

## Syllabus for B.Tech – Energy Engineering

<b>Course Number &amp; Title:</b> EN312 Solar Energy Laboratory	
<b>L-T-P-C:</b> 0-0-3-3	
<b>Offered in</b> (Odd/ Even / Any): Semester VI	
<b>Pre-Requisite:</b> Nil	
Preamble / Objectives (Optional): The objective of this lab is to understand the basic principles in the area of Solar Energy Technology for undergraduate students through a series of experiments.	
Course Content/ Syllabus: Solar cells, series and parallel connections of solar cells, solar PV module, series, parallel, and series-parallel combinations of solar PV modules, single-axis and dual-axis solar tracking, buck and boost converters, bidirectional DC-DC converter, PWM type charge controllers, MPPT type charge controllers, grid-tied solar power generation and its application, solar thermal heater, solar distillation or solar still, solar water pumping, solar cooker, solar street lighting and lanterns.	
List of Experiments:	
1) Study of solar radiation by using Pyranometer	
2) Investigation of I-V characteristics of a solar cell	
3) Investigation of I-V characteristics of a solar PV module	
4) Single-axis and dual-axis solar tracking in time, manual, and auto modes.	
5) Maximum power point tracking (MPPT) for photovoltaic (PV) Systems	
6) Buck and boost converters under open and closed loop voltage control	
7) Bidirectional DC-DC converter to manage the power flow between the power source and the rechargeable batteries	
8) Performance analysis of PWM and MPPT type charge controllers	
9) Grid-tied solar power generation and its application	
10) Real-time data monitoring and logging system for a solar PV system (SCADA)	
11) Solar parabolic trough collector-based water heating system	
12) Solar distillation or solar still	
13) Solar water pumping	
14) The constructional details of a box type solar cooker	
15) Solar liquid flat plate collector for water heating	
Books (In case UG compulsory courses, please give it as “Text books” and “Reference books”. Otherwise give it as “References”).	
Text Books: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	D Goswami, <i>Principles of solar engineering</i> , CRC Press Taylor & Francis Group, Broken Sound Parkway NW, 3 <sup>rd</sup> Edition, 2015.
2.	C S Solanki, <i>Solar Photovoltaics: Fundamentals, Technologies and Applications</i> , Prentice Hall India, 2 <sup>nd</sup> Edition, 2011.
Reference Books: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	A Walker, <i>Solar Energy: Technologies and Project Delivery for Buildings</i> , John Wiley & Sons, 2013.