
3.	Types of Solar thermal collectors	03	BB/PR
4.	Design of solar collectors and selective coating	03	BB/PR
6.	Solar water heating, Solar cooking, Solar drying,	03	BB/PR
7.	Solar distillation and solar refrigeration	03	BB/PR
8.	Active and passive heating and cooling of buildings Solar	02	BB/PR
9.	Solar thermal power generation	03	BB/PR
10.	Solar chimney and solar drying	02	BB/PR
11	Solar cells semiconductor physics and materials	02	BB/PR
11.	Solar cell characteristics and electrical representation	02	BB/PR
12.	Choppers-inverters-batteries-charge regulators,	03	BB/PR
13.	Solar PV Standalone/ Grid connected system	02	BB/PR
14.	Solar PV design and construction concepts.	03	BB/PR
15.	Solar PV applications	02	BB/PR
16	Solar Energy Storage and solar pond	03	BB/PR

Course Total	40	*Black Board-BB Presentation-PR

COURSE ASSESSMENT METHODS

ACTIVITIES	MARKS ALLOTED	No.of.Groups
BASED ON ACTIVITIES		
Life Cycle Analysis of solar system	10 Marks	4 Groups
Suggestion for enhanced implementation of solar systems in India (Policy/Marketing/Awareness/Technology)	10 Marks	4 Groups
Group Discussion	5 Marks	4 Groups
Outreach /Case Study on solar energy	10 Marks	4 Groups
Seminar Presentation	5 Marks	Individually
BASED ON INTERNALS		
Test-1 (Unscheduled) –August end	5 Marks	Individually
Test-2 (Scheduled)- September end	10 Marks	Individually
Test-3 (Scheduled)- October end	15 Marks	Individually
BASED ON END SEMESTER		
End Semester	30 Marks	Individually
TOTAL	100 Marks	

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

TEXT BOOKS

1. *D. Yogi Goswami, Frank Kreith, Jan. F. Kreider, "Principles of Solar Engineering", 2nd Edition, Taylor & Francis, 2000, Indian reprint, 2003*
2. *Edward E. Anderson, "Fundamentals for solar energy conversion", Addison WesleyPubl. Co., 1983.*

REFERENCES

1. *Duffie J. A and Beckman, W .A., "Solar Engineering of Thermal Process", John Wiley,1991.*
2. *G. N. Tiwari and M. K. Ghosal, "Fundamentals of Renewable energy Sources", NarosaPublishing House, New Delhi, 2007*
3. *Energy Studies, Second Edition, by W. Shepherd and D. W. Shepherd, Imperial CollegePress, London, 2004.*
4. *S. P. Sukhatme, Solar Energy - Principles of thermal collection and storage, second edition, Tata McGraw-Hil, New Delhi, 1996*
5. *M. S. Sodha, N. K. Bansal, P. K. Bansal, A. Kumar and M. A. S. Malik, Solar Passive*
6. *M. A. S. Malik, G. N. Tiwari, A. Kumar and M.S. Sodha, Solar Distillation. Pergamon Press, New York, 1982.*

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

Feedback form will be collected from the students by week 12 with the help of class representative and submitted to the concerned authorities.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Attendance during the assessment days is compulsory. 75% attendance is mandatory to attend the end semester examination. It is the duty of the faculty to compensate the classes which are cancelled due to some reasons or what so ever.
2. On-duty – permission is prior to attend the conference/workshop/industrial visit - approving authority is HOD/DEE
3. The grading policy is same as the guidelines which is given in M.Tech regulations of NIT, Tiruchirappalli.

FOR SENATE'S CONSIDERATION

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____